Staff Assessment

ABENGOA MOJAVE SOLAR

Application For Certification (09-AFC-5)
San Bernardino County

CALIFORNIA
ENERGY
COMMISSION

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MARCH 2010
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CEC-700-2010-003

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CALIFORNIA ENERGY COMMISSION

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ABENGOA MOJAVE SOLAR (AMS)
(09-AFC-5)
STAFF ASSESSMENT

EXECUTIVE SUMMARY

Testimony of Craig Hoffman

INTRODUCTION

This Staff Assessment (SA) contains the California Energy Commission staff's independent evaluation of the Abengoa Mojave Solar project (AMS) Application for Certification (09-AFC-5). The SA examines engineering, environmental, public health and safety aspects of the AMS project, based on the information provided by the applicant and other sources available at the time the SA was prepared. The SA contains analyses similar to those normally contained in an Environmental Impact Report (EIR) required by the California Environmental Quality Act (CEQA). When issuing a license, the Energy Commission is the lead state agency under CEQA and its process is functionally equivalent to the preparation of an EIR.

The Energy Commission staff has the responsibility to complete an independent assessment of the project's engineering design and identify the potential impacts on the environment, the public's health and safety, and determine whether the project conforms to all applicable laws, ordinances, regulations and standards (LORS). Upon identifying any potentially significant environmental impacts, staff recommends mitigation measures in the form of conditions of certification for construction, operation and eventual closure of the project.

The President and Congress have underscored the need for accelerated development of renewable energy projects in California with the passing of the American Recovery and Reinvestment Act (ARRA) of 2009. The Act specifically directs economic stimulus funding to qualified projects that begin construction by December 1, 2010. The AMS project is requesting ARRA funding which has required an accelerated project schedule and the preparation of a single Staff Assessment as opposed to a Preliminary Staff Assessment and Final Staff Assessment. The SA presents for the applicant, interveners, agencies, other interested parties, and members of the public, the staff's final analysis, conclusions, and recommendations.

When necessary, staff provides a comment period to resolve issues between the parties and to narrow the scope of disputed issues presented at evidentiary hearings. During the comment period that normally follows the publication of the SA, staff will conduct one or more workshops to discuss its findings, proposed mitigation, and proposed compliance-monitoring requirements. Based on the workshops and written comments, staff may refine its analysis, correct errors, and finalize conditions of certification to reflect areas where agreements have been reached with the parties and will then publish a Supplemental Staff Assessment (SSA). The SSA will be a limited document representing revisions and additions rather than a document including each technical section.

ENERGY COMMISSION'S "IN LIEU" PERMITTING PROCESS

Staff has implemented an objective of the Renewable Energy Action Team (REAT), as identified in the Governor's Executive Order S-14-08, to create a consolidated process for permitting renewable energy generation facilities under California law. This permit streamlining process is being implemented according to the Energy Commission's "in lieu permit" authority established under the Warren-Alquist Act. Accordingly, staff coordinated a joint environmental review with other agencies such as the U.S. Fish and Wildlife Service, California Department of Fish and Game, Lahontan Regional Water Quality Control Board, Mojave Desert Air Quality Management District and San Bernardino County to ensure that substantive requirements of these agencies were incorporated into the process and document.

The requirements of state and local permits that would ordinarily be issued but for the Energy Commission's exclusive jurisdiction, will be incorporated into the Commission's certificate if the project is approved. By implementing this cooperative approach, staff was able to reduce the overall permit processing time otherwise necessary to issue an Incidental Take Permit, Streambed Alteration Agreement and Waste Discharge Requirements.

PROJECT LOCATION AND DESCRIPTION

The proposed AMS project is a solar electric generating facility to be located on approximately 1,765 acres. The proposed project site is located approximately nine miles northwest of the Town of Hinkley in unincorporated San Bernardino County, approximately halfway between the City of Barstow and Kramer Junction (Highway 395 / Highway 58 junction). Project access is provided by Harper Lake Road, which is located approximately twenty miles west of Barstow along the Highway 58 corridor. The project site is approximately six miles north of where Harper Lake Road intersects with Highway 58. The existing Solar Electric Generating Stations VIII and IX facilities, owned by NextEra™ Energy Resources, are located immediately northwest of the project site.

The project site is comprised of private property that was historically used as the Lockhart Ranch complex. The property has served as an agricultural and cattle center for over sixty years and, in that capacity, has utilized water from ground wells; farming activities have included flood irrigation and ultimately the pivot system of irrigation of quarter section areas. Currently there are no ranching or residential activities on the property, and there is only one active pivot irrigation field in production on the site.

The project would utilize solar parabolic trough technology to activate a heat transfer fluid. The proposed collector fields of parabolic trough solar collectors are modular in nature and comprise many parallel rows of solar collectors, aligned on a north-south axis. Each solar collector has a linear, parabolic-shaped reflector that focuses the sun's radiation on a linear receiver known as a heat collection element located at the focus of the parabola.

As heat transfer fluid is circulated through the solar field, light from the sun reflects off the solar collector's parabolic troughs and is concentrated on the heat collection elements located at the focal point of the parabola. This heat transfer fluid provides a high-temperature energy source which is used to generate steam in solar steam generators. As this steam expands through the steam turbine generators, electrical power is generated.

The project will have a combined nominal electrical output of 250 megawatts (MW) from twin, independently-operable solar fields, each feeding a 125-MW power island. The plant sites, identified as Alpha (the northwest portion of the Project area) and Beta (the southeast portion of the project area), will be 884 acres and 800 acres respectively and joined at an on-site transmission line interconnection substation to form one full-output transmission interconnection. This proposed substation, located at the southwest corner of the Beta solar field, is referred to as the “Hinkley” substation. An additional 81 acres shared between the plant sites will be utilized for receiving and discharging offsite stormwater drainage.

The applicant has a power purchase agreement with Pacific Gas and Electric.

PUBLIC AND AGENCY COORDINATION

On August 27, 2008, the Energy Commission staff issued a notification of receipt of the Application for Certification (AFC), together with a project description, to property owners within 1,000 feet of the proposed project and those located within 500 feet of the linear facilities. Staff sent a similar notification and a copy of the AFC to a comprehensive list of agencies and libraries. Staff’s notification letters requested public and agency review and comment on the AFC, and invited continued participation in the Energy Commission’s review and permitting process. Staff followed up this notification on October 21, 2009 with a notice of receipt of Supplement to the AFC to those interested parties listed above.

The Energy Commission’s Public Advisor’s Office (PAO) reviewed public outreach information available from the applicant and others and then conducted its own, extensive efforts to identify certain local officials, as well as interested entities within a six-mile radius around the proposed site for the AMS project.

The PAO sent a cover letter and a two-sided bilingual notice in English and Spanish announcing the Informational Hearing, Environmental Scoping Meeting and Site Visit for the project, held on December 9, 2009, in the City of Barstow. This notice was sent to local Barstow and San Bernardino County elected officials; commissions and boards; eighteen local Native American Tribes and registered members (provided by the Native American Heritage Commission); public and private schools; places of worship; local non-profit groups (community, environmental, ethnic organizations), mobile home parks; emergency services; museums and libraries. There were no identified Native American tribal lands within a six-mile radius of the project.

In addition, the PAO arranged for advertisements in English in the December 5, 2009 issue of the *Victorville Daily Press* and Spanish in *Rumores News* and also requested public service announcements in English and Spanish at television and radio stations broadcasting in the project area.

In addition to the outreach efforts of the PAO, staff has continued to solicit comments on the AFC from local, state and federal agencies that have an interest in the project including San Bernardino County Planning Department and Public Works Department, Mojave Desert Air Quality Management District, Cal-Trans, Lahontan Regional Water

Quality Control Board, U.S. Fish and Wildlife Service, and California Department of Fish and Game. Staff has also considered the comments of interveners, community groups, and individual members of the public.

PUBLIC WORKSHOPS

On December 9, 2009, the Hearing Officer conducted a publicly noticed Informational Hearing, Environmental Scoping Meeting and Site Visit at the City of Barstow council chambers. This Scoping Meeting and Informational Hearing provided an opportunity for members of the community in the project vicinity to obtain information and offer comments and concerns about the proposed project as well as identify potential environmental impacts for consideration during the Energy Commission's review of the proposal. The applicant explained plans for developing the project and the related facilities and Energy Commission staff explained the administrative licensing process and Staff's role in reviewing the AFC.

On December 8, 2009, staff conducted a publicly noticed Data Response and Issue Resolution workshop at the California Energy Commission building in Sacramento and discussed the topics of Air Quality, Alternatives, Biology, Land Use, Soils and Water Resources and Waste Management. The purpose of the workshop was to provide members of the community and governmental agencies opportunity to obtain project information, and to offer comments they may have had regarding any aspect of the proposed project.

On January 15, 2010, staff conducted a second publicly noticed Data Response and Issue Resolution workshop at the Commission building and discussed the topics of Air Quality, Biology, Cultural Resources, Land Use, Soils and Water Resources and Waste Management. This meeting was continued to January 20, 2010 to extend discussions on Air Quality, Soils and Water Resources and Waste Management. The purpose of these workshops was to provide members of the community and governmental agencies the opportunity to obtain project information, and to offer comments they may have had regarding any aspect of the proposed project.

LIBRARIES

On August 27, 2008, the Energy Commission staff sent the AMS Application for Certification, and on October 21, 2009 followed up with the AMS Supplement to the Application for Certification, to various libraries located in Kern County and San Bernardino County (Barstow Branch Library, Victorville City Library, Apple Valley Newton T. Bass Branch Library, Adelanto Branch Library, Kern County Library - Mojave Branch, Barstow Community College Library and Victor Valley College) and to libraries in Eureka, Fresno, Los Angeles, Sacramento, San Diego, and San Francisco.

ENVIRONMENTAL JUSTICE

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

All Departments, Boards, Commissions, Conservancies and Special Programs of the Resources Agency must consider environmental justice in their decision-making process if their actions have an impact on the environment, environmental laws, or policies. Such actions that require environmental justice consideration may include:

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

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

Environmental Justice: Guidance Under the National Environmental Policy Act, 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. A minority population is identified when the minority population of the potentially affected area is (1) greater than 50%; or (2) or when one or more U.S. Census blocks in the potentially affected area have a minority population of greater than 50%.

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

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

As a result of staff's analysis, staff determined there are no environmental justice issues for the proposed AMS project. Staff identified the following economic benefits from the project: capital costs; construction and operation payroll; sales taxes; and school impact fees.

PROJECT’S COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Based upon the information provided to date and the analysis completed to date for each technical section, staff has concluded that with implementation of staff’s recommended mitigation measures described in the conditions of certification, all potential environmental impacts will be mitigated to a less than significant level. The project analysis complies with the requirements of the California Environmental Quality Act (CEQA). For a detailed review of potentially significant impacts and the related mitigation measures, please refer to each chapter of the SA.

Within the technical areas of **AIR QUALITY, BIOLOGICAL RESOURCES, SOIL AND WATER RESOURCES, TRANSMISSION SYSTEM ENGINEERING** and **WASTE MANAGEMENT** additional analysis will be needed in regard to specific issues that are described in each section’s summary of conclusions. These are outstanding issues that will be resolved in the SSA as identified on the following page.

Staff also concludes that with implementation of staff’s recommended mitigation measures described in the conditions of certification, the project would comply with all applicable laws, ordinances, regulations, and standards (LORS), with the exception of the **SOIL AND WATER RESOURCES** section.

The state has expressed a strong interest in developing its solar energy resources. However, the construction and operation of solar energy facilities requires the use of water, which state policy also protects. The Energy Commission must balance the state's interest in promoting solar energy development with its interest in conserving and protecting the state's water resources. Several projects currently proposed in the Mojave and Colorado deserts would use water for power plant cooling, which staff believes is contrary to the state’s long term interest in maximizing solar power generation and minimizing adverse environmental impacts. This will be an especially critical issue in the renewable development areas that will be identified in the joint state/federal Renewable Energy Action Team’s Desert Renewable Energy Conservation Plan (DRECP). Later this year, staff plans to file a request for an Energy Commission Order Instituting an Informational Proceeding to address the overall issue of water use by power plants. For a more detailed discussion of water policy and related LORS, see staff's technical analyses in the **SOIL AND WATER RESOURCES** section of the SA.

PROJECT’S ENVIRONMENTAL IMPACTS

Staff believes that with the Commission’s adoption of staff’s proposed mitigation measures and the proposed conditions of certification, the AMS project would not cause significant adverse impacts. The conclusions of each technical area are summarized in the table on the following page.

Executive Summary Table 1
Summary of Impacts to Each Technical Area

Technical Area	Additional Analysis Required	Complies with LORS	Impacts Mitigated
Air Quality	Yes	Yes	Yes
Alternatives		Not Applicable	Not Applicable
Biological Resources	Yes	Yes	Yes
Cultural Resources		Yes	Yes
Cumulative		Yes	Yes
Efficiency		Not Applicable	Not Applicable
Facility Design		Yes	Yes
Geology and Paleontology		Yes	Yes
Hazardous Materials		Yes	Yes
Land Use		Yes	Yes
Noise and Vibration		Yes	Yes
Public Health		Yes	Yes
Reliability		Not Applicable	Not Applicable
Socioeconomic Resources		Yes	Yes
Soil and Water Resources	Yes	**No**	Yes
Traffic and Transportation		Yes	Yes
Transmission Line Safety/Nuisance		Yes	Yes
Transmission System Engineering	Yes	Yes	Yes
Visual Resources		Yes	Yes
Waste Management	Yes	Yes	Yes
Worker Safety and Fire Protection		Yes	Yes

SUPPLEMENTAL STAFF ASSESSMENT

Based on Staff Assessment workshops and written comments, staff may refine its analysis, correct errors, and finalize conditions of certification to reflect areas where agreements have been reached with the parties and will then publish a Supplemental Staff Assessment (SSA). The SSA will be a limited document representing revisions and additions rather than a document including each technical section.

Staff expects that the following information will need to be incorporated into the SSA.

Air Quality - a Final Determination of Compliance will be needed from the Mojave Desert Air District and incorporated into staff analysis.

Biological Resources – a Section 7 consultation will need to be initiated between the applicant and US Fish and Wildlife Service. The applicant will need to provide to the Energy Commission, US Fish and Wildlife Service, and California Department of Fish and Game: a Draft Desert Tortoise Exclusion Fencing Plan, Clearance Survey, and Translocation Plan (Desert Tortoise Plan), a Draft Burrowing Owl Monitoring and Mitigation Plan (Burrowing Owl Plan), Swainson's Hawk Survey Results – Spring 2010 and Golden Eagle Survey Results and related Foraging Habitat Assessment. Staff will need to ensure that the current proposed mitigation measures in the Staff Assessment do not need to be modified based upon new information.

Soil and Water Resources - Completion of staff's analysis of the proposed project is subject to the following:

- Submittal of the following to the Lahontan Regional Quality Control Board (RWQCB) and County of San Bernardino for review and comment and to the Energy Commission for approval:
    - Engineering design detail and groundwater monitoring plans for the four proposed wastewater evaporation ponds;
    - Engineering design detail and groundwater monitoring plans for the proposed Heat Transfer Fluid (HTF) fluid bioremediation units;
    - Characterization of the anticipated waste streams proposed to be discharged into the evaporation ponds and bioremediation units;
    - A description of the frequency and chemical analysis of waste and a plan that describes actions that will be taken in case of a detectable release;
    - Engineering design detail for the proposed sanitary waste septic system and leach field;
    - A closure plan for the evaporation ponds and bioremediation units; and
    - Demonstration that the proposed project would be in compliance with RWQCB Order 2009-0009-DWQ Storm Water requirements that go into effect July 1, 2010.
- Submittal of the applicant's storm water surface profile analysis for flows in the main storm water diversion channel to San Bernardino County for review and comment and to the Energy Commission for approval.

Transmission System Engineering – the applicant will need to provide environmental information for downstream congestion management improvements in order for staff to complete a CEQA analysis on proposed improvements.

Waste Management – the applicant is completing a site characterization and sampling report which will be reviewed by staff to verify no new Waste Management mitigation measures are necessary.

The SSA will be completed once the above information is available and public comments have been incorporated into the document and workshops have been completed.

NOTEWORTHY PUBLIC BENEFITS

AMS offers the benefit of providing 100% of its power generation from the sun. The daylight operating hours generally coincide with the hours when peaking capacity and energy is needed to support the California ISO electric power transmission grid. In addition, staff has identified the following significant and environmentally important public benefits:

1. AMS would contribute to meeting goals under California's Renewable Portfolio Standard Program (Senate Bill (SB) 1078; as amended by SB 107), which establishes that 20% of the total electricity sold to retail customers in California by December 31, 2010 must consist of renewable energy;

2. AMS would contribute to meeting the Governor's Executive Order #S-14-08 which establishes that renewable energy must contribute 33% of the supply for meeting total state energy demands by 2020;

3. AMS would contribute to the state accomplishing its goals for reducing global carbon emissions in accordance with the California Global Warming Solutions Act of 2006 (Assembly Bill 32); and

4. AMS would generate both short term construction-related and long term operational-related increases in local expenditures and payrolls, as well as sales tax revenues.

INTRODUCTION

Craig Hoffman

PURPOSE OF THIS REPORT

This Staff Assessment (SA) is the California Energy Commission staff's independent analysis of the proposed Abengoa Mojave Solar project (hereafter referred to as AMS). For clarity, this SA is a staff document. It is neither a California Energy Commission Committee document nor a draft decision. The SA describes the following:

- The proposed project;
- The existing environment;
- Whether the facilities can be constructed and operated safely and reliably in accordance with applicable laws, ordinances, regulations, and standards (LORS);
- The environmental consequences of the project including potential public health and safety impacts;
- The potential cumulative impacts of the project in conjunction with other existing and known planned developments;
- Mitigation measures proposed by the applicant, staff, interested agencies, local organizations, and interveners which may lessen or eliminate potential impacts;
- The proposed conditions under which the project should be constructed and operated, if it is certified; and
- Project alternatives.

The analyses contained in this SA are based upon information from the: 1) Application for Certification (AFC), 2) responses to data requests, 3) supplementary information from local, state, and federal agencies, interested organizations, and individuals, 4) existing documents and publications, 5) independent research, 6) comments at workshops and 7) Committee public hearings. The analyses for most technical areas include discussions of proposed conditions of certification. Each proposed condition of certification is followed by a proposed means of verification that the condition of certification has been met. The SA presents final conclusions about potential environmental impacts and conformity with LORS, as well as proposed conditions that apply to the design, construction, operation, and closure of the facility.

The Energy Commission staff's analyses were prepared in accordance with Public Resources Code section 25500 et seq.; California Code of Regulations, title 20, section 1701 et seq.; and the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.).

ORGANIZATION OF THE STAFF ASSESSMENT

The SA contains an Executive Summary, Introduction, Project Description, and Project Alternatives. The environmental, engineering, and public health and safety analysis of the proposed project is contained in a discussion of 20 technical areas. Each technical area is addressed in a separate chapter. These chapters 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.

Each of the 20 technical area assessments includes a discussion of:

- Laws, ordinances, regulations, and standards (LORS);
- The regional and site-specific setting;
- Project specific and cumulative impacts;
- Mitigation measures;
- Closure requirements;
- Conclusions and recommendations; and
- Conditions of certification for both construction and operation (if applicable).

ENERGY COMMISSION SITING PROCESS

The California Energy Commission has the exclusive authority to certify the construction and operation of thermal electric power plants 50 megawatts (MW) or larger. The Energy Commission certification is in lieu of any permit required by state, regional, or local agencies, and federal agencies to the extent permitted by federal law (Pub. Resources Code, §25500). The Energy Commission must review power plant AFCs to assess potential environmental and public health and safety impacts, potential measures to mitigate those impacts (Pub. Resources Code, §25519), and compliance with applicable governmental laws and standards (Pub. Resources Code, §25523 (d)).

The Energy Commission's siting regulations require staff to independently review the AFC and assess whether the list of environmental impacts it contains is complete, and whether additional or more effective mitigation measures are necessary, feasible and available (Cal. Code Regs., tit. 20, §§ 1742 and 1742.5(a)). Staff's independent review is presented in this report (Cal. Code Regs., tit. 20, §1742.5).

In addition, staff must assess the completeness and adequacy of the health and safety standards, and the reliability of power plant operations (Cal. Code Regs., tit. 20, § 1743(b)). Staff is required to coordinate with other agencies to ensure that applicable laws, ordinances, regulations and standards are met (Cal. Code Regs., tit. 20, § 1744(b)).

Staff conducts its environmental analysis in accordance with the requirements of the California Environmental Quality Act. No Environmental Impact Report (EIR) is required because the Energy Commission's site certification program has been certified by the Resources Agency (Pub. Resources Code, §21080.5 and Cal. Code Regs., tit. 14, §15251 (k)). The Energy Commission is the CEQA lead agency and is subject to all portions of CEQA applicable to certified regulatory activities.

Staff typically prepares both a preliminary and final staff assessment. However, to adhere to agreed upon timelines for this project, staff will prepare a SA only. The SA presents for the applicant, interveners, agencies, other interested parties, and members of the public, the staff's final analysis, conclusions, and recommendations.

When necessary, staff provides a comment period to resolve issues between the parties and to narrow the scope of disputed issues presented at evidentiary hearings. During the comment period that normally follows the publication of the SA, staff will conduct one or more workshops to discuss its findings, proposed mitigation, and proposed compliance-monitoring requirements. Based on the workshops and written comments, staff may refine its analysis, correct errors, and finalize conditions of certification to reflect areas where agreements have been reached with the parties and will then publish a Supplemental Staff Assessment (SSA). The SSA will be a limited document representing revisions and additions rather than a document including each technical section.

The SA is only one piece of evidence that will be considered by the Committee (two Commissioners who have been assigned to this project) in reaching a decision on whether or not to recommend that the full Energy Commission approve the proposed project. At the public hearings, all parties will be afforded an opportunity to present evidence and to rebut the testimony of other parties, thereby creating a hearing record on which a decision on the project can be based. The hearing before the Committee also allows all parties to argue their positions on disputed matters, if any, and it provides a forum for the Committee to receive comments from the public and other governmental agencies.

Following the hearings, the Committee's recommendation to the full Energy Commission on whether or not to approve the proposed project will be contained in a document entitled the Presiding Members' Proposed Decision (PMPD). Following publication, the PMPD is circulated in order to receive public comments. At the conclusion of the comment period, the Committee may prepare a revised PMPD. A revised PMPD will be circulated for a comment period to be determined by the Committee. At the close of the comment period for the revised PMPD, the PMPD is submitted to the full Energy Commission for a decision. Within 30 days of the Energy Commission decision, any intervener may request that the Energy Commission reconsider its decision.

A Compliance Monitoring Plan and General Conditions will be assembled from conditions contained in the SA and other evidence presented at the hearings. The Compliance Monitoring Plan and General Conditions will be presented in the PMPD. The Energy Commission staff's implementation of the plan ensures that a certified facility is constructed, operated, and closed in compliance with the conditions adopted by the Energy Commission.

AGENCY COORDINATION

As noted above, the Energy Commission certification is in lieu of any permit required by state, regional, or local agencies and federal agencies to the extent permitted by federal law (Pub. Resources Code, § 25500). However, the Commission typically seeks comments from and works closely with other regulatory agencies that administer LORS that may be applicable to proposed projects. These agencies may include as applicable the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, California Coastal Commission, State Water Resources Control Board/Regional Water Quality Control Board, California Department of Fish and Game, and the California Air Resources Board. On August 27, 2009, Energy Commission staff sent the AMS AFC to all local, state, and federal agencies that might be affected by the proposed project. On October 21, 2009, staff sent the AMS Supplemental AFC to all local, state, and federal agencies that might be affected by the proposed project.

OUTREACH

The Energy Commission's outreach program is primarily facilitated by the Public Adviser's Office (PAO). This is an ongoing process that to date has involved the following efforts:

LIBRARIES

On August 27, 2008, the Energy Commission staff sent the AMS Application for Certification and on October 21, 2009 followed up with the AMS Supplement to the Application for Certification to various libraries located in San Bernardino County and Kern County (Barstow Branch Library, Victorville City Library, Apple Valley Newton T. Bass Branch Library, Adelanto Branch Library, Kern County Library - Mojave Branch, Barstow Community College Library and Victor Valley College) and to libraries in Eureka, Fresno, Los Angeles, Sacramento, San Diego, and San Francisco.

INITIAL OUTREACH EFFORTS

The PAO reviewed related information available from the applicant and others and then conducted its own, extensive outreach efforts to identify certain local officials, as well as interested entities within a six-mile radius around the proposed site for the AMS project.

The PAO sent a cover letter and a two-sided bilingual notice in English and Spanish announcing the Informational Hearing and Site Visit for the project, held on December 9, 2009, in the City of Barstow. This notice was sent to local Barstow and San Bernardino County elected officials; commissions and boards; eighteen local Native American Tribes and registered members (provided by the Native American Heritage Commission); public and private schools; places of worship; local non-profit groups (community, environmental, ethnic organizations); state prison, mobile home parks; emergency services; museums and libraries. There were no identified Native American tribal lands within a six-mile radius of the project.

In addition, the PAO arranged for advertisements in English in the December 5, 2009 issue of the *Victorville Daily Press* and Spanish in *Rumores News* and also requested public service announcements in English and Spanish at television and radio stations broadcasting in the project area.

Energy Commission regulations require staff to notice, at a minimum, property owners within 1,000 feet of a project and 500 feet of a linear facility (such as transmission lines, gas lines, and water lines). This was done for the AMS project. Staff's ongoing public and agency coordination activities for this project are discussed under the Public and Agency Coordination heading in the **EXECUTIVE SUMMARY** section of the SA.

ENVIRONMENTAL JUSTICE

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

For all siting cases, Energy Commission staff conducts an environmental justice screening analysis in accordance with the *Final Guidance for Incorporating Environmental Justice Concerns in EPA’s NEPA (National Environmental Policy Act) Compliance Analysis,* dated April 1998. The purpose of the screening analysis is to determine whether a minority or low-income population exists within the potentially affected area of the proposed site.

California Statute section 65040.12(c) of the Government Code defines *environmental justice* to mean “fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.” Staff’s specific activities, with respect to environmental justice for the AMS project, are discussed in the **EXECUTIVE SUMMARY**.

PROJECT DESCRIPTION

Craig Hoffman

INTRODUCTION

Mojave Solar LLC (Applicant), a wholly owned subsidiary of Abengoa Solar Inc., filed an Application for Certification (AFC) with the California Energy Commission (Energy Commission) on August 10, 2008, to construct and operate a nominal 250 megawatt (MW) solar thermal power plant, the Abengoa Mojave Solar (AMS) project. On September 23, 2009, the California Energy Commission determined that the AFC was deficient in nine of 23 areas. On September 24, 2009, the applicant provided additional information to supplement the AFC. At a business meeting held on October 21, 2009, the Energy Commission adopted the Executive Director's data adequacy recommendation of data adequate, thereby deeming the AFC complete for filing purposes.

PROJECT LOCATION AND SITE DESCRIPTION

The proposed AMS project is a solar electric generating facility to be located on approximately 1,765 acres. The proposed project site is located approximately nine miles northwest of the town of Hinkley in unincorporated San Bernardino County, approximately halfway between the city of Barstow and Kramer Junction (Highway 395 / Highway 58 junction). Project site access is provided by Harper Lake Road, which is located approximately twenty miles west of Barstow along the Highway 58 corridor. The project site is approximately six miles north of where Harper Lake Road intersects with Highway 58. The existing Solar Electric Generating Stations VIII and IX facilities, now owned by NextEra™ Energy Resources, are located immediately northwest of the project site. See **Project Description Figures 1, 2 and 3.**

The project site is comprised of private property that was historically used as the Lockhart Ranch complex. The property has served as an agricultural and cattle center for over sixty years and, in that capacity, has utilized water from ground wells; farming activities have included flood irrigation and ultimately the pivot system of irrigation of quarter section areas. Currently there are no ranching or residential activities on the property, and there is only one active pivot irrigation field in production on the site. The property is designated Rural Living (RL) by the San Bernardino County General Plan and also zoned RL.

PROJECT PURPOSE AND OBJECTIVES

The project is expected to supply renewable energy to the California energy market. As described in the AFC, the applicant's specific project objectives are as follows:

- To help achieve the State of California renewable energy objectives and to support the state's Renewable Portfolio Standard requirements with providing long term production of renewable electric energy,

- To safely and economically construct, operate and maintain an efficient, reliable and environmentally-sound power generating facility,
- To develop a project using up-to-date and improved versions of an already-proven renewable energy technology, minimizing technical risk and improving the financial viability of the project,
- To maximize the renewable energy from a site with an excellent solar resource, appropriate slope and grading, availability of water rights and availability of transportation and other infrastructure in order to minimize the cost of renewable energy for consumers,
- To reduce or eliminate potentially significant adverse environmental impacts of the project by locating away from sensitive noise and visual receptors and sensitive species,
- To electrically interconnect to suitable electrical transmission while minimizing environmental impacts associated with interconnection and minimizing cost, and
- To develop a site with close proximity to natural gas infrastructure in order to minimize environmental impacts and cost.

Based upon the applicant's design objectives, staff concluded the project's objectives also include operation for 30 or more years.

PROJECT FEATURES

SOLAR FIELD, POWER GENERATION EQUIPMENT AND PROCESS

The proposed AMS project is a solar electric generating facility to be located on approximately 1,765 acres. The project would utilize solar parabolic trough technology to activate a heat transfer fluid. The proposed collector fields of parabolic trough solar collectors are modular in nature and comprise many parallel rows of solar collectors, aligned on a north-south axis. Each solar collector has a linear, parabolic-shaped reflector that focuses the sun's radiation on a linear receiver known as a heat collection element located at the focus of the parabola. See **Project Description Figures 4 and 5.**

As heat transfer fluid is circulated through the solar field, light from the sun reflects off the solar collector's parabolic troughs and is concentrated on the heat collection elements located at the focal point of the parabola. This heat transfer fluid provides a high-temperature energy source which is used to generate steam in steam generators. As this steam expands through the steam turbine generators, electrical power is generated.

The project would have a combined nominal electrical output of 250 megawatts (MW) from twin, independently-operable solar fields, each feeding a 125-MW power island. The plant sites, identified as Alpha (the northwest portion of the Project area) and Beta (the southeast portion of the Project area), would be 884 acres and 800 acres, respectively, and joined at an on-site transmission line interconnection substation to form one full-output transmission interconnection. The applicant proposes that an additional 81 acres shared between the plant sites will be utilized for receiving and discharging offsite drainage improvements.

Each power island would have its own warehouse and control/admin building. Solar collector array assembly buildings would be installed in the northeast portion of the Alpha solar field, which would be later converted to warehouses. The total square footage of the various proposed project buildings and pre-engineered enclosures (e.g., control/admin building, warehouse, electrical equipment enclosures, etc.) is approximately 185,000 square feet for the entire project.

The sun would provide 100% of the power supplied to the project through solar-thermal collectors; no supplementary fossil-based energy source (e.g., natural gas) is proposed for electrical power production. However, natural gas for the AMS project's ancillary purposes, such as firing the auxiliary boilers and space heating, would be supplied by an existing natural gas pipeline that runs to the project boundary; no offsite pipeline facilities are proposed as a part of this project. Each power island would also have a diesel powered firewater pump for fire protection and a diesel fired backup generator for power plant essentials.

NATURAL GAS

Natural gas for the project's ancillary purposes, such as the auxiliary boilers and space heating, would be supplied by a Southwest Gas Corporation (SGC) owned pipeline that runs to the project boundary near the Alpha power island. No offsite pipeline facilities are proposed as a part of this project.

WATER DEMAND AND SOURCE OF SUPPLY

The AMS project proposes to use wet cooling towers for power plant cooling and according to the applicant owns adjudicated water rights to the Harper Valley Groundwater Basin. The Mojave Water Agency administers these water rights. According to the AFC's laboratory analysis of groundwater samples collected from the active Ryken well, which is within the project vicinity, the expected groundwater supply appears to be above 1,500 milligrams per liter (mg/L) Total Dissolved Solids which is considered brackish and therefore not suitable for municipal supply or other potable uses without treatment. The solar project proposes to utilize 2,163 acre-feet of water per year, for 30 years. The AMS project through ownership or purchase options has rights to 10,478 acre-feet of groundwater per year from the adjudicated basin, and those rights are subject to the terms of the court adjudication.

Process and cooling water needs of the project would be met by use of groundwater pumped from wells on the plant site. This water would be treated prior to use in power plant operations. Water for domestic use by employees would also be provided by onsite groundwater that would be treated to potable water standards by a packaged treatment unit.

Several former agricultural wells exist on the site and were used to determine water quality and for pumping tests. New water supply wells would need to be installed to provide the reliability needed during plant operations. These wells would draw from the adjudicated water rights owned by the project developer. The remaining agricultural wells may be used to monitor groundwater levels and quality. Those wells located within the solar array footprint will have their pump motors and bowls removed and cut down to near-surface grade elevations and decommissioned in accordance with applicable regulations.

On both the Alpha and Beta plant fields, raw water and service water storage tanks, each having a capacity of 1,930,000 gallons, would provide enough storage capacity to allow for interruption of water supply to the facility of approximately one to two days. A portion (approximately 360,000 gallons) of each service water storage tank will be dedicated to the plant’s fire protection water system, for a total of 720,000 gallons for the entire project.

WATER TREATMENT SYSTEMS

The raw water, circulating water, process water and solar collector array (SCA) washing water all require onsite treatment, and this treatment varies according to the quality required for each of these uses. The groundwater would be pumped to the raw water storage tank, and a biocide (sodium hypochlorite) would be used to treat the water. When transferred to the service water tank, the water is again treated with the biocide if needed. This water would be used directly in the cooling tower as make-up water.

To conserve water, the lower total dissolved solids (TDS) reverse osmosis (RO) reject streams would be recycled back to the service water storage tank for reuse in the cooling tower. Additionally, a clear well would be used, and when the discharge exceeds the treatment system demand, the clear well discharge would be released to the cooling tower to further conserve water. In order to reduce overall water consumption and sizing of evaporation ponds, service water will first be used as makeup to the cooling tower and circulating water system.

SOLAR COLLECTOR ARRAY WASHING

To facilitate dust and contaminant removal, partially deionized (demineralized) water would be used to clean the SCAs on a periodic basis, determined by the reflectivity monitoring program and other maintenance considerations. Washing the SCA maintains the mirror surface, the HCE and other components clean and free to operate normally. This operation is generally completed at night and involves a water truck spraying deionized water on the SCAs in a drive-by fashion. Water from the SCA washing operation is expected to evaporate on the SCA with minimal water applied to the ground. No site runoff or recharge is anticipated from this process.

EVAPORATION PONDS

The project would include four – 5-acre evaporation ponds for industrial wastewater. It is expected that each plant field would have two double-lined evaporation ponds with a nominal surface area of five acres each for a total of ten acres per field, or twenty acres for the entire project. The ponds would be designed in accordance with Lahontan Regional Water Quality Control Board (RWQCB) requirements. The applicant plans to use multiple ponds to allow plant operations to continue in the event that a pond needs to be taken out of service for needed maintenance. Each pond would have enough surface area so that the evaporation rate exceeds the cooling tower blowdown rate at maximum design conditions and at annual average conditions. Pond depth would be selected so that the ponds would not need to have residual solids removed during the life of the plant.

The pond liner system is expected to consist of a 60 mil high-density polyethylene (HDPE) inner liner and a 50 mil HDPE outer liner. Between the liners would be a synthetic drainage net that is used as part of the leachate collection and removal system (LCRS). Monitoring of the evaporation ponds would be required to detect the presence of liquid and/or constituents of concern. The LCRS would be monitored and a series of monitoring wells would also be used for the evaporation ponds. Based on the power plant process, chemicals used, and water quality, the applicant expects that the constituents of concern for this monitoring would include chloride, sodium, sulfate, TDS, biphenyl, diphenyl oxide, potassium, selenium, chromium and phosphate. The proposed detection monitoring program for the facility consists of regularly testing the LCRS, lysimeters, and monitoring wells for the presence of liquid and/or constituents of concern.

WASTEWATER

Wastewater streams and the disposition of wastewater (water treatment system effluent) would ultimately be discharged to evaporation ponds. As discussed previously, the cooling tower blowdown will be processed with various processes, including clarification and reverse osmosis, prior to reuse to make SCA washing and steam system makeup water. The reject water would be ultimately discharged to evaporation ponds for final evaporation/dewatering. The residual solids would remain in the pond for the duration of the plant life.

NON-HAZARDOUS SOLID WASTE

Construction, operation and maintenance of the project would generate non-hazardous solid wastes typical of power generation or other industrial facilities. These wastes include scrap metal and plastic, insulation material, paper, glass, empty containers, and other miscellaneous solid wastes. These materials would be disposed of by means of contracted refuse collection and recycling services.

HAZARDOUS WASTE MANAGEMENT

There will be a variety of hazardous materials used and stored during construction and operation of the project. Hazardous materials that would be used during construction include gasoline, diesel fuel, oil, lubricants, and small quantities of solvents and paints. All hazardous materials used during construction and operation would be stored onsite in storage tanks / vessels / containers that are specifically designed for the characteristics of the materials to be stored, as appropriate.

A variety of safety-related plans and programs would be developed and implemented to ensure safe handling, storage and use of hazardous materials. Plant personnel would be supplied with appropriate personal protective equipment and properly trained in the use, handling and cleanup of hazardous materials used at the facility, as well as procedures to be followed in the event of a leak or spill. Adequate supplies of appropriate cleanup materials would be stored onsite.

FIRE PROTECTION

Fire protection systems would be provided to limit personnel injury, property loss and project downtime resulting from a fire. The systems include a fire protection water system and portable fire extinguishers. The project's fire protection water system would be supplied from a dedicated 360,000-gallon portion of the 1,930,000-gallon service water storage tanks located on each plant field. One electric and one diesel-fueled backup firewater pump, each with a capacity of 3,000 gallons per minute, would deliver water to the fire-protection water piping network on each plant site. A smaller electric motor-driven jockey pump would maintain pressure in the piping network.

The piping network would supply: fire hydrants located at intervals throughout the power island; a sprinkler deluge system at each unit transformer, Heat Transfer Fluid (HTF) expansion tank and circulating pump area; and sprinkler systems in the operations and administration buildings. Portable fire extinguishers of appropriate sizes and types would be located throughout the plant site. Fire protection for the solar field would be provided by zoned isolation of the HTF lines in the event of a rupture that results in fire. As vegetation or other combustible materials would not be allowed in the solar field, the HTF would extinguish itself naturally, since the remainder of the field is of nonflammable material (aluminum, steel and glass).

TRANSMISSION SYSTEM INTERCONNECTION AND UPGRADES

The AMS project is proposing to connect to Southern California Edison Company's (SCE) Kramer-Cool Water 230-kV transmission line, which is located adjacent to the southern border of the proposed project site. All AMS project-related transmission facilities would be within the project boundaries except the connection within the existing transmission right-of-way adjacent to the site.

The existing transmission line corridor has facilities installed on the north side, the Kramer-Cool Water 230 kV radial line owned and operated by SCE and, on the south side, the Mead-Adelanto 500 kV transmission line operated by the Los Angeles Department of Water and Power (LADWP). A lower voltage transmission line exists between the two. The transmission corridor's northern boundary is adjacent to the project's southern boundary.

The project proposes interconnection to the #1 Kramer-Cool Water line. The project is located approximately 32 transmission-miles west of the Cool Water generating facility and approximately 13 transmission-miles east of the Kramer interconnection substation. To interconnect the project into the existing Kramer-Cool Water No.1 230 kV transmission line, a new substation would be needed. This proposed substation, located at the southwest corner of the Beta solar field and referred to as "Hinkley," is to be located approximately 13 transmission-miles east from the existing Kramer Substation and approximately 32 transmission-miles west of the existing Cool Water Substation.

PROJECT CONSTRUCTION AND OPERATION

If approved, the applicant expects that construction of the generating facility, from site preparation and grading to commercial operation, would take place from the third quarter of 2010 to the third quarter of 2012 (24 months total). If approved, the applicant anticipates that the project would be on line and in commercial service by the fourth quarter of 2012.

The construction workforce would consist of laborers, craftsmen, supervisory personnel, support personnel and construction management personnel. The project's predicted peak and average construction employment levels are 1,162 and 830, respectively.

FACILITY CLOSURE

The AMS project would be designed for an operating life of between 30 years to 40 years. Depending on maintenance factors, at an appropriate point beyond the designed operating life, the project would cease operation and close down. At that time, it would be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts.

Although the setting for this project does not appear to present any special or unusual closure problems, it is impossible to foresee what the situation would be in 30 years or more when the project ceases operation. Therefore, provisions must be made which provide the flexibility to deal with the specific situation and project setting at the time of closure. Facility closure would be consistent with laws, ordinances, regulations and standards in effect at the time of closure.

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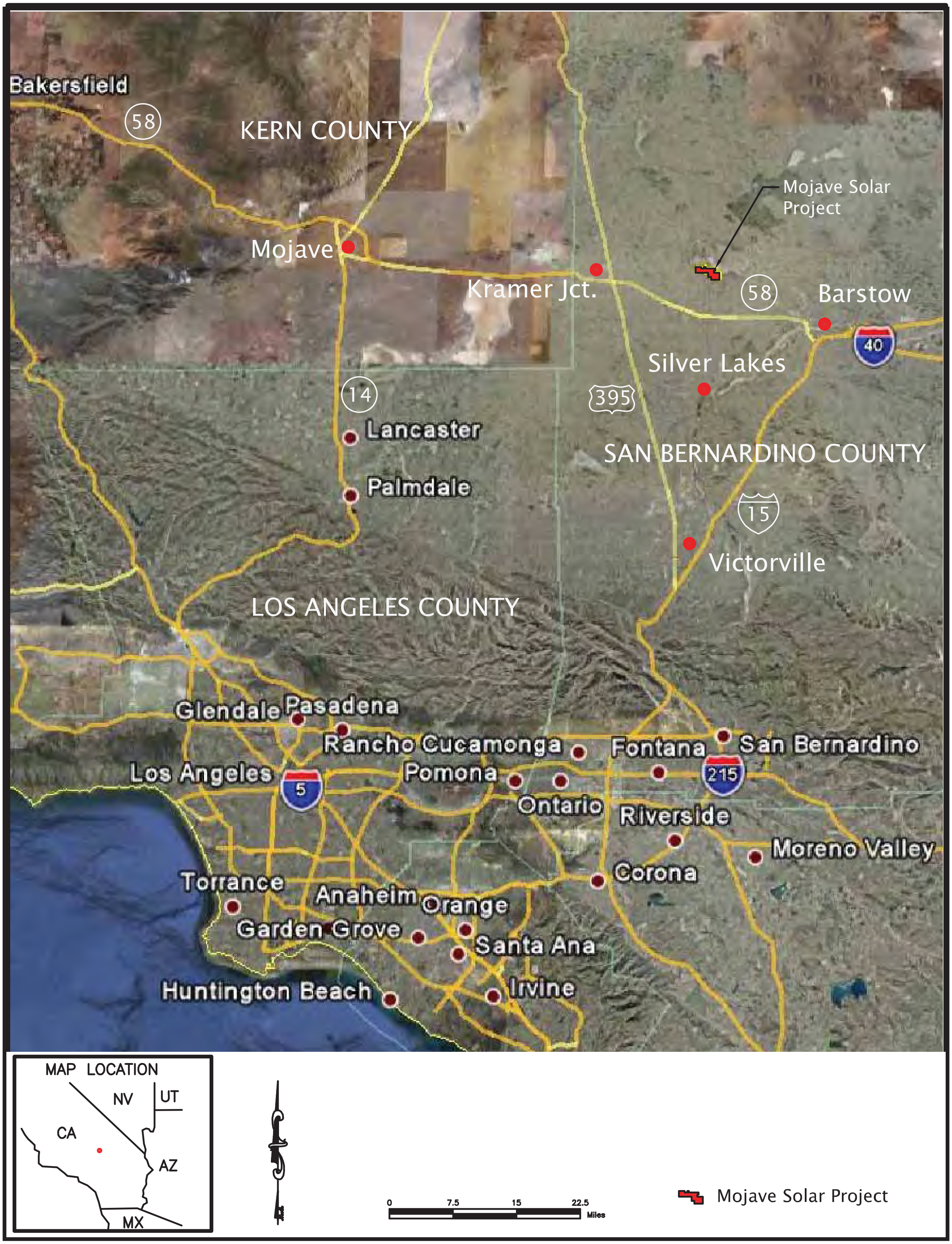
AS 2009b - Abengoa Solar Inc. / E. Garcia (TN 53375). Data Adequacy Supplement for Mojave Solar Project (09-AFC-5), dated 9/24/2009. Submitted to CEC on 9/24/2009.

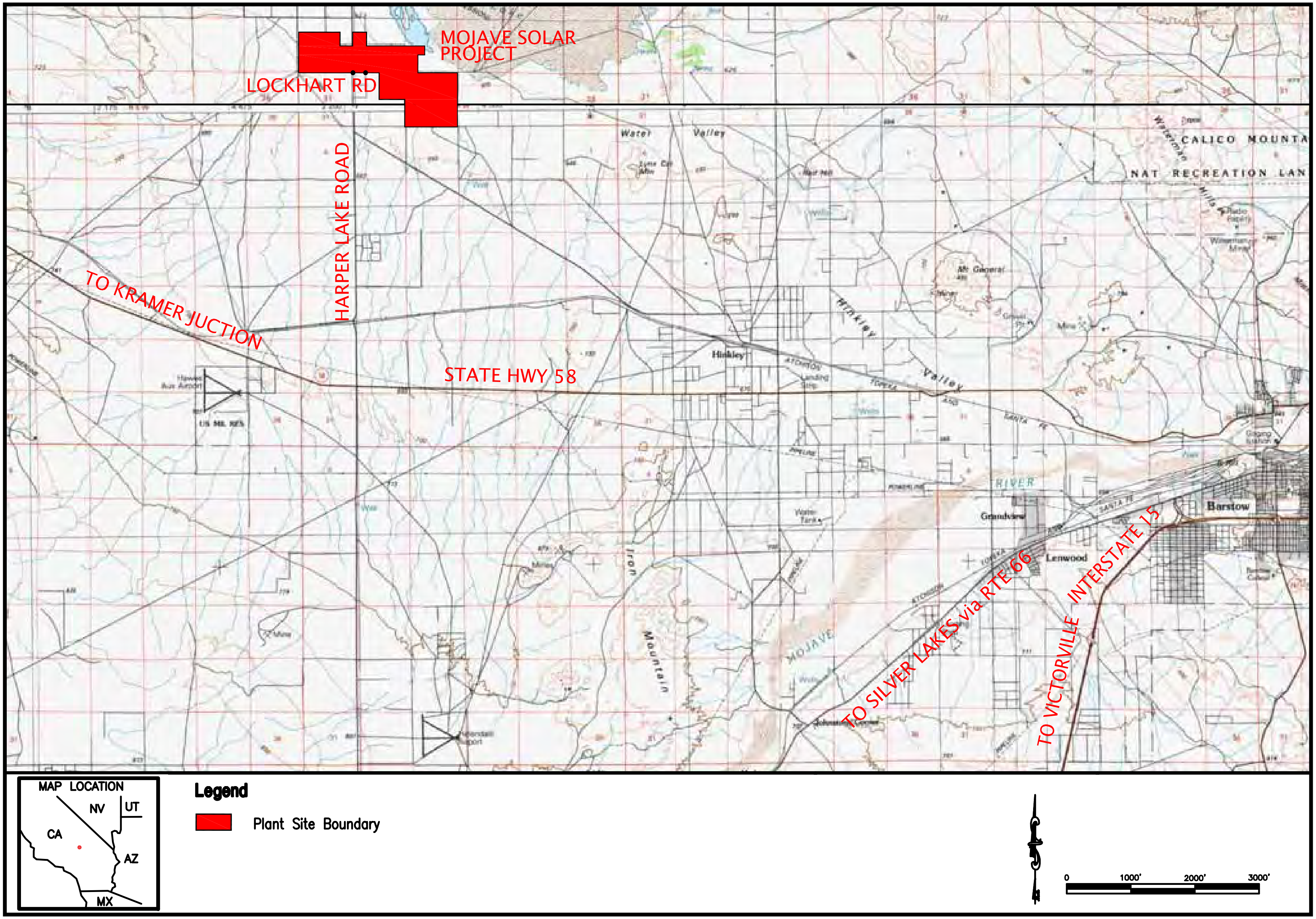
PROJECT DESCRIPTION - FIGURE 1
Abengoa Mojave Solar 1 Project - Regional Map



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010
SOURCE: AFC Figure 1-1

PROJECT DESCRIPTION - FIGURE 2

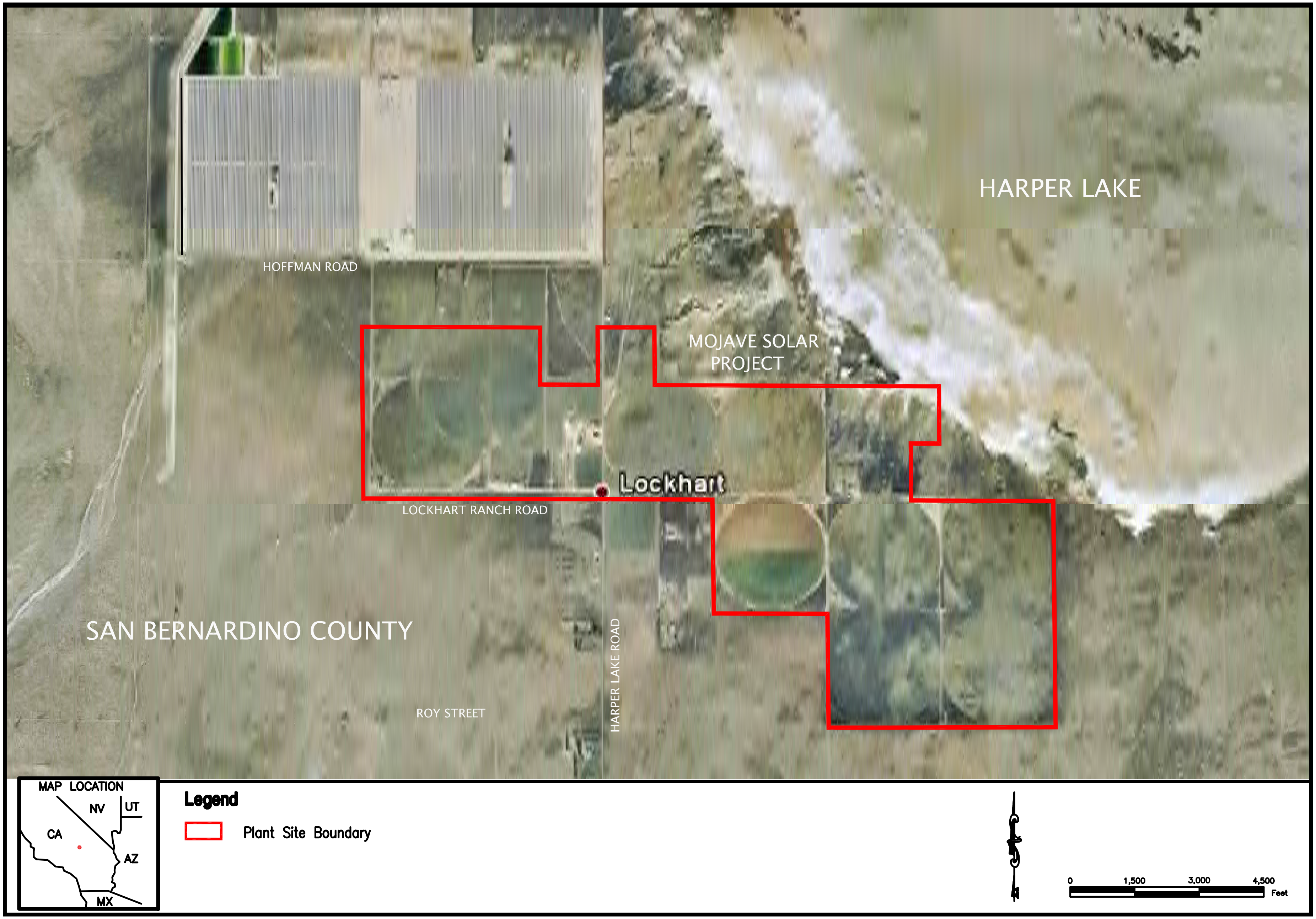
Abengoa Mojave Solar 1 Project - Vicinity Map



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

SOURCE: AFC Figure 1-2

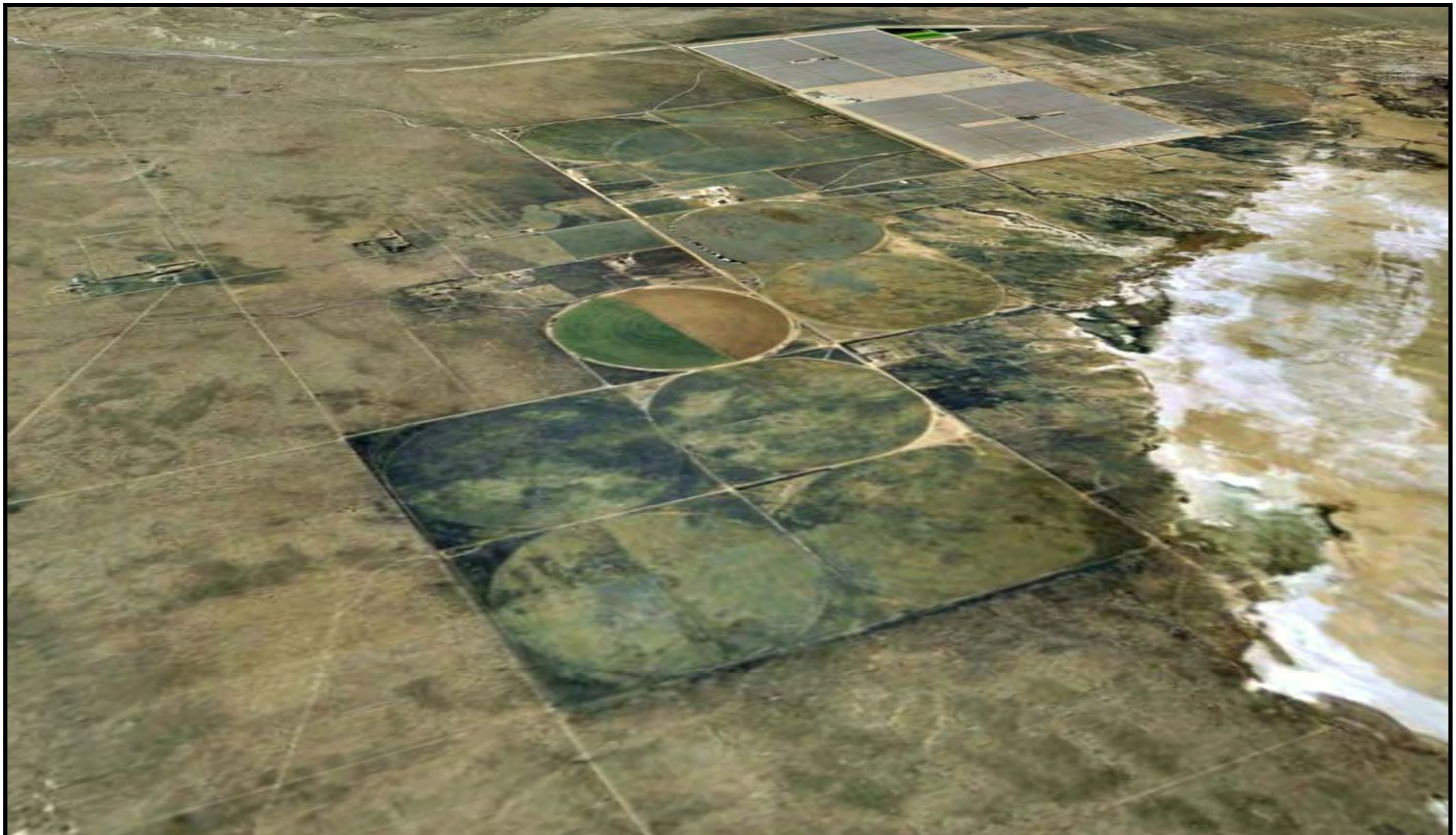
PROJECT DESCRIPTION - FIGURE 3
Abengoa Mojave Solar 1 Project - Site Map



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010
SOURCE: AFC Figure 1-3

PROJECT DESCRIPTION - FIGURE 4

Abengoa Mojave Solar 1 Project - Visual Appearance of the Site Prior to Construction



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

SOURCE: AFC Figure 1-4(a)

PROJECT DESCRIPTION - FIGURE 5

Abengoa Mojave Solar 1 Project - Visual Appearance of the Site After Construction

SOURCE: AFC Figure 1-4(b)

CUMULATIVE ANALYSIS

Testimony of Suzanne Phinney, D Env.

INTRODUCTION

The Abengoa Mojave Solar (AMS) Project is proposed to be sited on private land and is subject to CEQA review. 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 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)).

OVERVIEW OF RENEWABLE ENERGY PROJECTS

A large number of renewable projects have been proposed on BLM managed land, State land, and private land in California. As of November 2009, there were 24 solar projects, 9 wind projects, and 2 geothermal projects in California in various stages of the environmental review process or under construction. Solar, wind, and geothermal development applications have requested use of BLM land, including approximately one million acres of the California desert. State and private lands have also been targeted for renewable solar and wind projects.

Cumulative Impacts Figure 1 and **Table 1** illustrate the numerous proposed renewable projects on BLM, State and private land in the Western Mojave.

LIKELIHOOD OF DEVELOPMENT

The numerous renewable projects now described in applications to the BLM and on private land are competing for utility Power Purchase Agreements, which will allow utilities to meet state-required Renewable Portfolio Standard. While **Cumulative Impacts Figure 1 and Table 1** show a large number of applications, it is unlikely that all of these projects will be constructed for the following reasons:

- Not all developers will be able to develop the detailed information necessary to meet agency standards. Most of the solar projects with pending applications are proposing generation technologies that have not been implemented at large scales. As a result, preparing complete and detailed environmental documentation is time-consuming and costly.

- After Lead Agency approval, all permits must be obtained by the applicant or the prescriptions required by the regulatory authorities incorporated into the Lead Agency's license, permit or right-of-way grant. The large size of these projects may result in permitting challenges related to endangered species, mitigation requirements, and other issues.
- Also after project approval, construction financing must be obtained (if it has not been obtained earlier in the process). The availability of financing will be dependent on the status of competing projects, the laws and regulations related to renewable project investment, and the time required for obtaining permits.

INCENTIVES FOR RENEWABLE DEVELOPMENT

A number of existing policies and incentives encourage renewable energy development. These incentives lead to a greater number of renewable energy proposals. Example of incentives for developers to propose renewable energy projects on private and public lands in California, Nevada and Arizona, include the following:

- **U.S. Treasury Department's Payments for Specified Energy Property in Lieu of Tax Credits** under §1603 of the American Recovery and Reinvestment Act of 2009 (Public Law 111-5) - Offers a grant (in lieu of investment tax credit) to receive funding for 30% of their total capital cost at such time as a project achieves commercial operation (currently applies to projects that begin construction by December 31, 2010 and begin commercial operation before January 1, 2017).
- **U.S. Department of Energy (DOE) Loan Guarantee Program** pursuant to §1703 of Title XVII of the Energy Policy Act of 2005 - Offers a loan guarantee that is also a low interest loan to finance up to 80% of the capital cost at an interest rate much lower than conventional financing. The lower interest rate can reduce the cost of financing and the gross project cost on the order of several hundred million dollars over the life of the project, depending on the capital cost of the project.

DEFINITION OF A CUMULATIVE PROJECT SCENARIO

Cumulative impacts analysis is intended to highlight past, present, and future foreseeable actions that are closely related either in time or location to the project being considered, catalogue past projects and discuss how they have harmed the environment, and discuss past, present, and future foreseeable actions even if they were undertaken by another agency or another person. Most of the projects listed in the cumulative projects tables (**Cumulative Impacts Tables 1, 2, and 3** at the end of this section) have, are, or will be required to undergo their own independent environmental review.

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 Staff Assessment uses the “list approach” to provide a tangible understanding and context for analyzing the potential cumulative effects of a 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. 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 disciplines, as shown in the maps and accompanying tables. **Cumulative Impacts Figures 1 and 2** are on the following pages, and **Cumulative Impacts Tables 1, 2, and 3** are presented at the end of this section.

- **Cumulative Impacts Figure 1** and **Table 1 (Renewable Energy Applications in the BLM’s West Mojave Planning Area).** The analysis of cumulative effects for some disciplines requires consideration of the numerous solar and wind development applications for use of private and BLM land in the larger geographic region. The 9,359,070-acre West Mojave Planning Area spans western San Bernardino County, eastern Kern County, northeastern Los Angeles County, and southwestern Inyo County, and includes 3,263,874 acres of BLM lands and168 acres of State lands. Of the 3,029,230 acres of privately-owned lands in the Planning Area, 14.7 percent (446,592 acres) are incorporated in cities and towns. Large military bases in the Planning Area include Naval Air Weapons Station China Lake (1,109,783 acres), Fort Irwin (754,718 acres), Edwards Air Force Base (306,875 acres), and Twentynine Palms Marine Corps Air Ground Combat Center (600,008 acres, with 360,000 acres of proposed expansion).
- **Cumulative Impacts Figure 1** highlights land uses that may not be appropriate for large scale renewable projects (e.g., wilderness areas), and shows the limited land areas that remain after these potentially incompatible areas are removed from consideration for renewable development.
- **Cumulative Impacts Figure 2 (Harper Lake Region Existing and Future/Foreseeable Projects)** and **Tables 2 (Existing Projects)** and **3 (Future/Foreseeable Projects)**. The area of consideration consists of an approximate 10-mile radius around the project site. This area extends to the town of Hinkley (9 miles to the southeast) but not to Barstow (approximately 20 miles to the southeast). Table 2 presents the existing projects, and Table 3 presents future foreseeable projects. Both tables indicate project name, type, location, and status.

APPROACH TO CUMULATIVE IMPACT ANALYSIS

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

1. Define the geographic scope of cumulative impact analysis for each discipline, based on the potential area within which impacts of the AMS project could combine with those of other projects.

2. Evaluate the effects of the AMS project in combination with past and present (existing) projects in the project area.

3. Evaluate the effects of the AMS project with foreseeable future projects that occur within the area of geographic effect defined for each discipline.

Each of these steps is described below.

Geographic Scope of Cumulative Impact Analysis

The area of cumulative effect varies by resource. For example, air quality impacts tend to disperse over a large area, while traffic impacts are typically more localized. For this reason, the geographic scope for the analysis of cumulative impacts must be identified for each resource area.

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 each analysis is based on the topography surrounding the AMS and the natural boundaries of the resource affected, rather than jurisdictional boundaries. The geographic scope of cumulative effects will often extend beyond the scope of the direct effects, but not beyond the scope of the direct and indirect effects of the proposed action and alternatives.

In addition, each project in a region will have its own implementation schedule, which may or may not coincide or overlap with the AMS' schedule. This is a consideration for short-term impacts from the AMS. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the AMS project.

Project Effects in Combination with Past, Present, and Foreseeable Future Projects

Past and present projects, as well as reasonably foreseeable future projects that could contribute to the cumulative effects scenario depend on the extent of resource effects. The future projects include large renewable projects proposed in the Western Mojave. These projects are illustrated in **Cumulative Impacts Figure 1 and Table 1 (Renewable Energy Applications in the Western Mojave Area)**. Solar and wind development applications have been submitted for approximately 553,000 acres of BLM land and 13,900 acres of non-federal land in the Western Mojave Planning Area. Note that these acreages include the entirety of those projects in which the centroid (geographic center of the project area) falls within the Planning Area boundary, but not projects in which only a small portion coincides.

Each discipline evaluates the impacts of the proposed project on top of the current baseline; the past, present (existing) and future projects in the AMS vicinity as illustrated in **Cumulative Impacts – Figure 2 (Harper Lake Region Existing and Future/Foreseeable Projects)** and **Cumulative Impacts Tables 2 (existing projects)** and **3 (future/foreseeable projects)**.

Table 1 - Proposed Renewable Energy Projects in the Western Mojave Area

BLM Land					
# of Projects	**Technology**	**Status**	**Acres**	**Total MW**	**Source**
10 projects	Solar photovoltaic	Application submitted to BLM; pending	77,438 acres (total)	6,275 MW	BLM 2009; staff calculations
8 projects	Solar thermal	Application submitted to BLM; pending	42,168 acres (total)	6,240 MW	BLM 2009; staff calculations
40 projects	Wind	Application submitted to BLM; pending	433,260 acres (total)	--	BLM 2009; staff calculations
Non-Federal Land					
Project	**Technology**	**Status**	**Acres**	**MW**	**Source**
Antelope Valley Solar Ranch One	Solar photovoltaic	Application for a conditional use permit filed with Los Angeles County in March 2009. Estimated to be fully operational by the end of 2013.	2,100 acres	230 MW	NextLight 2009
Beacon Solar Energy Project	Solar thermal	AFC under review by CEC; estimated online date 10/2011	2,012 acres	250 MW	CEC 2009
Palmdale Hybrid Power Plant	Natural gas- solar thermal hybrid	AFC under review by CEC; estimated online date 2013	250 acres (solar component)	50 MW (solar component)	CEC 2009
Victorville 2 Hybrid Power Project	Natural gas- solar thermal hybrid	AFC approved by CEC. Pre-construction; current online date 11/2010	250 acres (solar component)	50 MW (solar component)	CEC 2009
Alta-Oak Creek Mojave Project	Wind	Under environmental review by Kern County. Draft EIR published 8/2009.	9,300 acres	Up to 800 MW	Kern County 2009
Suncal Barstow Hybrid Solar Project	Solar thermal-solar parabolic trough hybrid	Pending	6,720 acres	500 MW, with 125 MW supplemental PV generation capacity	SunCal 2009

Table 2 - Harper Lake Region Existing Projects

ID	Project Name	Location	Agency/Owner	Status	Project Description	Source
1	SEGS VIII and IX	Harper Lake. Adjacent to NW of project site.	Florida Power and Light (part owner)	Existing (operational since 1989)	Two solar parabolic trough fields with a combined capacity of 160 MW on 1,000 acres.	Solel 2009

Table 3 - Harper Lake Region Future/Foreseeable Projects

ID	Project Name	Location	Agency/Owner	Status	Project Description	Source
A	Hawes Composting Facility	80 acres of a 160-acre parcel located south of State Route 58, approximately 12.3 miles east of Kramer Junction and eight miles west of Hinkley	Nursery Products, LLC	Under review by San Bernardino County Land Use Services Department. Hearing and publication of Final Supplemental Environmental Impact Report in November 2009.	Construct a biosolids and green material composting facility to produce agricultural grade compost. The facility would store on site a maximum of 7,000 cubic yards of green material feedstock and 2,000 cubic yards of biosolids The facility will process approximately 400,000 tons per year of compostable material. The total amount of active compost is not expected to exceed 250,000 tons.	San Bernardino County 2009
B	SR-58 via Hinkley	State Route 58 from 2.8 miles west of Hidden River Road (post mile 21.8) to 0.7 miles east of Lenwood Road (post mile 31.1)	Caltrans	Notice of intent in May 2007.	Upgrade and realign 10 miles of two-lane highway to 4-lane divided freeway/expressway.	Caltrans 2009
C	Solar Photovoltaic Project (BLM: CACA 48941)	(Desert Onyx) T11N, R3, & 4W	Optisolar, Inc.	BLM received application (April 2007), cost recovery funds, and POD. POD review pending.	585 MW solar photovoltaic project proposed for 5,033 acres of BLM land. Adjacent to Harper ACEC.	BLM 2009
D	Wind Project (BLM: CACA 46805)	(Iron Mountain) T8N, R3&4W South of Hwy 58.	Horizon Wind Energy	BLM received application (December 2004) and issued ROW grant (February 2006). ROW testing expires December 2009; request to amend within DWMA. BLM received cost recovery funds.	Wind project proposed on 10,105 acres of BLM land.	BLM 2009

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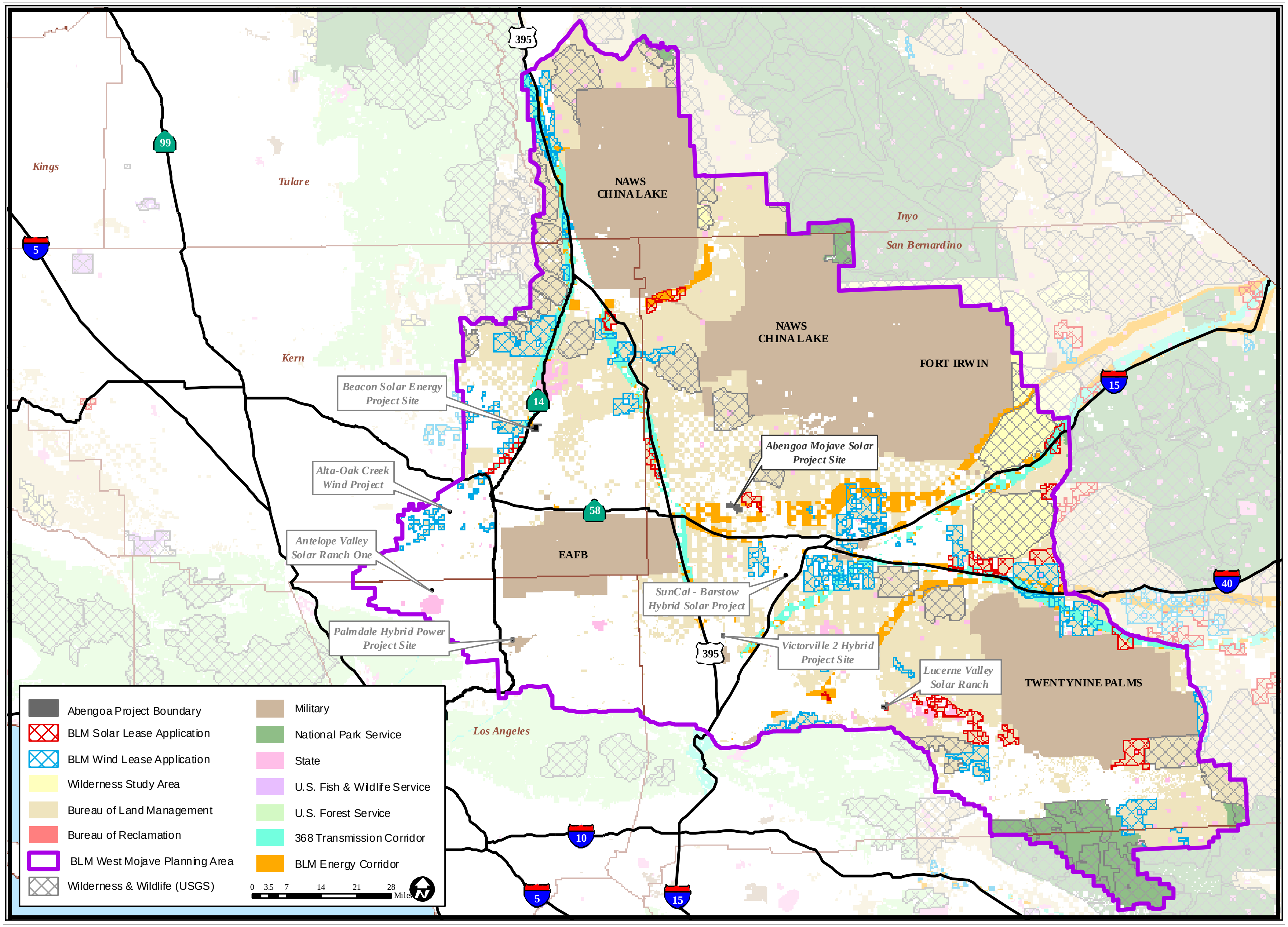
MARCH 2010

CUMULATIVE IMPACTS - FIGURE 1

Abengoa Mojave Solar Project - Renewable Energy Applications in the Western Mojave Desert



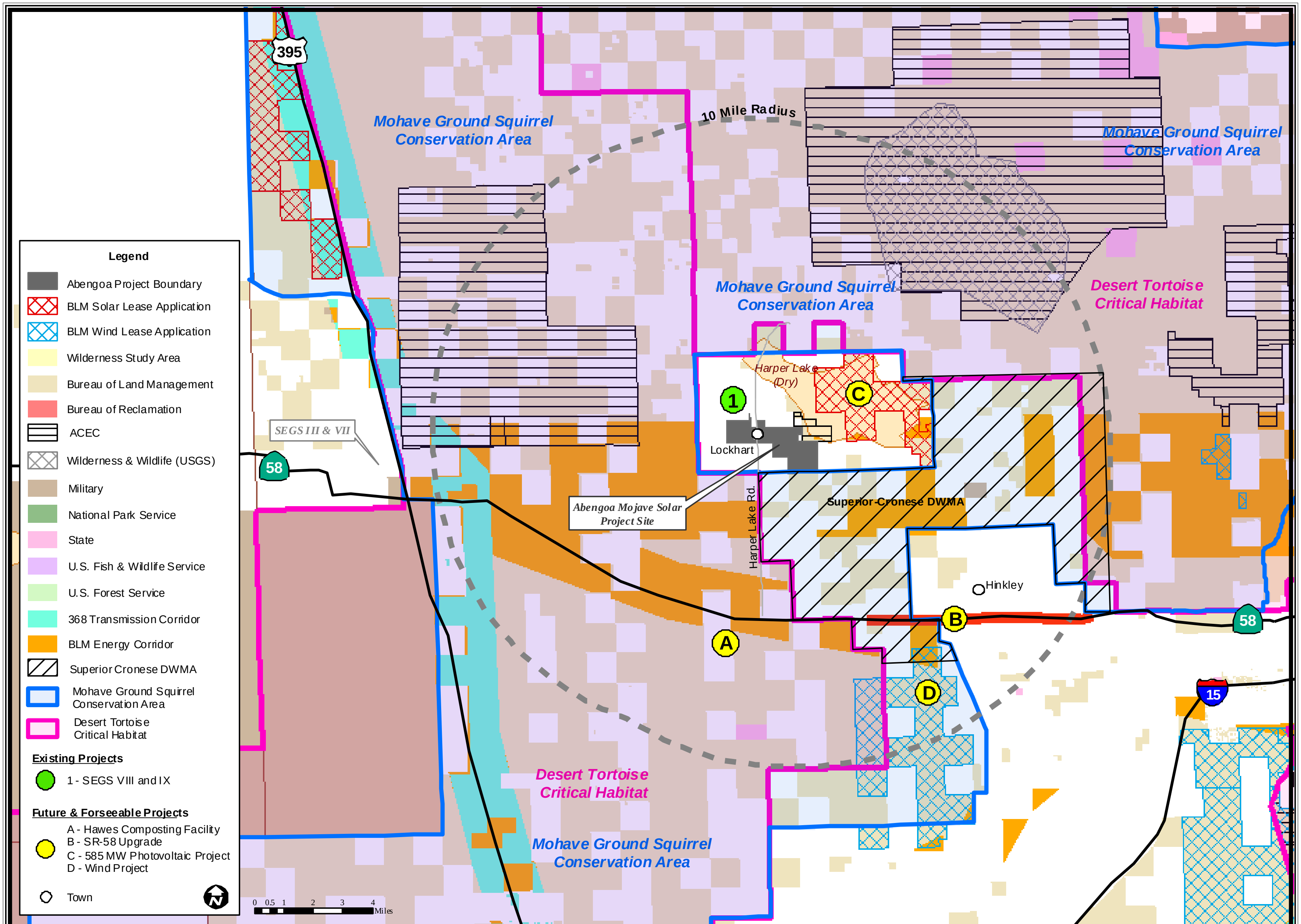
CUMULATIVE IMPACTS

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

SOURCE: California Energy Commission, Bureau of Land Management

CUMULATIVE IMPACTS - FIGURE 2

Abengoa Mojave Solar Project - Harper Lake Region Existing and Future / Foreseeable Projects



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

SOURCE: California Energy Commission, Bureau of Land Management

ENVIRONMENTAL ASSESSMENT

AIR QUALITY

Testimony of Tao Jiang and William Walters, P.E.

SUMMARY OF CONCLUSIONS

Staff finds that with the adoption of the attached conditions of certification the proposed Abengoa Mojave Solar Project (AMS or proposed project) would comply with all applicable laws, ordinances, regulations, and standards (LORS) and would not result in any significant air quality-related impacts[1].

The AMS project would emit substantially lower greenhouse gas[2] emissions per megawatt-hour than fossil fueled generation resources in California. The AMS project, 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

This analysis evaluates the expected air quality impacts from the emissions of criteria air pollutants from both the construction and operation of AMS. Criteria air pollutants are defined as air contaminants for which the state and/or federal governments 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 Staff Assessment (SA). 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 project are discussed in an **APPENDIX AIR-1** and analyzed in the context of cumulative impacts.

[1] Staff has identified potential issues with the applicant's current construction and operation emission estimates and may provide revised estimates in the Supplemental Staff Assessment, but staff considers this to be an emissions documentation issue rather than an issue that would substantially affect the impact analysis findings.

[2] 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 project (Appendix Air-1), presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.

In carrying out this analysis, the California Energy Commission (Energy Commission) staff evaluated the following three major issues:

- Whether AMS is likely to conform with applicable federal, state, and Mojave Desert Air Quality Management District (MDAQMD) air quality laws, ordinances, regulations and standards (Title 20, California Code of Regulations, section 1744 (b));
- Whether AMS 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); and
- Whether mitigation measures proposed for AMS are adequate to lessen potential impacts under the California Environmental Quality Act (CEQA) to a level of insignificance (Title 20, California Code of Regulations, section 1742 (b)).

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 AMS are summarized in **Air Quality Table 1**. Staff's analysis examines the proposed 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 MDAQMD. Prevention of Significant Deterioration (PSD) requires major sources or major modifications to major sources to obtain permits for attainment pollutants. AMS 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 Dc Standards of Performance for Small Industrial-Commercial-Institutional Steam Generation Units. Establishes recordkeeping and reporting requirements for natural gas 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.

Applicable LORS	Description
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.
Local (Mojave Desert Air Quality Management District)	
Rule 201 and 203 Permits Required	Requires a Permit to Construct before construction of an emission source occurs. Prohibits operation of any equipment that emits or controls air pollutant without first obtaining a permit to operate.
Rules 401, 402, and 403 Nuisance, Visible Emissions, Fugitive Dust	Limits the visible, nuisance, and fugitive dust emissions and would be applicable to the construction period of the project.
Rule 403.2 Fugitive Dust Control for the Mojave Desert Planning Area	Limits fugitive dust emissions within the Mojave Desert Planning Area. Rule 403.2 supersedes Rule 403 if there are any conflicting requirements. This rule would be applicable to the construction period of the project.
Rule 404 Particulate Matter - Concentration	Limits the particulate matter concentration from stationary source exhausts.
Rule 406 Specific Contaminants	The rule prohibits sulfur compound emissions in excess of 500 ppmv.
Rule 407 Liquid and Gaseous Air Contaminants	The rule prohibits carbon monoxide emissions in excess of 2,000 ppmv.
Rule 409 Combustion Contaminants	Limits the emissions from fossil fuel combustion.
Rule 431 Sulfur Content of Fuels	Limits the sulfur content of liquid fuels to no more than 0.5% by weight.
Rule 461 Gasoline Transfer and Dispensing	This rule specifies the vapor recovery requirement for gasoline tank filling (Phase I) and vehicle refueling (Phase II) for gasoline storage and refueling facilities.
Rule 900 Standard of Performance for New Stationary Source	Incorporates the Federal NSPS (40 CFR 60) rules by reference.
Rule 1303 New Source Review	Specifies BACT/Offsets technology and requirements for a new emissions unit that has potential to emit any regulated pollutants.
Rule 1306 Electric Energy Generating Facilities	Describes actions to be taken for permitting of power plants that are within the jurisdiction of the Energy Commission.

SETTING

CLIMATE AND METEOROLOGY

The proposed AMS site located in the Mojave Desert is relatively flat, rising in elevation from the northeast to the west and southwest, with an elevation of approximately 2,070 feet above mean sea level. The Mojave Desert has a typical desert climate, having extreme daily temperature changes, low annual precipitation, strong seasonal winds, and mostly clear skies. The annual highest temperature in the Mojave Desert exceeds 100°F and the average daily temperature variation is approximately 35 degrees in the summer and 30 degrees in the winter. Winter temperatures are more moderate, with mean maximum temperatures in the low 60s and lows in the low or mid 30s. Nearby Barstow has a total average annual precipitation of less than four and a half inches (WC 2009). Over 65% of the annual precipitation occurs in the winter season, between December and March. However, occasional heavy precipitation occurs in the summer due to thunderstorms.

The applicant collected recent (2001 to 2004) meteorological data from the Daggett Airport Automated Surface Observing System (ASOS) station. The average annual wind rose for these three years at this monitoring station shows a prevailing wind from southwest through northwest occurring approximately 60% of the time. Easterly winds are much less frequent. The wind speeds are relatively high, with the annual average wind speed of 4.9 m/s. The wind between 3.6 and 5.7 m/s is the most common, at 30% of the time. Calm conditions occur approximately 7.6% of the time.

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 within a 3-mile radius of the project site. The nearest sensitive receptor is the Hinkley Elementary School located about 10 miles southeast of the project site. The nearest residence is approximately 60 feet south of the southern boundary and several additional residences are located within 0.6 miles of the project boundaries (AS 2009a, Section 5.6.2.1 and Table C.4-4).

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 United States Environmental Protection Agency (USEPA). 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).

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 normally 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.

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 μg/m^3)	0.070 ppm (137 μg/m^3)
	1 Hour	—	0.09 ppm (180 μg/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 μg/m^3)	0.03 ppm (57 μg/m^3)
	1 Hour	0.100 ppm (188 μg/m^3)[b]	0.18 ppm (339 μg/m^3)
Sulfur Dioxide (SO_2)	Annual	0.030 ppm (80 μg/m^3)	—
	24 Hour	0.14 ppm (365 μg/m^3)	0.04 ppm (105 μg/m^3)
	3 Hour	0.5 ppm (1300 μg/m^3)	—
	1 Hour	—	0.25 ppm (655 μg/m^3)
Particulate Matter (PM10)	Annual	—	20 μg/m^3
	24 Hour	150 μg/m^3	50 μg/m^3
Fine Particulate Matter (PM2.5)	Annual	15 μg/m^3	12 μg/m^3
	24 Hour	35 μg/m^3	—
Sulfates (SO_4)	24 Hour	—	25 μg/m^3
Lead	30 Day Average	—	1.5 μg/m^3
	Calendar Quarter	1.5 μg/m^3	—
Hydrogen Sulfide (H_2S)	1 Hour	—	0.03 ppm (42 μg/m^3)
Vinyl Chloride (chloroethene)	24 Hour	—	0.01 ppm (26 μg/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%.

Source: ARB 2010a.
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] The U.S. EPA is in the process of implementing this new standard, which is expected to become effective April 12, 2010. This standard is based on the 3-year average of the 98th%ile of the yearly distribution of 1-hour daily maximum concentrations. Due to this regulation not yet being effective, with a corresponding lack of guidance on impact analysis and existing background concentrations, staff has not completed an impact assessment for compliance with this standard.

The project site is located in the Mojave Desert Air Basin[3] (MDAB) and is under the jurisdiction of the Mojave Desert Air Quality Management District (MDAQMD). The MDAB in the area of the project site is designated as non-attainment for the federal and state ozone and PM10 standards, and the state PM2.5 standard. This area is designated as attainment or unclassified for the state and federal CO, NOx, and SOx standards, and the federal PM2.5 standards. **Air Quality Table 3** summarizes the area's attainment status for various applicable state and federal standards.

Air Quality Table 3
MDAQMD Federal and State Attainment Status

Pollutant	Attainment Status [a]	
	Federal	State
Ozone	Moderate Nonattainment [b]	Moderate Nonattainment
CO	Attainment	Attainment
NO_2	Attainment [c]	Attainment
SO_2	Attainment	Attainment
PM10	Moderate Nonattainment	Nonattainment
PM2.5	Attainment	Nonattainment

Source: ARB 2010b, U.S. EPA 2010a, U.S. EPA 2010b.
Notes:
[a] Attainment = Attainment or Unclassified, where Unclassified is treated the same as Attainment for regulatory purposes.
[b] MDAQMD has asked to be reclassified from moderate to severe-17 nonattainment of the federal 8-hour ozone standard (severe-17 allows 17 years to reach attainment).
[c] Nitrogen dioxide attainment status for the new federal 1-hour NO_2 standard is scheduled to be determined by January 2012.

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 2002 through 2008 (the last year that the complete annual data is currently available) 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 1999 through 2008 are shown in **Air Quality Figure 1**. All ozone, NO_2, CO and PM10 data shown are from the Barstow monitoring station. All PM2.5 and SO_2 data are from the Victorville 14306 Park Avenue monitoring station.

[3] The Mojave Desert Air Basin lies inland east of the San Joaquin Valley Air Basin to the west and north and east of the South Coast Air Basin. The desert portions of Kern, San Bernardino, Riverside, and Los Angeles counties are within its boundaries.

Air Quality Table 4
Criteria Pollutant Summary
Maximum Ambient Concentrations (ppm or μg/m³)

Pollutant	Averaging Period	Units	2003	2004	2005	2006	2007	2008	Limiting AAQS[b]
Ozone	1 hour	ppm	0.105	0.1	0.099	0.112	0.099	0.104	0.09
Ozone	8 hours	ppm	0.095	0.083	0.093	0.095	0.088	0.097	0.07
PM10 [a]	24 hours	$\mu g/m^3$	143	40	78	80	47	50	50
PM10	Annual	$\mu g/m^3$	25.7	21.3	25.4	21.9	29.8	26.1	20
PM2.5 [a]	24 hours	$\mu g/m^3$	--	20	19	19	19	--	35
PM2.5	Annual	$\mu g/m^3$	--	10.8	--	10.3	9.7	--	12
CO	1 hour	ppm	2.7	1.6	3.3	3.5	1.4	1.4	20
CO	8 hours	ppm	1.51	1.18	1.34	1.19	0.7	1.23	9.0
NO_2	1 hour	ppm	0.095	0.101	0.087	0.082	0.073	0.081	0.18
NO_2	Annual	ppm	0.024	0.023	0.022	0.022	0.02	0.019	0.03
SO_2	1 hour	ppm	0.011	0.011	0.012	0.018	0.009	0.006	0.25
SO_2	3 hour	ppm	0.010	0.007	0.008	0.012	0.006	0.005	0.5
SO_2	24 hours	ppm	0.006	0.003	0.003	0.005	0.005	0.002	0.04
SO_2	Annual	ppm	0.001	0.001	0.001	0.001	0.001	0.001	0.03

Source: ARB 2010c, U.S.EPA 2010c
Notes:
[a] Exceptional PM concentration events, such as those caused by wind storms were excluded.
[b] The limiting ambient air quality standard (AAQS) is the most stringent of the California AAQS or National AAQS for that pollutant and averaging period.

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. The MDAB would be in attainment of both NAAQS and CAAQS ozone standards without the influence of transported pollutants from upwind regions, specifically the South Coast Air Basin (Los Angeles Area) and to a lesser extent the San Joaquin Valley Air Basin (MDAQMD 2008).

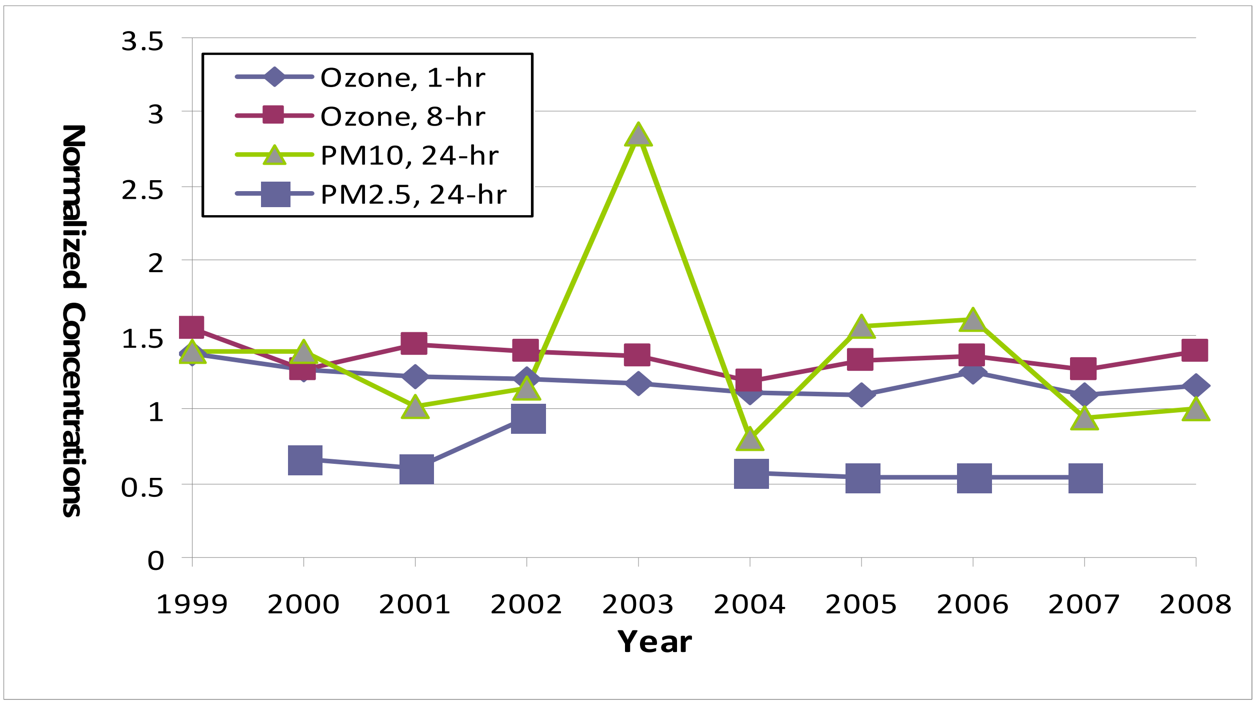
As **Air Quality Table 4** and **Air Quality Figure 1** indicate, the 1-hour and 8-hour ozone concentrations measured, with some annual variability, have been fairly constant over time. The collected air quality data (not shown) indicate that the ozone violations occurred primarily during the sunny and hot periods typical during May through September.

Nitrogen Dioxide

The entire air basin is classified as attainment for the state 1-hour and annual and federal annual NO_2 standards. The nitrogen dioxide attainment standard could change due to the new federal 1-hour standard, although a review of the air basin wide monitoring data suggest this would not occur for the MDAB.

Approximately 90% of the 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.

Air Quality Figure 1
1999-2008 Historical Ozone and PM Air Quality Data[a,b,c]



Source: ARB 2010c, U.S.EPA 2010c
Note:
[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 1-hour ozone concentration in 2005 is 0.099 ppm/0.090 ppm standard = 1.10.
[b] All ozone and PM10 data are from the Barstow monitoring station.
[c] All PM2.5 data are from the Victorville monitoring station. The completeness of the 24-hr PM2.5 data is limited where only years 2000 to 2002 and 2004 to 2007 have 98th%ile values for comparison with the federal standard.

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 has a lack of significant mobile source emissions and has CO concentrations that are 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 designated non-attainment for both the federal and the state PM10 standards. As shown in **Air Quality Figure 1**, maximum PM10 concentrations at Barstow were at or above the state 24-hour PM10 standard for eight of the recent ten year history. The peak concentrations from 2003 through 2008 occurred during three of the four seasons, all but winter, and the highest of the peak concentrations are likely to be due in part to high wind events.

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.

San Bernardino County in the site area is classified as nonattainment for the state PM2.5 standard, and attainment for the federal PM2.5 standard. This divergence between the federal PM10 and PM2.5 attainment status indicates that a substantial fraction of the ambient particulate matter levels are most likely due to localized fugitive dust sources, such as vehicles 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 western MDAB are limited due to the limited number of major stationary sources and California's significant 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 on 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/m³)

Pollutant	Averaging Time	Recommended Background	Limiting Standard	Percent of Standard
NO_2	1 hour	154.4	339	46%
	Annual	41.8	57	73%
PM10	24 hour	80.0	50	160%
	Annual	29.8	20	149%
PM2.5	24 hour	19.0	35	54%
	Annual	10.3	12	86%
CO	1 hour	4,025	23,000	18%
	8 hour	1,367	10,000	14%
SO_2	1 hour	47.2	655	7%
	3 hour	31.2	1,300	2%
	24 hour	13.1	105	13%
	Annual	2.7	80	3%

Source: ARB 2010c, U.S.EPA 2010c, and Energy Commission Staff Analysis

Where possible, staff prefers that the recommended background concentration measurements come from nearby monitoring stations with similar characteristics. For this proposed project the Barstow monitoring station (ozone, NO_2, CO and PM10), at approximately 18 miles east south east of the project site, is the closest monitoring station to the site. The Victorville monitoring station (PM2.5 and SO_2) is located approximately 34 miles south of the project site. In general, the Barstow and Victorville monitoring stations are considered to provide conservative estimates of the worst case background concentrations due to their proximity to higher populations and major traffic routes and for Victorville due to the greater pollutant transport from the South Coast Air Basin (Metropolitan Los Angeles).

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

PROJECT DESCRIPTION

The proposed AMS project is a solar electric generating facility totaling 250 MW located on approximately 1,765 acres. The project consists of two separate 125 MW power units, identified as Alpha (northwest) and Beta (southwest). The project would utilize a 21.5 million Btu/hr natural gas-fueled auxiliary heat transfer fluid (HTF) heater on each power unit to reduce startup time and to keep the temperature of the HTF above its freezing point (54 °F).

The proposed solar energy facility would use a 6 cell wet cooling tower for power plant cooling on each power unit. Water would be supplied from onsite groundwater wells, and would be treated as necessary for cooling tower and other onsite uses. The project would also have several other operating emission sources including: 1) HTF expansion vessels and HTF overflow tanks at each power unit with vent emission control systems; 2) an HTF piping system for each power unit; 3) two diesel-fueled 346 horsepower firewater pump engines for fire protection; 4) two diesel-fueled 4,160 horsepower emergency generators; 5) a contaminated soil bio-remediation area; 6) on-site mobile equipment needed for site maintenance (mirror washing) and operation; and 7) offsite vehicle emissions associated with truck hauling of raw materials (fuel and water treatment chemicals) and waste water evaporation pond solids, and employee commute trips.

The applicant is currently proposing the use of groundwater from wells to be constructed onsite to supply plant site raw water needs. Therefore, no offsite water pipelines are proposed to be constructed. Additionally process wastewater would be kept onsite in evaporation ponds and sanitary wastewater would be sent to an onsite sanitary waste septic system, so no offsite industrial waste water or sewer pipelines are proposed to be constructed.

The project also proposes an electrical interconnection to Southern California Edison's (SCE's) transmission system. SCE has proposed significant system-wide upgrades to the transmission system. The onsite transmission line construction would include a new 230KV Hinkley substation and transmission gen-tie lines (11,460 feet for Alpha and 4,430 for Beta). Therefore, no offsite transmission line construction is required to interconnect the project.

The project would connect with an existing Southwest Gas Corporation natural gas pipeline that is located adjacent to the Alpha power unit. Therefore, no offsite gas pipeline construction is required for this project.

PROJECT CONSTRUCTION

The total duration of project construction for AMS is estimated to be approximately 26 months. Different areas within the project site and the construction laydown areas would be disturbed at different times over the construction period. Total construction disturbance area would be approximately 1,765 acres. The maximum acreage disturbed on any one day during construction is estimated by the applicant to be 200 acres. 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. 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 new onsite transmission lines, water and gas pipelines, construction of power plant facilities, roads, and substations, and vehicle travel on paved/unpaved roads.

The applicant's maximum daily and average annual emission estimates, that include the applicant's fugitive dust mitigation assumptions and fleet average off-road equipment emission factors, are provided below in **Air Quality Tables 6** and **7**.

Air Quality Table 6
AMS Construction - Maximum Daily Emissions [a]

	NOx	SOx	CO	VOC	PM10	PM2.5
Onsite Construction Emissions						
Onsite Construction Equipment	583.1	0.6	310.9	97.3	25.9	25.7
Fugitive dust	--	--	--	--	145.4	30.5
Subtotal of Onsite Emissions	583.1	0.6	310.9	97.3	171.3	56.2
Offsite Construction Emissions						
Paved Road Dust	--	--	--	--	10.2	0.3
Track-out Dust	--	--	--	--	5.9	1.0
Delivery/Hauling Exhaust	97.5	0.1	29.5	7.1	4.4	4.4
Worker Travel Exhaust	54.4	0.5	469.5	39.6	3.8	3.8

Source: AS 2009a, ESH 2009c, ESH 2010e, ESH 2010g
[a] - The maximum daily emissions do not always occur on the same day for each pollutant or occur concurrently for the separate construction activities.

Air Quality Table 7
AMS Construction – Average Annual Emissions (tons/year)

	NOx	SOx	CO	VOC	PM10	PM2.5
Onsite Construction Emissions						
Onsite Construction Equipment	68.9	0.1	34.7	11.0	4.0	4.0
Fugitive dust	--	--	--	--	12.8	2.7
Subtotal of Onsite Emissions	68.9	0.1	34.7	11.0	16.8	6.7
Offsite Emissions						
Paved Road Dust	--	--	--	--	1.2	0.0
Track-out Dust	--	--	--	--	0.7	0.1
Delivery/Hauling Exhaust	12.5	0.0	3.8	0.9	0.57	0.56
Worker Travel Exhaust	7.2	0.1	60.8	5.2	0.46	0.46

Source: AS 2009a, ESH 2009c, ESH 2010e, ESH 2010g

The emissions presented in **Air Quality Table 7** represents annual values averaged over the 26 month construction period and not maximum annual emissions. The applicant submitted revised construction emission estimates on February 2nd, and staff is continuing to review these complex data responses, which calculated a greater than expected reduction from the original overly conservative emission estimate. Staff may provide separate estimates of fugitive dust emissions and maximum annual construction emissions in the Supplemental Staff Assessment to cover issues that staff has with the applicant's revised estimates.

PROJECT OPERATION

The AMS facility would be a nominal 250 Megawatt (MW) parabolic solar trough thermal solar electrical generating facility (AS 2009a). The direct air pollutant emissions from power generation are minimal; however, there are required auxiliary equipment and maintenance activities necessary to operate and maintain the facility. The facility includes two 125 MW power blocks with identical stationary operating equipment, with one noted exception, and maintenance activity requirements.

The AMS onsite stationary and mobile emission sources are as follows:

- Two 21.5 MMBtu natural gas-fueled auxiliary HTF heaters, one per power block, used to maintain the temperature of the HTF above freezing during cold months and pre-warming for daily startup year-round;
- Two 6-cell wet-cooling towers, one per power block, each to provide cooling and heat rejection from a single power block process;
- Two 346-hp diesel-fired emergency fire water pump engines, one per power block;
- Two 4,160-hp diesel engine-driven emergency generators, one per power block;
- One 2,000 gallon gasoline tank and one 2,000 gallon diesel tank that would refuel onsite dedicated vehicles for both power blocks;
- Eight HTF expansion vessels and two HTF overflow tanks on each power block, that would be serviced by HTF venting control systems;
- Two separate HTF piping systems for each power block[5] with a total facility component count of 3,247 valves, 1,550 flanges/connectors, 24 pump seals, and 16 pressure relief valves.
- Spent HTF waste loadout;
- Two bio-remediation/ land farm units, one per power block, to treat HTF contaminated soils; and
- Onsite diesel and gasoline fueled maintenance vehicles used for mirror washing and other maintenance/operation support activities.

The emissions from the spent HTF waste loadout, bioremediation/land farm units, and diesel tanks are negligible, they do not require permitting by the MDAQMD, and are not included in the VOC emission estimates for the facility or discussed further in this section.

[5] Staff is currently in the process of determining a consistent approach for HTF piping component emission factors. Consistent with Kern County Air Pollution Control District methods the applicant originally used light liquid Synthetic Organic Chemical Manufacturing Industry (SOCMI) emission factors, but due to issues with the application of those emission factors the applicant has revised their estimate as of February 25th (ESH 2010k) to be based on U.S.EPA light liquid leak rate emission factors (U.S.EPA 1995). However, staff is not sure that all of the new emission factors selected for use by the applicant from the voluminous U.S.EPA reference document are the most representative or correct factors. Staff will provide a revised emission estimate for this and other emission consistency issues related to the MDAQMD's PDOC/FDOC in the Air Quality section of the Supplemental Staff Assessment, if necessary.

The applicant[6] provided both onsite and offsite emission estimates using the following assumptions to develop the hourly, daily, and annual onsite emissions estimates for AMS operation:

A. Maximum Hourly Emissions

- Both auxiliary HTF heaters, the cooling towers, one emergency generator engine, the HTF vent, and the HTF piping system all operate for the full hour.
- The gasoline tank has a 1,000 gallon loading event.
- The onsite diesel vehicles (SCA cleaning truck, evacuation truck, etc) and gasoline vehicles (stakebed truck, ranger truck, welding truck, etc) hourly emissions are based on the annual emissions divided by 8,760 hours per year.

B. Maximum Daily Emissions

- Both auxiliary HTF heaters operate for 24 hours.
- Both cooling towers operate for 16 hours.
- One emergency generator engine operates for one hour.
- The HTF vent system operates for eight hours.
- The HTF piping system fugitive emissions occur 16 hours per day for valves, flanges/connectors, and pump seals; and eight hours per day for pressure relief valves.
- The gasoline tank has a 1,000 gallon loading event and 200 gallons of vehicle refueling.
- The onsite diesel vehicles (SCA cleaning truck, evacuation truck, etc) and gasoline vehicles (stakebed truck, ranger truck, welding truck, etc) hourly emissions are based on the annual emissions divided by 365 days per year.

C. Maximum Annual Emissions

- Both auxiliary HTF heaters operate for 4,380 hours per year.
- Both cooling towers operate for 5,840 hours per year.
- The emergency fire pump engines and emergency generator engines operate for 50 hours per year each[7].
- The HTF vent system operates for 2,920 hours per year.
- The HTF piping system daily fugitive emissions multiplied by 365 days per year.
- The gasoline tank has an annual throughput of 18,000 gallons.

[6] Assumptions regarding the gasoline tank emissions have been updated by staff to reflect both maximum emission events per hour and per day and also reflect that the gasoline tank will be required to have both Phase I and Phase II vapor balance controls.

[7] This basis is updated from the applicant's assumption of 52 hours based on a regulatory limit of 50 hours for engine testing and maintenance operation.

- The diesel vehicles (SCA cleaning truck, evacuation truck, etc) and gasoline vehicles (stakebed truck, ranger truck, welding truck, etc) emissions are based on a total annual vehicle miles traveled (VMT) of 40,000 and 102,040, respectively.

The AMS onsite stationary source and mobile equipment emissions, including fugitive PM10 emissions, for the entire facility are estimated and summarized in **Air Quality Table 8**.

Air Quality Table 8
AMS Operation - Maximum Hourly, Daily, and Annual Onsite Emissions

	Maximum Hourly Emissions (lbs/hr)					
Emission Source	**NOx**	**SOx**	**CO**	**VOC**	**PM10**	**PM2.5**
Auxiliary HTF Heaters	0.47	0.03	1.63	0.46	0.32	0.32
Cooling Towers	--	--	--	--	4.48	4.48
Emergency Fire Pump Engines	0.00	0.00	0.00	0.00	0.00	0.00
Emergency Generator Engines	46.61	0.04	3.78	0.92	0.33	0.33
HTF Expansion Tanks/Venting Systems	--	--	--	1.14	--	--
HTF Piping Systems	--	--	--	0.20	--	--
Gasoline Storage Tank	--	--	--	0.42	--	--
Maintenance Vehicles (all types)	0.38	0.00	0.23	0.07	0.03	0.03
Operations Fugitive Dust	--	--	--	--	4.25	0.90
Total Maximum Hourly Emissions	47.46	0.07	5.64	3.21	9.41	6.06
Emission Source	**Maximum Daily Emissions (lbs/day)**					
Auxiliary HTF Heaters	11.36	0.60	39.22	11.08	7.65	7.65
Cooling Towers	--	--	--	--	71.74	71.74
Emergency Fire Pump Engines	0.00	0.00	0.00	0.00	0.00	0.00
Emergency Generator Engines	46.61	0.04	3.78	0.92	0.33	0.33
HTF Expansion Tanks/Venting Systems	--	--	--	9.10	--	--
HTF Piping Systems	--	--	--	1.69	--	--
Gasoline Storage Tank	--	--	--	0.63	--	--
Maintenance Vehicles (all types)	9.21	0.02	5.49	1.65	0.61	0.61
Operations Fugitive Dust	--	--	--	--	102.10	21.70
Total Maximum Daily Emissions	67.18	0.66	48.49	25.07	182.43	102.03
Emission Source	**Annual Emissions (tons/year)**					
Auxiliary HTF Heaters	0.52	0.03	1.79	0.51	0.35	0.35
Cooling Towers	--	--	--	--	13.09	13.09
Emergency Fire Pump Engines	0.11	0.00	0.10	0.01	0.01	0.01
Emergency Generator Engines	2.33	0.00	0.19	0.05	0.02	0.02
HTF Expansion Tanks/Venting Systems	--	--	--	1.66	--	--
HTF Piping Systems	--	--	--	0.31	--	--
Gasoline Storage Tank	--	--	--	0.01	--	--
Maintenance Vehicles (all types)	1.68	0.00	1.00	0.30	0.11	0.11
Operations Fugitive Dust	--	--	--	--	18.63	3.96
Total Annual Emissions	4.64	0.03	3.08	2.85	32.21	17.54

Source: AS 2009a, ESH 2009c, ESH 2010e, ESH 2010g, ESH 2010k

In addition to the onsite stationary and mobile emission sources there are offsite deliveries (fuel, water treatment chemicals, periodic evaporation pond solids waste haul trips, etc.) and daily employee trips. The following assumptions were used by the applicant to develop daily and annual offsite mobile source emissions estimates for AMS operation:

A. Maximum Daily Emissions

- For delivery vehicles the daily emission were based on the annual emissions divided by 260 (deliveries occur on weekdays).
- For employee commuting the daily emissions were based on the annual emissions divided by 365 days per year (employees work every day).

B. Maximum Annual Emissions

- 12,540 gasoline delivery vehicle VMT (medium duty gasoline vehicles size was assumed).
- 12,540 diesel delivery vehicle VMT (heavy duty diesel trucks were assumed).
- 1,241,000 employee commuting VMT based on an average of 68 commuting employees per day, 365 days per year, with a 50 mile round trip commute distance.

The AMS offsite mobile source emissions estimated by the applicant[8], including fugitive PM10 emissions, are summarized in **Air Quality Table 9**.

Air Quality Table 9
AMS Operation - Maximum Daily and Annual Offsite Emissions

	Maximum Daily Emissions (lbs/day)					
Emission Source	**NOx**	**SOx**	**CO**	**VOC**	**PM10**	**PM2.5**
Diesel Delivery Vehicles	1.65	0.00	0.46	0.12	0.08	0.07
Gasoline Delivery Vehicles	0.1	0.00	0.63	0.05	0.00	0.00
Employee Vehicles	3.77	0.03	37.67	3.13	0.31	0.30
Total Maximum Daily Emissions	5.52	0.03	38.76	3.30	0.39	0.37
Emission Source	**Annual Emissions (tons/year)**					
Diesel Delivery Vehicles	0.21	0.00	0.06	0.02	0.01	0.01
Gasoline Delivery Vehicles	0.01	0.00	0.08	0.01	0.00	0.00
Employee Vehicles	0.69	0.01	6.88	0.57	0.06	0.06
Total Annual Emissions	0.91	0.01	7.02	0.60	0.07	0.07

Source: AS 2009a, ESH 2009c, ESH 2010e, ESH 2010g

[8] Staff does not believe that the applicant emission estimate assumptions for trip length or daily emissions are reasonable, nor did the applicant include fugitive road dust emissions in the offsite emissions estimate. So staff will be providing a revision to these assumptions and emissions in the Supplemental Staff Assessment.

PROJECT CONSTRUCTION AND OPERATION OVERLAP

The Alpha and Beta Units may be developed in phases. Although there could be some overlap of construction and commercial operation, staff does not anticipate this overlap to be the maximum worst case scenario. Construction emissions are considerably higher than operating emissions and the maximum construction emissions occur early in the overall construction process (first six months), so any overlap after the maximum construction period is assumed not to create a new maximum emissions scenario. Therefore, staff concludes that the overlapping emissions and impacts during this overlapping period would be no worse than the worst-case construction impacts and has not performed any additional impact assessment of the construction/operation overlapping period.

INITIAL COMMISSIONING AND CLOSURE

Initial commissioning refers to a period prior to beginning commercial operation when the equipment undergoes initial tests. Because of this proposed 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.

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 as discussed above.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Energy Commission staff assesses four kinds of primary and secondary[9] 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 project. Operational impacts result from the emissions of the proposed project during operation, which includes all of the onsite auxiliary equipment emissions (HTF heaters, cooling towers, 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. The cumulative impacts analysis assesses the impacts that result from the proposed 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 project. (Pub. Resources Code § 21083; Cal. Code Regs., tit. 14, §§ 15064(h), 15065(c), 15130, and 15355.)

METHOD AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

CEC staff evaluates 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, Energy Commission staff uses health-based ambient air

[9] 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.

quality standards (AAQS) established by the ARB and the 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 and their precursors (NOx, VOC, PM10 and SO_2) 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. 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.

DIRECT/CUMULATIVE IMPACTS AND MITIGATION

While the emissions are the actual mass of pollutants emitted from the proposed project, the impacts are the concentration of pollutants from the proposed 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 project there are no very tall emission stacks, but the construction and maintenance vehicles and emergency engine do have high temperature and velocity exhausts; and the auxiliary HTF heaters also have relatively high exhaust temperatures and velocities. The emissions from the proposed 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 magnitude 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 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 applicant used the U.S.EPA guideline ARMS/EPA Regulatory Model (AERMOD) model to estimate ambient impacts from project construction and operation. The construction emission sources for the site were grouped into two categories: equipment (off-road equipment); and vehicles (on-road equipment), where the exhaust and fugitive dust emissions for each type were calculated for particulate matter modeling. Emissions from onsite equipment engines during construction were modeled as point sources and fugitive emission sources were modeled as area sources. For operation the stationary sources were modeled as point sources and the maintenance vehicle emissions, tailpipe and fugitive dust emissions, were modeled as area sources.

The inputs for the air dispersion models include stack information (exhaust flow rate, temperature, and stack dimensions), specific fire pump engine, emergency generator, auxiliary HTF heater, cooling tower, and vehicle emission data; and meteorological data, such as wind speed, atmospheric conditions, and site elevation. For this project, the meteorological data used as inputs to the model included hourly wind speeds and directions measured at the Daggett Airport meteorological site during 2001 through 2004, which is the closest complete meteorological data source to the project site. Concurrent upper air data from Desert Rock and Nevada was also used. This meteorological data was approved for use by the MDAQMD.

NOx emissions from internal combustion sources, such as diesel engines, are primarily in the form of nitric oxide (NO) rather than NO_2. Nitric oxide converts into NO_2 in the atmosphere, primarily through the reaction with ambient ozone. The applicant used the U.S.EPA ambient ratio method (ARM) default multiplier of 0.75 as the worst-case downwind annual NO_2/NOx ratio for the determination of the annual NO_2 concentration for construction and operation. However, the applicant did not use any modeling procedures to consider the short-term near-field NO_2/NOx ratios for construction or operation. Therefore, the modeling method is very conservative and over predicts actual worst-case 1-hour NO_2 concentrations.

Staff revised the background concentrations provided by the applicant, replacing them 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 project's 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 project's short-term direct construction and operation ambient air quality impacts, as estimated by the applicant, and describe appropriate mitigation measures.

Construction Impacts and Mitigation

The following section discusses the project's direct and cumulative ambient air quality impacts during construction, as estimated by the applicant, and evaluated by staff. Additionally, this section discusses the recommended mitigation measures.

Construction Modeling Analysis

Using estimated peak onsite hourly, daily and annual construction equipment exhaust emissions, the applicant modeled the proposed project's construction emissions to determine impacts (ESH 2010g). To determine the construction impacts on ambient standards (i.e. 1-hour through annual) it was assumed that the emissions would occur during a daily construction schedule of 10 hour days (7 am to 5 pm). The predicted proposed project concentration levels were added to a conservatively estimated background of existing emission concentration levels (**Air Quality Table 5**) to determine the cumulative effect. The results of the applicant's modeling analysis are presented in **Air Quality Table 10**. The construction modeling analysis includes both the onsite fugitive dust and vehicle tailpipe emission sources estimated by the applicant (with applicant-proposed control measures) and summarized in **Air Quality Tables 6** and **7**.

Air Quality Table 10
Maximum Project Construction Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	177	154.4	331.4	339	98%
	Annual	1.8	41.8	43.6	57	76%
PM10	24-hr	72	80.0	152.0	50	304%
	Annual	1.8	29.8	31.6	20	158%
PM2.5	24-hr	15	19.0	34.0	35	97%
	Annual	0.45	10.3	11.0	12	92%
CO	1-hr	94	4,025	4,119	23,000	18%
	8-hr	31	1,367	1,398	10,000	14%
SO_2	1-hr	0.18	47.2	47.4	665	7%
	3-hr	0.08	31.2	31.3	1300	2%
	24-hr	0.03	13.1	13.1	105	13%
	Annual	0.003	2.7	2.7	80	3%

Source: AS 2009a, ESH 2009c, ESH 2010e, ESH 2010g
Note:
[a] Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.

This modeling analysis indicates, with the exception of 24-hour and annual PM10 impacts, that the proposed 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. However, there are a few residences located adjacent to or nearby the proposed project fence line. Staff concludes that there would be a potential for nuisance dust conditions to occur within one quarter mile of the earthmoving activities. Therefore, staff is recommending that the applicant, at the residents request, pay for equivalent lodging for these residents during the initial grading phase of construction when the maximum particulate impacts from the proposed project's construction could occur at each of the residential locations located within one quarter mile of the project fence line. Therefore, staff concludes that the construction impacts, when considering staff's recommended mitigation measures, would not contribute substantially to exceedances of the PM10 CAAQS.

Construction Mitigation

Applicant's Proposed Mitigation

To mitigate the impacts due to construction of the facility, the applicant has proposed the following mitigation measures (AES 2009a):

- The Applicant will have an on-site construction mitigation manager who will be responsible for the implementation and compliance of the construction mitigation program. The documentation of the ongoing implementation and compliance with the proposed construction mitigations will be provided on a periodic basis.
- All unpaved roads and disturbed areas in the Project and laydown construction sites will be watered as frequently as necessary to control fugitive dust. The frequency of watering will be on a minimum schedule of every two hours during the daily construction activity period. Watering may be reduced or eliminated during periods of precipitation.
- On-site vehicle speeds will be limited to five mph on unpaved areas within the Project construction site.
- The construction site entrance(s) will be posted with visible speed limit signs.
- All construction equipment vehicle tires will be inspected and cleaned as necessary to be free of dirt prior to leaving the construction site via paved roadways.
- Gravel ramps will be provided at the tire cleaning area.
- All unpaved exits from the construction site will be graveled or treated to reduce track-out to public roadways.
- All construction vehicles will enter the construction site through the treated entrance roadways, unless an alternative route has been provided.

- Construction areas adjacent to any paved roadway will be provided with sandbags or other similar measures as specified in the construction SWPPP to prevent runoff to roadways.
- All paved roads within the construction site will be cleaned on a periodic basis (or less during periods of precipitation), to prevent the accumulation of dirt and debris.
- The first 500 feet of any public roadway exiting the construction site will be cleaned on a periodic basis (or less during periods of precipitation), using wet sweepers or air-filtered dry vacuum sweepers, when construction activity occurs or on any day when dirt or runoff from the construction site is visible on the public roadways.
- Any soil storage piles and/or disturbed areas that remain inactive for longer than 10 days will be covered, or shall be treated with appropriate dust suppressant compounds.
- All vehicles that are used to transport solid bulk material on public roadways and that have the potential to cause visible emissions will be covered, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to minimize fugitive dust emissions. A minimum freeboard height of two feet will be required on all bulk materials transport.
- Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) will be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition will remain in place until the soil is stabilized or permanently covered with vegetation.
- Disturbed areas will be re-vegetated or covered with gravel or other dust suppressant material as soon as practical.

To mitigate exhaust emissions from construction equipment, the Applicant is proposing the following:

- The Applicant will work with the construction contractor to utilize to the extent feasible, U.S.EPA/Air Resources Board (ARB) Tier II/Tier III engine compliant equipment for equipment over 100 hp.
- Ensure periodic maintenance and inspections per the manufacturers specifications.
- Reduce idling time through equipment and construction scheduling.
- Use California low sulfur diesel fuels (<=15 ppmw S).

Adequacy of Proposed Mitigation

Staff generally concurs with the applicant's proposed mitigation measures, which mirror many of the staff's mitigation recommendations from previous siting cases. But staff has been proposing additional fugitive dust mitigation, such as requiring the use of soil binders or paving to reduce emissions on unpaved roads, that is considered necessary to reduce the very high fugitive dust emission potential for large solar projects, such as AMS. Staff also believes that the off-road equipment mitigation measures need to be updated to meet current staff recommendations.

Staff Proposed Mitigation

Staff recommends construction PM10 and NOx emission mitigation measures as articulated in Conditions of Certification **AQ-SC1** through **AQ-SC5** that include modified versions of similar mitigation measures proposed by the applicant in the AFC. In particular, staff proposes modifications to the unpaved road fugitive dust controls necessary to control the higher fugitive dust emission potential for this type of project, and modifications to the off-road equipment mitigation measure to update it to current staff standards that consider the high unmitigated emission potential for the construction of this project.

Staff recommends **AQ-SC1** to require the applicant to have an on-site construction mitigation manager who would be responsible for the implementation and compliance of the construction mitigation program. The documentation of the ongoing implementation and compliance with the construction mitigation program would be provided in the monthly construction compliance report that is required in staff's recommended Condition of Certification **AQ-SC2**.

Recommended Condition of Certification **AQ-SC3** formalizes the fugitive dust control requirements. These requirements include paving of the main access road to the main power block before construction begins on that part of the site, that durable non-toxic soil stabilizers be used on the onsite unpaved plant roads as soon as they are constructed, and many other activity-specific control measures be applied to reduce fugitive dust emissions during construction.

Recommended Condition of Certification **AQ-SC4** would limit the potential offsite impacts from visible dust emissions, by responding to situations when the control measures required by **AQ-SC3** are not working effectively to control fugitive dust from leaving the construction site area.

Staff recommends Condition of Certification **AQ-SC5** to mitigate the PM and NOx emissions from the large diesel-fueled construction equipment. Implementation of this mitigation measure would provide additional primary and secondary PM mitigation to supplement the recommended fugitive dust mitigation measures. This condition requires the use of EPA/ARB Tier 3 engine compliant equipment for equipment over 50 and under 750 horsepower (hp) where available based on a good faith effort to find and use available EPA/ARB Tier 3 engines, and requires that all engines over 750 hp comply with Tier 2 emission standards. In the event that the desired Tier 2 and 3 engines cannot be found there are provision for allowing equivalent tailpipe controls on older engines and limited exemptions for specialty and short-term equipment use. This condition also includes equipment idle time restrictions and engine maintenance provisions. The Tier 2 standards include engine emission standards for NOx plus non-methane hydrocarbons, CO, and PM emissions; while the Tier 3 standards (for engines between 50 and 750 hp) further reduce the NOx plus non-methane hydrocarbons emissions. The Tier 2 and Tier 3 standards became effective for engine/equipment model years 2001 to 2004 and models years 2006 to 2008, respectively, for engines between 50 and 750 hp.

Staff is also recommending in **AQ-SC9** that the applicant be responsible for paying for offsite lodging, if requested, during initial site grading for residents located within one quarter mile of the proposed project's site fence line. This recommended condition is considered necessary to mitigate the potential particulate nuisance conditions that could exist near the proposed project's site fence line during the initial grading activities. This condition of certification is being recommended considering the specific conditions and construction requirements for AMS. These specific conditions and construction requirements include the following:

- Several residences are located adjacent to or within one quarter mile of the site fence line.
- The site grading/preparation phase of construction includes up to 5 million cubic yards of earthmoving, including the creation of a large earthen drainage channel near residences.
- The project site is in an area that is windy and dry, which creates additional dust control challenges for a large project site.

Based on the relatively short-term nature of the worst-case construction impacts, and staff's recommended construction emissions mitigation measures, staff believes that the construction air quality impacts would be less than significant with the implementation of its recommended Conditions of Certification.

Operation Impacts and Mitigation

The following section discusses the project's direct and cumulative ambient air quality impacts, as estimated by the applicant, and evaluated by staff. Additionally, this section discusses the recommended mitigation measures.

Operation Modeling Analysis

Using estimated peak onsite hourly, daily and annual operating emissions, the applicant modeled the proposed project's operation emissions to determine impacts (ESH 2010e). The predicted proposed project concentration levels were added to a conservatively estimated background of existing emission concentration levels (**Air Quality Table 5**) to determine the cumulative effect. **Air Quality Table 12** presents the results of the applicant's modeling analysis. Staff notes that the applicant's determined maximum 1-hour NO_2 concentration was not based on the ozone limiting method (OLM) calculation, or any other method to determine the NO_2/NOx ratio, and so assumes that all NOx emission are NO_2 which overstates the maximum NO_2 impacts. The operation modeling analysis includes emissions from the stationary sources and the onsite fugitive dust and vehicle tailpipe emission sources estimated by the applicant, which all include the applicant's proposed control measures, and that are summarized in **Air Quality Table 8**.

Air Quality Table 12
Maximum Project Operation Emission Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	130	154.4	284.4	339	84%
	Annual	0.18	41.8	42.0	57	74%
PM10	24-hr	8.8	80.0	88.8	50	178%
	Annual	2.3	29.8	32.1	20	161%
PM2.5	24-hr	4.4	19.0	23.4	35	67%
	Annual	0.7	10.3	11.0	12	92%
CO	1-hr	76	4,025	4,101	23,000	18%
	8-hr	7.8	1,367	1,375	10,000	14%
SO_2	1-hr	0.25	47.2	47.5	665	7%
	3-hr	0.18	31.2	31.4	1300	2%
	24-hr	0.07	13.1	13.2	105	13%
	Annual	0.003	2.7	2.7	80	3%

Source: AS 2009a, ESH 2009c, ESH 2010e, ESH 2010g
Note:
[a] Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.

This modeling analysis indicates, with the exception of 24-hour and annual PM10 impacts, that the proposed 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 that would exist 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. Therefore, staff concludes that the operation impacts, when considering staff's recommended mitigation measures, would not contribute substantially to exceedances of the PM10 CAAQS.

Operations Mitigation

Applicant's Proposed Mitigation

Emission Controls

As discussed in the air quality section of the AFC (AS 2009a) and data responses (ESH 2009c, 2010e, and 2010g), the applicant proposes the following emission controls on the stationary equipment associated with AMS operation:

Auxiliary HTF Heaters

The applicant's proposed Best Available Control Technology (BACT) for the two 21.5 MMBtu/hr auxiliary HTF heaters would include the use of natural gas (clean fuel) and the use of ultra-low NOx burners (for NOx). The AFC (AS 2009a) provides the following BACT concentration limit and hourly emission limits, each for the two heaters:

- NOx: 9.0 ppmvd at 3% O_2 – 0.24 lbs/hour
- CO: 50 ppmvd at 3% O_2 – 0.82 lbs/hour
- VOC: 0.23 lbs/hour,
- PM10/PM2.5: 0.16 lbs/hour
- SO_2: 0.01 lbs/hour

Emergency Generator Engines

The applicant's proposed Best Available Control Technology (BACT) for the 4,190 brake horsepower (bhp) emergency generator engines is compliance with the New Source Performance Standards, Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, specifically NSPS compliant engines. To meet this requirement the applicant is proposing Tier 2 compliant engines with the following emission limits:

- NOx: 5.05 grams/bhp – 46.61 lbs/hour
- CO: 0.41 grams/bhp - 3.78 lbs/hour
- VOC: 0.1 grams/bhp – 0.92 lbs/hour
- PM10/PM2.5: 0.036 grams/bhp – 0.33 lbs/hour
- SO_2: Fuel ≤ 15 ppmw S – 0.04 lbs/hour

Fire Water Pump Engine

The applicant's proposed Best Available Control Technology (BACT) for the 346 bhp fire pump engines is compliance with the New Source Performance Standards, Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, specifically NSPS compliant engines. To meet this requirement the applicant is proposing Tier 3 compliant engines with the following emission limits:

- NOx: 2.8 grams/bhp – 2.13 lbs/hour
- CO: 2.6 grams/bhp - 1.98 lbs/hour
- VOC: 0.2 grams/bhp – 0.15 lbs/hour
- PM10/PM2.5: 0.15 grams/bhp – 0.11 lbs/hour
- SO_2: Fuel ≤ 15 ppmw S – 0.002 lbs/hour

Cooling Tower

The applicant's proposed Best Available Control Technology (BACT) for the cooling tower is the use of a high efficiency drift eliminator with a guaranteed drift efficiency of 0.0005%. The applicant would also limit the recirculating water TDS content to 9,968 ppm.

HTF System Emissions

The applicant's proposed Best Available Control Technology (BACT) for the HTF Tank Venting System Emissions consists of the following, which would control total HTF related potential organic compound emissions by 99.9%:

- Nitrogen blankets on the HTF storage tanks.
- Distillation/condensation of the HTF expansion system, the high boilers, and the low boilers (primarily benzene and phenol)[10].

Additional assumed mitigation measures to reduce emissions from the HTF piping system and waste load out include the following:

- Daily inspections of the tanks and distribution system for the presence of leaks in the areas of valves, flanges, and pump seals.
- Continuous maintenance of the system.
- Proper handling of HTF during delivery, transfer to the system, and waste disposal.

Maintenance Vehicles

The applicant has not proposed any specific emission controls for this emission source.

Fugitive Dust

The applicant has proposed to control fugitive dust emissions during operation through the use of wind erosion operational practices such as windbreaks, water, and dust suppressants in areas disturbed by vehicles or wind and by limiting vehicle speeds (AS 2009b).

Adequacy of Proposed Mitigation

Staff concurs with the District's determination that the project's stationary source proposed emission controls/emission levels for criteria pollutants meets BACT requirements and that the proposed stationary source emission levels are reduced to the lowest technically feasible levels. The applicant has not proposed mitigation to reduce the maintenance vehicle emissions, and has proposed limited and not well defined fugitive dust emission controls. Staff believes that mitigation for these non-stationary emission sources is necessary to adequately mitigate the proposed project's operating emissions.

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[10] High boilers are large molecular weight molecules from product degradation including solid sludge that would boil at very high temperatures and low boilers are smaller molecular weight breakdown product molecules, such as benzene, that are much more volatile and boil and much lower temperatures.

Staff Proposed Mitigation

Staff concludes that the proposed project's direct stationary source ozone precursor and PM10 emissions are minimal, but when combined with the maintenance vehicles emissions could be significant. Additionally, staff believes that a solar renewable project, which would have a 30-year life in a setting likely to continue to be impacted by both local and upwind emission sources, should address its contribution to the potentially ongoing nonattainment of the PM10 and ozone standards. Staff recommends that mitigation measures be required to reduce the non-stationary emissions from the proposed project. Therefore, staff recommends the project owner be required to purchase new on-road and off-road vehicles that meet California emissions standards (**AQ-SC6**) and that the project owner be required to apply fugitive dust controls that are equivalent to those recommended for construction (**AQ-SC7**) to adequately mitigate the proposed project's operation emissions.

Staff is also proposing Condition of Certification **AQ-SC8** to ensure that the Energy Commission license is amended, as necessary, to incorporate changes to the air quality permits.

Staff concludes that with the proposed District- and staff-recommended conditions of certification the proposed project's operating emissions would be less than significant.

Staff has considered the minority population surrounding the site (see **Socioeconomics Figure 1**). Since the 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 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 project displacing the need for their operation, since solar renewable energy facilities would operate on a must-take basis[11]. The exact nature and location of such reductions is not known, so the discussion below focuses on the direct emissions from the proposed project within the northwestern San Bernardino 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 AMS do have the potential (if left unmitigated) to

[11] 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.

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% 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 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. There are two conditions that are of interest, described as *ammonia rich* and *ammonia poor*. The term ammonia rich indicates that there is more than enough ammonia to react with all the sulfuric acid and to establish a balance of nitric acid-ammonium nitrate. Further ammonia emissions in this case would not necessarily lead to increases in ambient PM2.5 concentrations. In the case of an ammonia poor environment, there is insufficient ammonia to establish a balance and thus additional ammonia would tend to increase PM2.5 concentrations.

The San Bernardino County portion of the Mojave Desert Air Basin has not undergone the rigorous secondary particulate studies that have been performed in other areas of California, such as the San Joaquin Valley, that have more serious fine particulate pollution problems. However, the available chemical characterization data shows that the ammonium nitrate and ammonium sulfate fine particulate concentrations in China Lake, Edwards Air Force Base, and Mojave in 2000 were 40% of the to the PM2.5 on an annual average (ARB 2005). Because of the known relationship of NOx and SOx emissions to PM2.5 formation it can be said that the emissions of NOx and SOx from AMS do have the potential (if left unmitigated) to contribute to higher PM2.5 levels in the region.

Impact Summary

The applicant is proposing to mitigate the proposed project's stationary source NOx, VOC, SO_2, and PM10/PM2.5 emissions through the use of Best Available Control Technology (BACT). Staff has recommended augmenting the applicant's proposed stationary source mitigation with mitigation requirements for project maintenance vehicles (**AQ-SC6**) to further reduce VOC and NOx emissions. With the applicant's stipulated stationary source mitigation, as enforced by District conditions and staff's recommended vehicle mitigation, staff concludes that the proposed project would not cause significant secondary pollutant impacts.

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 the existing background sources or foreseeable future projects. Air districts attempt 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 air 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 northwestern San Bernardino County portion of the Mojave Desert Air Basin, including a discussion of historical ambient levels for each of the significant criteria pollutants. The "Construction Impacts and Mitigation" subsection discusses the proposed project's contribution to the local existing background caused by project construction. The "Operation Impacts and Mitigation" subsection discusses the proposed 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 project's *localized cumulative impacts*, the proposed project's direct operating emissions combined with other local major emission sources.

Summary of Projections

The project site area within the MDAB is designated as non-attainment for both federal (8-hour) and State (1-hour) ozone and PM10 standards, as well as state PM2.5 standard. All other criteria pollutants (NO_2, and SO_2, and CO) are considered to be in attainment by the State, and in attainment and/or unclassified under federal standards, including PM2.5.

Ozone

Since the San Bernardino County portion of Mojave Desert is currently classified as non-attainment for the federal 8-hour ozone standard, the District is required to prepare and adopt an ozone attainment plan for submittal to the U.S.EPA describing how it will attain the federal 8-hour standard. The MDAQMD has adopted State and Federal attainment plans for the region within its jurisdiction. The MDAQMD adopted the

MDAQMD 2004 Ozone Attainment Plan (approved by U.S.EPA), and has updated it with the MDAQMD Federal 8-hour Ozone Attainment Plan 2008 to demonstrate that the MDAQMD will meet the required Federal ozone planning milestones and attain the 8-hour ozone NAAQS by June 2021. There are no additional control measures for direct ozone precursor reductions required as part of the update. However, the MDAQMD is committed to have all applicable Federal Reasonably Available Control Technology (RACT) rules as proposed in their 8-hour Reasonably Available Control Technology – State Implementation Plan Analysis (RACT SIP Analysis) adopted in 2006. In addition, the MDAQMD updated and indentified new measures in 2007, which will be adopted through 2014, as the State of California mandates including all feasible ozone precursor control measures. The enhanced vapor recovery for fuel storage tanks measure would be applicable to the proposed project's gasoline tank.

Particulate Matter

The District is currently classified as nonattainment for the state and the federal 24-hour PM10 air quality standard. The District first adopted a Federal Particulate Matter (PM10) Attainment Plan (PMAP) in July 31, 1995. However, some experts are critical of the federal standards as not being sufficiently health protective. California has adopted far more stringent standards for PM10. Currently, the vast majority of air districts in the state are designated nonattainment of the state PM10 standard. There is no legal requirement for air districts to provide plans to attain the state PM10 standard, so air districts have not developed such plans.

In 1997 the federal government adopted PM2.5 standards, as did the state in 2003. The EPA has determined that the area is unclassified, or attainment for both the annual and the 24-hour federal PM2.5 standard. However, the ARB classifies the area as nonattainment of the annual state PM2.5 air quality standard.

The PMAP states that "(t)he air quality of the MDAQMD is impacted by both fugitive dust from local sources and occasionally by region-wide wind blown dust during moderate to high wind episodes. This region-wide or "regional" event includes contributions from both local and distant dust sources which frequently result in violations of the NAAQS that are multi-district and interstate in scope." It also states that "(i)t is not feasible to implement control measures to reduce dust from regional wind events." Therefore, the District would have put considerable effort to reduce the emissions from "…unpaved road travel, construction, and local disturbed areas in the populated areas, and certain stationary sources operating in the rural Lucerne Valley."

As a solar power generation facility, the direct air pollutant emissions from power generation are negligible and the emission source would be limited to auxiliary equipment and maintenance activities. The emissions from the proposed project would be minimal compared to the other power generation facilities, and it is unlikely that the proposed project would measurably contribute to ongoing air basin PM10 nonattainment exceedance events.

Summary of Conformance with Applicable Air Quality Plans

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

Localized Cumulative Impacts

The proposed project's contributions to localized cumulative impacts can be reasonably estimated through air dispersion modeling (see the "Operation Modeling Analysis" subsection). 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 applicant) 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 six miles of the project site. Based on staff's modeling experience, beyond six 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 applicant) works with the air district and local counties to identify any new area sources within six 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 project, thus a local major source might not be well represented by the background air monitoring. 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 two 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 AMS if the high impact area is the result of high fence line concentrations from another stationary source and AMS 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 applicant 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 applicant 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 applicant to complete. There are several reasons for this: modeling analyses take time to perform and require significant expertise, the applicant has already performed a modeling analysis of the proposed project alone (see the "Operational Modeling Analysis" subsection), and the applicant 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 project emissions can be evaluated, and the mitigation itself can be proposed by staff and/or the applicant (see the "Operation Mitigation" subsection).

The applicant, in consultation with the MDAQMD, confirmed that there are no projects within a six miles radius from the AMS project 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 six mile radius of the proposed project site. However, there are several dozen pending solar, wind, and other projects in the Mojave Desert west of Barstow. These projects include two large thermal solar project (Beacon Solar Energy Project and Ridgecrest Solar Power Project) and two large gas-fired turbine/solar hybrid projects (Palmdale Hybrid Power Plant Project and Victorville 2 Hybrid Power Project) that are in the licensing process or recently approved by the Energy Commission. This potential for significant additional development within the air basin and corresponding increase in air basin emissions is a major part of staff's rationale for recommending Conditions of Certification **AQ-SC6** and **AQ-SC7** that are designed to mitigate the proposed project's cumulative impacts by reducing the dedicated on-site vehicle emissions and fugitive dust emissions during site operation. With these recommended mitigation measures, staff has concluded that the cumulative air quality impacts are less than significant.

Staff has considered the minority population surrounding the site (see **Socioeconomics Figure 1**). Since, with the Commission's adoption of staff recommended Conditions of Certification, the proposed project's cumulative air quality impacts would be mitigated to less than significant, there is no environmental justice issue for air quality.

COMPLIANCE WITH LORS

The Mojave Desert Air Quality Control District issued a Preliminary Determination of Compliance (PDOC) for AMS on March 1, 2010 (MDAQMD 2010a), and will issue a Final Determination of Compliance after a 30 day public notice period. Compliance with all District rules and regulations was demonstrated to the District's satisfaction in the PDOC. The District's PDOC conditions are presented in the Conditions of Certification (**AQ-1** to **AQ-50**).

Staff expects to submit an official PDOC comment letter to the District and expects that the FDOC may contain revisions to conditions in response to Energy Commission, applicant, or third party comments, and staff will subsequently provide a Supplemental Staff Assessment with any revised FDOC findings or conditions of certification.

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 Standard (Subparts Dc and IIII). However, this proposed project does not require a federal NSR or Title V permit and would not require a PSD permit from U.S.EPA prior to initiating construction.

The proposed project requires the approval of a federal agency, which staff believes will be the U.S. Department of Energy, if it is to receive Recovery Act funding. Therefore, the project is subject to the General Conformity regulations (40 CFR Part 93). The project area is moderate nonattainment of the federal ozone and PM10 ambient air quality standards, and the general conformity emissions applicability thresholds for these nonattainment classifications are 100 tons/year for direct and indirect ozone precursor (NOx and VOC) emissions and for PM10 emissions[12]. The project's maximum annual mitigated direct and indirect construction and operation emissions, as shown in **Air Quality Tables 6**, **8** and **9** have been determined by the applicant to be well below the applicable General Conformity applicability thresholds of 100 tons per year for NOx, VOC, and PM10[13]. Therefore, staff concludes that the project would not be required to complete a conformity analysis and would be in conformance with the State Implementation.

STATE

The applicant will demonstrate that the proposed 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.

[12] The General Conformity regulations specify PM10 and PM10 precursor emissions, where such precursors have been identified as major PM10 contributors in the SIP. The currently applicable PM10 SIP does not identify secondary pollutants (NOx, SOx, and VOC) as major contributors to ambient PM10 concentrations.

[13] As noted previously staff plans to complete a separate construction emissions analysis, but staff believes that the results of this analysis will still indicate that the maximum annual emissions for NOx, VOC, and PM10 are below 100 tons per year.

The emergency generator and fire water pump engines are also subject to the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines. This measure limits the types of fuels allowed, established maximum emission rates, and establishes recordkeeping requirements. The proposed Tier 2 emergency engine and Tier 3 fire water pump engine meet the current emission limit requirements of this measure. This measure would also limit the engines' testing and maintenance operation to no more than 50 hours per year per engine.

LOCAL

The District rules and regulations specify the emissions control and offset requirements for new sources such as AMS. Best Available Control Technology would be implemented, and emission reduction credits (ERCs) are not required to offset the proposed project's emissions by District rules and regulations based on the permitted stationary source emission levels for the proposed project. Compliance with the District's new source review requirements would ensure that the proposed project would be consistent with the strategies and future emissions anticipated under the District's air quality attainment and maintenance plans.

The applicant provided an air quality permit application to the MDAQMD and the District issued a PDOC on March 1, 2010 (MDAQMD 2010a). The PDOC states that the proposed project is expected to comply with all applicable District rules and regulations. The DOC evaluates whether and under what conditions the proposed project would comply with the District's applicable rules and regulations, as described below.

Regulation II – Permits

Rule 201 and 203 – Permit to Construct and Permit to Operate

Rule 201 establishes the emission source requirements that must be met to obtain a Permit to Construct. Rule 203 prohibits use of any equipment, the use of which may emit air contaminants, without obtaining a Permit to Operate. The applicant has complied with this rule by submitting the AFC and District permit applications materials.

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, the District has determined that the facility is expected to comply with this rule.

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 and Rule 403.2 - Fugitive Dust Control for the Mojave Desert Planning Area

These rules limit fugitive emissions from certain bulk storage, earthmoving, construction and demolition, and manmade conditions resulting in wind erosion. With the implementation of recommended staff conditions **AQ-SC3**, **AQ-SC4** and **AQ-SC7,** 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 AMS stationary sources subject to this rule (auxiliary HTF heaters, emergency engines, and cooling towers) would comply with the PM concentration limits of this regulation.

Rule 406 – Specific Contaminants

The rule prohibits sulfur emissions, calculated as SO_2, in excess of 500 ppmv. Compliance with this rule is assured with the required use of pipeline quality natural gas for the auxiliary HTF heaters and California low sulfur diesel fuel for the emergency generator and fire pump engines.

Rule 407 – Liquid and Gaseous Air Contaminants

The rule prohibits carbon monoxide emissions in excess of 2,000 ppmv. The auxiliary heaters and emergency generator and fire pump engines would have CO emissions well below this concentration limit. Compliance with this rule is expected.

Rule 409 - Fuel Burning Equipment - 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 foot of gas calculated to 12% of carbon dioxide (CO_2) at standard conditions. The AMS stationary sources would have particulate concentrations below the limit of this rule.

Rule 431 – Sulfur Content of Fuels

The rule prohibits the burning of gaseous fuel with a sulfur content of more than 800 ppm and liquid fuel with a sulfur content of more than 0.5% sulfur by weight. Compliance with this rule is assured with the required use of pipeline quality natural gas and California low sulfur diesel fuel for the emergency engines.

Rule 461 – Gasoline Transfer and Dispensing

This rule is to limit the emissions of volatile organic compounds (VOC) and toxic compounds during the storage, transfer and dispensing of gasoline. The PDOC includes conditions to assure compliance with this rule.

Regulation IX – Standards of Performance for New Stationary Sources

Rule 900 – Standard of Performance for New Stationary Source

This rule incorporates the Federal New Source Performance Standards (NSPS [40 CFR 60]) rules by reference. The proposed boilers are subject to subpart Dc. The District conditions would ensure compliance with the requirements of this rule.

The proposed Tier 2 and Tier 3 engines meet the current emission limit requirements of NSPS Subpart IIII. The exact model and size of the engines are only estimated at this time and it is uncertain exactly when the emergency engines would be purchased and whether Tier 4 engine emission limits may apply at that time. So, staff has added a requirement to the verification of District Condition of Certification (**AQ-35** and **AQ-42**) to require the applicant to provide documentation that demonstrates that the engines purchased meet the appropriate NSPS standards for new engines at the time of purchase.

Regulation XIII – New Source Review

Rule 1303 – New Source Review

This rule requires implementation of BACT for any emission source unit which emits or has the potential to emit 25 lbs/day or more and requires offsets if specific annual emission limits are exceeded. The PDOC concluded that the emergency engines trigger BACT and the engines complied, and that the HTF vent controls would meet BACT and Maximum Available Control Technology (MACT) requirements for the control of hazardous air pollutant emissions. The District is proposing a presumptive MACT standard for HTF vent controls of 98-99% emission control. The other stationary sources did not trigger BACT but would meet BACT requirements based on the applicant's proposed controls. The PDOC concluded that offsets were not required for the proposed project.

Rule 1306 – Electric Energy Generating Facilities

This rule describes actions to be taken for permitting of power plants. Compliance with this rule would be achieved with the completion of the FDOC.

NOTEWORTHY PUBLIC BENEFITS

Renewable energy facilities, such as AMS, 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 project, it would indirectly reduce criteria pollutant emissions within the Southwestern U.S. by reducing fossil fuel fired generation.

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

CONCLUSIONS

Staff has made the following conclusions about the Abengoa Mojave Solar Project:

- The proposed project would comply with applicable District Rules and Regulations, including New Source Review requirements, and staff recommends the inclusion of the Districts PDOC conditions as Conditions of Certification **AQ-1** through **AQ-50.**
- If left unmitigated, the proposed project's construction activities would likely contribution to significant adverse PM10 and ozone impacts. Staff recommends **AQ-SC1** to **AQ-SC5** to mitigate the potential impacts.
- The proposed project's operation would not cause new violations of any NO_2, SO_2, PM2.5 or CO ambient air quality standards, and therefore, the project's direct operational NOx, SOx, PM2.5 and CO emission impacts are not significant.
- The proposed project's direct and indirect, or secondary emissions contributions to existing violations of the ozone and PM10 ambient air quality standards are likely significant if unmitigated. Therefore, staff recommends **AQ-SC6** to mitigate the onsite maintenance vehicle emissions and **AQ-SC7** to mitigate the operating fugitive dust emissions to ensure that the potential ozone and PM10 impacts are mitigated to less than significant over the life of the project.
- The proposed project's construction includes significant earthmoving activities adjacent to or nearby several existing residences. Staff recommends **AQ-SC9** that requires the project owner pay for the temporary relocation of the effected adjacent residents, if requested by those residents, to avoid potential particulate emissions nuisance conditions.
- The proposed project would be consistent with the requirements of SB 1368 and the Emission Performance Standard for greenhouse gases (see **APPENDIX AIR-1**).

PROPOSED 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).

<u>**Verification:**</u> At least 60 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 60 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 30 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 from leaving the project. Any deviation from the AQCMP mitigation measures shall require prior CPM notification and approval.

Verification: The AQCMM shall provide the CPM a Monthly Compliance Report (**COMPLIANCE-6**) 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 and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

The following fugitive dust mitigation measures shall be included in the Air Quality Construction Mitigation Plan (AQCMP) required by **AQ-SC2**.

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 prior to taking initial deliveries.

b. All unpaved construction roads and unpaved operational 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 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. All other disturbed areas in the project and linear construction sites shall be watered as frequently as necessary during grading; 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.

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 (**COMPLIANCE-6**) 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 and 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, a construction mitigation report that demonstrates compliance with the AQCMP mitigation measures for purposes of controlling diesel construction-related emissions. Any deviation from the AQCMP mitigation measures shall require prior and CPM notification and approval.

Verification: The AQCMM shall include in the Monthly Compliance Report (**COMPLIANCE-6**) 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 list of all heavy equipment used on site during that month, including the owner of that equipment and a letter from each owner indicating that 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.

The following off-road diesel construction equipment mitigation measures shall be included in the Air Quality Construction Mitigation Plan (AQCMP) required by **AQ-SC2**.

a. All 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.

b. All construction diesel engines with a rating of 50 hp or higher and lower than 750 hp shall meet, at a minimum, the Tier 3 California Emission Standards for Off-Road Compression-Ignition Engines, as specified in California Code of Regulations, Title 13, section 2423(b)(1), unless a good faith effort to the satisfaction of the CPM that is certified by the on-site AQCMM demonstrates that such engine is not available for a particular item of equipment. Engines larger than 750 hp shall meet Tier 2 engine standards. In the event that a Tier 3 engine is not available for any off-road equipment larger than 100 hp and smaller than 750 hp, that equipment shall be equipped with a Tier 2 engine, or an engine that is equipped with retrofit controls to reduce exhaust emissions of 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 "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 construction equipment is intended to be on site for five days or less.

   3. The CPM may grant relief from this requirement if the AQCMM can demonstrate a good faith effort to comply with this requirement and that compliance is not practical.

c. The use of a retrofit control device may be terminated immediately, provided that the CPM is informed within 10 working days of the termination and that a replacement for the equipment item in question meeting the controls required in item “b” occurs within 10 days of termination of the use, if the equipment would be needed to continue working at this site for more than 15 days after the use of the retrofit control device is terminated, if 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 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.

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.

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.

f. Construction equipment will employ electric motors when feasible.

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 new model year vehicles that meet California on-road vehicle emission standards or appropriate U.S.EPA/California off-road engine emission standards for the model year when obtained.

Verification: At least 60 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 (**COMPLIANCE-7**).

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 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.

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

Verification: The project owner shall submit any ATC, PTO, and proposed air permit modifications to the CPM within five 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 air permits to the CPM within 15 days of receipt.

AQ-SC9 The project owner shall offer to pay for temporary equivalent lodging to all residents that are located within one quarter mile of the project site fence line during the initial grading/site preparation phase of construction, for those periods of time when the earthmoving activities may occur within one quarter mile of these residential properties. The project owner shall contact and provide this offer of temporary lodging to all residents affected by this condition at least one month prior to the start of initial grading.

__Verification:__ The project owner shall provide a written declaration to the CPM signed by the owner or residents of the properties effected by this condition that the residents have accepted or declined the project owners offer for paid relocation during the affected period of the initial grading/site preparation phase of construction. Additionally, in the Monthly Compliance Report the project owner shall provide documentation regarding any requests from the residents to be relocated for longer periods during construction and the project owner's actions to meet those requests.

DISTRICT CONDITIONS

District Preliminary Determination of Compliance Conditions (MDAQMD 2010a)

Application No. 00010710 and 00010711 (Two - 21.5 MMBtu/hr Natural Gas Fired Auxiliary Boilers)

EQUIPMENT DESCRIPTION

Two 21.5 MMBtu/hr natural gas fired auxiliary boilers with low-NOx burner systems.

AQ-1 Operation of this equipment shall be conducted in compliance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

__Verification:__ The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-2 This equipment shall be exclusively fueled with pipeline quality natural gas and shall be operated and maintained in strict accord with the recommendations of its manufacturer or supplier and/or sound engineering principles.

__Verification:__ The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-3 Emissions from this equipment shall not exceed the following hourly emission limits, verified by fuel use and an initial compliance test:

A. NOx as NO_2:

0.237 lb/hr operating at 100% load (based on 9.0 ppmvd corrected to 3% O2 and averaged over one hour)

B. CO:

0.817 lb/hr operating at 100% load (based on 50 ppmvd corrected to 3% O2 and averaged over one hour)

C. VOC as CH_4:

0.231 lb/hr operating at 100% load

D. SOx as SO_2:

0.0126 lb/hr operating at 100% load

E. PM10:

0.159 lb/hr operating at 100% load

Verification: As part of the Annual Compliance Report (**COMPLIANCE-7**), the project owner shall include information demonstrating compliance with boiler operating emission rates.

AQ-4 Prior to the expiration date each year, after the completion of construction the project owner shall have this equipment tuned, as specified by Rule 1157(I), Tuning Procedure.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-5 The project owner shall maintain an operations log for this equipment on-site and current for a minimum of five (5) years, and said log shall be provided to District personnel on request. The operations log shall include the following information at a minimum:

A. Cumulative annual fuel use in cubic feet or operation in hours;

B. Annual tune-up verification;

C. Results of annual compliance testing;

D. Any permanent changes made to the equipment that would affect air pollutant emissions, and indicate when changes were made.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-6 The project owner shall perform initial compliance tests on this equipment in accordance with the MDAQMD Compliance Test Procedural Manual. The test report shall be submitted to the District within 180 days of initial start up:

A. NOx as NO2 in ppmvd at 3% oxygen and lb/hr (measured per USEPA Reference Methods 19 and 20).

B. CO in ppmvd at 3% oxygen and lb/hr (measured per USEPA Reference Method 10).

Verification: The project owner shall notify the District and the CPM within fifteen (15) working days before the execution of the compliance test required in this condition. The test results shall be submitted to the District and to the CPM within 180 days of initial start up.

AQ-7 The project shall perform annual compliance tests on this equipment in accordance with the MDAQMD Compliance Test Procedural Manual. The test report shall be submitted to the District no later than six weeks prior to the expiration date of this permit. The following compliance tests are required:

A. NOx as NO_2 in ppmvd at 3% oxygen and lb/hr (measured per USEPA Reference Methods 19 and 20).

B. VOC as CH_4 in ppmvd at 3% oxygen and lb/hr (measured per USEPA Reference Methods 25A and 18).

C. SOx as SO_2 in ppmvd at 3% oxygen and lb/hr.

D. CO in ppmvd at 3% oxygen and lb/hr (measured per USEPA Reference Method 10).

E. PM10 in mg/m^3 at 3% oxygen and lb/hr (measured per USEPA Reference Methods 5 and 202 or CARB Method 5).

F. Flue gas flow rate in dscf per minute.

G. Opacity (measured per USEPA reference Method 9).

Verification: The project owner shall notify the District and the CPM within fifteen (15) working days before the execution of the compliance test required in this condition. The test results shall be submitted to the District and to the CPM within the timeframe required by this condition.

AQ-8 Annual fuel usage shall not exceed 45.94 MMscf.

Verification: As part of the Annual Compliance Report (**COMPLIANCE-7**), the project owner shall include information demonstrating compliance with boiler annual fuel use limit.

Application No. 00010906 and 00010907 (Two - HTF Ullage Expansion Tank)

EQUIPMENT DESCRIPTION

Two HTF ullage/expansion tanks.

AQ-9 Operation of this equipment shall be conducted in compliance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-10 This equipment shall be operated and maintained in strict accord with the recommendations of its manufacturer or supplier and/or sound engineering principles.

Verification: The project owner shall make the site available for inspection of HTF piping Inspection and Maintenance Program records (**AQ-17**) and HTF system equipment by representatives of the District, ARB, and the Energy Commission.

AQ-11 This system stores HTF, specifically the condensable fraction of the vapors vented from the ullage system.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-12 This tank shall be operated at all times under a nitrogen blanket.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-13 The ullage/expansion system nitrogen venting shall be carried out only through vents which have vapor condensing coolers which shall be maintained at or below 120 degrees Fahrenheit.

Verification: The project owner shall provide the District and CPM manufacturer design specifications showing compliance with this condition at least 30 days prior to the installation of the ullage/expansion vent system. The project owner shall have active temperature gauges that can be inspected to show compliance with this condition.

AQ-14 The HTF storage tank shall have in place a properly operating liquid HTF air cooler which shall maintain the tank at or below 165 degrees Fahrenheit.

Verification: The project owner shall provide the District and CPM manufacturer design specifications showing compliance with this condition at least 30 days prior to the installation of the HTF storage tanks. The project owner shall have active temperature gauges that can be inspected to show ongoing compliance with this condition.

AQ-15 The nitrogen condensing tanks shall be maintained at or below 176 degrees Fahrenheit.

Verification: The project owner shall provide the District and CPM manufacturer design specifications showing compliance with this condition at least 30 days prior to the installation of the nitrogen condensing tanks. The project owner shall have active temperature gauges that can be inspected to show ongoing compliance with this condition.

AQ-16 Vent release and HTF storage tank temperatures shall be monitored in accordance with a District approved Inspection, Monitoring and Maintenance plan.

Verification: The project owner shall provide the District for review and approval and the CPM for review the required Inspection, Monitoring and Maintenance plan at least 30 days prior to the installation of the HTF storage tanks and vent systems.

AQ-17 The project owner shall establish an inspection and maintenance program to determine, repair, and log leaks in HTF piping network and expansion tanks. Inspection and maintenance program and documentation shall be available to District staff upon request.

Verification: The project owner shall establish an inspection and maintenance program that that at a minimum includes the following:

A. All pumps, compressors and pressure relief devices (pressure relief valves or rupture disks) shall be electronically, audio, or visually inspected once every operating day.

B. All accessible valves, fittings, pressure relief devices (PRDs), hatches, pumps, compressors, etc. shall be inspected quarterly using a leak detection device such as a Foxboro OVA 108 calibrated for methane.

C. VOC leaks greater than 100-ppmv shall be tagged (with date and concentration) and repaired within seven calendar days of detection.

D. VOC leaks greater than 10,000-ppmv shall be tagged and repaired within 24-hours of detection.

E. The project owner shall maintain a log of all VOC leaks exceeding 10,000-ppmv, including location, component type, and repair made.

F. The project owner shall maintain record of the amount of HTF replaced on a monthly basis for a period of five years.

G. Any detected leak exceeding 100-ppmv and not repaired in 7-days and 10,000-ppmv not repaired within 24-hours shall constitute a violation of this Authority to Construct ATC)/Permit to Operate (PTO).

H. Pressure sensing equipment shall be installed that will be capable of sensing a major rupture or spill within the HTF network.

The inspection and maintenance plan shall be submitted to the CPM for review and approval at least 30 days before taking delivery of the HTF. The project owner shall make the site available for inspection of HTF piping Inspection and Maintenance Program records and HTF system equipment by representatives of the District, ARB, and the Energy Commission.

AQ-18 If current non-criteria substances become regulated as toxic or hazardous substances and are used in this equipment, the project owner shall submit to the District a plan demonstrating how compliance will be achieved and maintained with such regulations.

Verification: The project owner shall submit a compliance plan of the toxic or hazardous substances for District approval and CPM review if current non-criteria substances in the HTF become regulated as toxic or hazardous substances.

Application No. 00010947 and 00010948 (Two Cooling Towers)

EQUIPMENT DESCRIPTION

Two 6-cell cooling towers with drift eliminator rate of 0.0005% and water circulation rate of 90,000 gpm.

AQ-19 Operation of this equipment shall be conducted in compliance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-20 This equipment shall be operated and maintained in strict accord with the recommendations of its manufacturer or supplier and/or sound engineering principles.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-21 The drift rate shall not exceed 0.0005% with a maximum circulation rate of 90,000 gallons per minute. The maximum hourly PM10 emission rate shall not exceed 2.24 pounds per hour, as calculated per the written District-approved protocol.

Verification: The manufacturer guarantee data for the drift eliminator, showing compliance with this condition, shall be provided to the CPM and the District 30 days prior to cooling tower operation. As part of the Annual Compliance Report (**COMPLIANCE-7**) the project owner shall include information on operating emission rates to demonstrate compliance with this condition.

AQ-22 The operator shall perform weekly tests of the blow-down water total dissolved solids (TDS). The average TDS shall not exceed 9,968 ppm on a calendar monthly basis.

Verification: The cooling tower recirculation water TDS content test results shall be provided to representatives of the District, ARB, and the Energy Commission upon request.

AQ-23 The operator shall conduct all required cooling tower water tests in accordance with a District-approved test and emissions calculation protocol. Thirty (30) days prior to the first such test the operator shall provide a written test and emissions calculation protocol for District review and approval.

Verification: The project owner shall provide an emissions calculation and water sample testing protocol to the District for approval and CPM for review at least 30 days prior to the first cooling tower water test.

AQ-24 This equipment shall not be operated for more than 5,840 hours per rolling twelve month period and more than 16 hours per calendar day.

Verification: The project owner shall submit to the CPM the cooling tower operating data demonstrating compliance with this condition as part of the Annual Operation Report (**COMPLIANCE-7**).

AQ-25 The project owner shall maintain an operations log for this equipment on-site and current for a minimum of five (5) years, and said log shall be provided to District personnel on request. The operations log shall include the following information at a minimum:

A. Total operation time (hours per day, hours per month, and hours per rolling twelve month period); and

B. The date and result of each blow-down water test in TDS ppm, and the resulting mass emission rate.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-26 A maintenance procedure shall be established that states how often and what procedures will be used to ensure the integrity of the drift eliminators. This procedure is to be kept onsite and available to District personnel on request.

Verification: The project owner shall make available at request the written drift eliminator maintenance procedures for inspection by representatives of the District, ARB, and the Energy Commission.

Application No. 00010712 and 00010713 (Two - 4,190 HP Emergency IC Engine)

EQUIPMENT DESCRIPTION

Two - Tier II 4,190 HP diesel fueled emergency generator engines, each driving a generator.

AQ-27 This equipment shall be installed, operated and maintained in strict accord with those recommendations of the manufacturer/supplier and/or sound engineering principles which produce the minimum emissions of contaminants. Unless otherwise noted, this equipment shall also be operated in accordance with all data and specifications submitted with the application for this permit.

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission

AQ-28 This unit shall only be fired on ultra-low sulfur diesel fuel, whose sulfur concentration is less than or equal to 0.0015% (15 ppm) on a weight per weight basis per CARB Diesel or equivalent requirements.

Verification: The project owner shall make the site available for inspection of equipment and fuel purchase records by representatives of the District, ARB, and the Energy Commission.

AQ-29 A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed and maintained on this unit to indicate elapsed engine operating time. (Title 17 CCR §93115.10(e)(1)).

Verification: At least thirty (30) days prior to the installation of the engine, the project owner shall provide the District and the CPM the specification of the hour meter.

AQ-30 This unit shall be limited to use for emergency power, defined as in response to a fire or when commercially available power has been interrupted. In addition, this unit shall be operated no more than 0.5 hrs per day for a total of 50 hours per year for testing and maintenance, excluding compliance source testing. Time required for source testing will not be counted toward the 50 hour per year limit.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-31 The project owner shall maintain a operations log for this unit current and on-site, either at the engine location or at a on-site location, for a minimum of two (2) years, and for another year where it can be made available to the District staff within five working days from the District's request, and this log shall be provided to District, State and Federal personnel upon request. The log shall include, at a minimum, the information specified below:

A. Date of each use and duration of each use (in hours);

B. Reason for use (testing & maintenance, emergency, required emission testing);

C. Calendar year operation in terms of fuel consumption (in gallons) and total hours; and,

D. Fuel sulfur concentration (the project owner may use the supplier's certification of sulfur content if it is maintained as part of this log).

Verification: The project owner shall submit records required by this condition that demonstrating compliance with the sulfur content and engine use limitations of conditions **AQ-28** and **AQ-30** in the Annual Compliance Report (**COMPLIANCE-7**), including **a photograph showing the annual reading of engine hours**. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-32 This unit shall not be used to provide power during a voluntary agreed to power outage and/or power reduction initiated under an Interruptible Service Contract (ISC); Demand Response Program (DRP); Load Reduction Program (LRP) and/or similar arrangement(s) with the electrical power supplier.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-33 This engine may operate in response to notification of impending rotating outage if the area utility has ordered rotating outages in the area where the engine is located or expects to order such outages at a particular time, the engine is located in the area subject to the rotating outage, the engine is operated no more than 30 minutes prior to the forecasted outage, and the engine is shut down immediately after the utility advises that the outage is no longer imminent or in effect.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-34 This unit is subject to the requirements of the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (Title 17 CCR 93115). In the event of conflict between these conditions and the ATCM, the more stringent shall govern.

Verification: Not necessary.

AQ-35 This unit is subject to the requirements of the Federal National Source Performance Standards (NSPS) for Stationary Compression Ignition Internal Combustion Engines (40 CFR Part 60 Subpart IIII).

Verification: The project owner shall submit the engine specifications at least 30 days prior to purchasing the engines for review and approval demonstrating that the engines meet NSPS emission limit requirements at the time of engine purchase.

Application No. 00010714 and 00010715 (Two - 346 HP Emergency IC Engine)

EQUIPMENT DESCRIPTION

Two - Tier III 346 HP diesel fueled emergency generator engines, each driving a fire suppression water pump.

AQ-36 This equipment shall be installed, operated and maintained in strict accord with those recommendations of the manufacturer/supplier and/or sound engineering principles which produce the minimum emissions of contaminants. Unless otherwise noted, this equipment shall also be operated in accordance with all data and specifications submitted with the application for this permit.

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission

AQ-37 This unit shall only be fired on ultra-low sulfur diesel fuel, whose sulfur concentration is less than or equal to 0.0015% (15 ppm) on a weight per weight basis per CARB Diesel or equivalent requirements.

Verification: The project owner shall make the site available for inspection of equipment and fuel purchase records by representatives of the District, ARB, and the Energy Commission.

AQ-38 A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed and maintained on this unit to indicate elapsed engine operating time. (Title 17 CCR §93115.10(e)(1)).

Verification: At least thirty (30) days prior to the installation of the engine, the project owner shall provide the District and the CPM the specification of the hour timer.

AQ-39 This unit shall be limited to use for emergency power, defined as in response to a fire or due to low fire water pressure. In addition, this unit shall be operated no more than 50 hours per year for testing and maintenance, excluding compliance source testing. Time required for source testing will not be counted toward the 50 hour per year limit. The 50 hour limit can be exceeded when the emergency fire pump assembly is driven directly by a stationary diesel fueled CI engine operated per and in accord with the National Fire Protection Association (NFPA) 25 - "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 1998 edition. This requirement includes usage during emergencies. {Title 17 CCR 93115.3(n)}

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-40 The project owner shall maintain a operations log for this unit current and on-site, either at the engine location or at a on-site location, for a minimum of two (2) years, and for another year where it can be made available to the District staff within five working days from the District's request, and this log shall be provided to District, State and Federal personnel upon request. The log shall include, at a minimum, the information specified below:

A. Date of each use and duration of each use (in hours);

B. Reason for use (testing & maintenance, emergency, required emission testing);

C. Calendar year operation in terms of fuel consumption (in gallons) and total hours; and,

D. Fuel sulfur concentration (the project owner may use the supplier's certification of sulfur content if it is maintained as part of this log).

Verification: The project owner shall submit records required by this condition that demonstrating compliance with the sulfur content and engine use limitations of conditions **AQ-37** and **AQ-39** in the Annual Compliance Report (**COMPLIANCE-7**), including **a photograph showing the annual reading of engine hours**. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-41 This unit is subject to the requirements of the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (Title 17 CCR 93115). In the event of conflict between these conditions and the ATCM, the requirements of the ATCM shall govern.

Verification: Not necessary.

AQ-42 This unit is subject to the requirements of the Federal National Source Performance Standards (NSPS) for Stationary Compression Ignition Internal Combustion Engines (40 CFR Part 60 Subpart IIII).

Verification: The project owner shall submit the engine specifications at least 30 days prior to purchasing the engines for review and approval demonstrating that the engines meet NSPS emission limit requirements at the time of engine purchase.

Application No. 00010995 (One – Gasoline Storage Tank)

EQUIPMENT DESCRIPTION

One – Above ground gasoline storage tank and fuel receiving and dispensing equipment.

AQ-43 The toll-free telephone number that must be posted is 1-800-635-4617.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-44 The project owner shall maintain a log of all inspections, repairs, and maintenance on equipment subject to Rule 461. Such logs or records shall be maintained at the facility for at least two (2) years and shall be available to the District upon request.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-45 Any modifications or changes to the piping or control fitting of the vapor recovery system require prior approval from the District.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-46 The gasoline vapor vent pipe(s) are to be equipped with pressure relief valve(s) per applicable CARB requirements.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-47 The project owner shall perform the following tests within 60 days of construction completion and annually thereafter in accordance with the applicable CARB test methods:

- The District shall be notified a minimum of 10 days prior to performing the required tests with the final results submitted to the District within 30 days of completion of the tests.
- The District shall receive passing test reports no later than six (6) weeks prior to the expiration date of this permit.

Verification: The project owner shall notify the District at least 10 days prior to performing the required tests. The test results shall be submitted to the District within 30 days of completion of the tests and shall be made available to the CPM if requested.

AQ-48 The annual throughput of gasoline shall not exceed 25,000 gallons per year. Throughput Records shall be kept on site and available to District personnel upon request. Before this annual throughput can be increased the facility may be required to submit to the District a site specific Health Risk Assessment in accord with a District approved plan. In addition public notice and/or comment period may be required.

Verification: The project owner shall submit to the CPM gasoline throughput records demonstrating compliance with this condition as part of the Annual Compliance Report (**COMPLIANCE-7**). The project owner shall maintain on site the annual gasoline throughput records and shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-49 The applicant shall install, operate, and maintain CARB approved Phase I and Phase II vapor recovery systems on the proposed facility gasoline tank and dispensing system. The Phase I and Phase II vapor recovery systems will meet all applicable CARB standards at the time of installation for the systems selected.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-50 The California Air Resources Board (CARB) has established a timeline for Aboveground Storage Tanks (AST) Enhanced Vapor Recovery (EVR) system implementation. Pursuant to CARB requirements and State mandated retrofits, the project owner shall ensure that this tank meets all the applicable requirements within the designated timeframes. Prior to conducting any modifications the project owner shall obtain a District approved Authority to Construct (ATC) Permit. See the following link for AST EVR Timeline: http://o3.arb.ca.gov/vapor/asttimeline_123009.pdf

Verification: The project owner shall provide the District and the CPM documentation, at least 30 days prior to installation, showing that the tank at the time of installation will meet appropriate ARB EVR requirements.

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ACRONYMS

AAQS	Ambient Air Quality Standard
AERMOD	ARMS/EPA Regulatory Model
AFC	Application for Certification
AMS	Abengoa Mojave Solar (the proposed project)
AQMD	Air Quality Management District
AQCMM	Air Quality Construction Mitigation Manager
AQCMP	Air Quality Construction Mitigation Plan
ARB	California Air Resources Board
ATC	Authority to Construct
ATCM	Airborne Toxic Control Measure
BACT	Best Available Control Technology
bhp	brake horsepower
Btu	British thermal unit
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
EIR	Environmental Impact Report
ERC	Emission Reduction Credit
FDOC	Final Determination Of Compliance
HTF	Heat Transfer Fluid (Therminol® VP-1)
GHG	Greenhouse Gas
hp	horsepower
H_2S	Hydrogen Sulfide
lbs	Pounds
LORS	Laws, Ordinances, Regulations and Standards
MACT	Maximum Achievable Control Technology (for Hazardous Air Pollutants)
MDAB	Mojave Desert Air Basin
MDAQMD	Mojave Desert Air Quality Management District
mg/m^3	milligrams per cubic meter

MMBtu	Million British thermal units
MW	Megawatts (1,000,000 Watts)
NAAQS	National Ambient Air Quality Standard
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
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
ppmw	Parts Per Million by Weight
PSD	Prevention of Significant Deterioration
PTO	Permit to Operate
SA	Staff Assessment (this document)
scf	Standard Cubic Feet
SO_2	Sulfur Dioxide
SOx	Oxides of Sulfur
U.S. EPA	United States Environmental Protection Agency
$\mu g/m^3$	Microgram per cubic meter
VMT	Vehicles Miles Traveled
VOC	Volatile Organic Compounds

APPENDIX AIR-1 - GREENHOUSE GAS EMISSIONS

Testimony of William Walters, P.E.

SUMMARY OF CONCLUSIONS

The Abengoa Mojave Solar Project (AMS) is a proposed addition to the state's electricity system. AMS is a 250 MW solar concentrating thermal power plant, which would utilize parabolic trough solar thermal technology to solar heat a heat transfer fluid (HTF). This hot HTF would be used to generate steam in a solar steam generator. 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.

While AMS would emit some GHG emissions, the contribution of AMS 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 energy generation and GHG emissions from new and existing fossil-fired electricity resources. Electricity is produced by operation of inter-connected generation resources. Operation of one power plant, like AMS, affects all other power plants in the interconnected system. AMS would be a "must-take" facility and its operation would affect the overall electricity system operation and GHG emissions in several ways:

- AMS would provide low-GHG, renewable generation.
- AMS would facilitate to some degree the replacement high GHG emitting (e.g., out-of-state coal) electricity generation that must be phased out to meet the State's 2006 Emissions Performance Standard.
- AMS could facilitate to some extent the replacement of generation provided by aging fossil-fired power plants that use once-through cooling.

These system impacts would result in a net reduction in GHG emissions across the electricity system providing energy and capacity to California. Thus, staff concludes that the proposed 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 CEQA significant.

Staff concludes that the short-term minor emission of greenhouse gases 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 Abengoa Mojave Solar Project, 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]).

The California Air Resources Board (ARB) has promulgated regulations for mandatory GHG emission reporting to comply 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 Abengoa Mojave Solar Project, which solely generates electricity from solar power, is exempt from the mandatory GHG emission reporting requirements for electricity generating facilities [CCR Title 17 §95101(c)(1)]. However, the proposed project may be subject to future reporting requirements and GHG reductions or trading requirements as additional state or federal GHG regulations are developed and implemented.

INTRODUCTION

Greenhouse gas (GHG) emissions are not criteria pollutants, but they are discussed in the context of cumulative impacts. However, on April 2, 2007, the U.S. Supreme Court found that GHGs are pollutants that must be covered by the federal Clean Air Act. In response, on September 30, 2009, the U.S. Environmental Protection Agency proposed to apply Prevention of Significant Deterioration (PSD) requirements to facilities whose carbon dioxide-equivalent emissions exceed 25,000 tons per year (U.S.EPA 2009c). The rule making is not finalized, but the GHG emissions for AMS are not expected to exceed this amount.

The state has demonstrated a clear willingness to address global climate change through research, adaptation and inventory reductions. In that context, staff evaluates the GHG emissions from the proposed project, presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.

Generation of electricity can produce greenhouse gases with the criteria air pollutants that have been traditionally regulated under the federal and state Clean Air Acts. For fossil fuel-fired power plants, the GHG emissions include primarily carbon dioxide, with much smaller amounts of nitrous oxide (N_2O, not NO or NO_2, which are commonly known as NOx or oxides of nitrogen), and methane (CH_4 – often from unburned natural gas). For solar energy generation projects the stationary source GHG emissions are much smaller than fossil fuel-fired power plants, but the associated maintenance vehicle emissions are higher. Other sources of GHG emissions include sulfur hexafluoride (SF_6) from high voltage equipment and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/chiller equipment. GHG emissions from the electricity sector are dominated by CO_2 emissions from carbon-based fuels; other sources of GHG emissions are small and also are more likely to be easily controlled or reused or recycled, but are nevertheless documented here as some of the compounds have very high global warming potentials.

Global warming potential is a relative measure, compared to carbon dioxide, of a compound's residence time in the atmosphere and ability to warm the planet. Mass emissions of GHGs are converted into carbon dioxide equivalent (CO2E) metric tonnes (MT) for ease of comparison.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

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

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

Applicable Law	Description
Federal	
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.
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 that will reduce GHG emission to 1990 levels by 2020. Electricity production facilities will be regulated by the ARB.
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	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).

GLOBAL CLIMATE CHANGE AND ELECTRICITY PRODUCTION

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 greenhouse gases, 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).

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 greenhouse gases (GHG) or global climate change[15] 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 California Air Resources Board (ARB) to adopt standards that will reduce statewide GHG emissions to statewide GHG emissions levels in 1990, with such reductions to be achieved by 2020.[16] 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.

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 major sources of GHG via regulations, market mechanisms, and other actions. ARB staff is developing regulatory language to implement its plan and holds ongoing public workshops on key elements of the recommended GHG reduction measures, including market mechanisms (ARB 2006). The regulations must be effective by January 1, 2011 and mandatory compliance commences on January 1, 2012. The mandatory reporting requirements are effective for electric generating facilities with a nameplate capacity equal or greater than 1 megawatt (MW) capacity if their emissions exceed 2,500 metric tonnes per year. The due date for initial reports by existing facilities was June 1, 2009.

Examples of strategies that the state might pursue for managing GHG emissions in California, in addition to those recommended by the Energy Commission and the Public Utilities Commission, were identified in the California Climate Action Team's Report to the Governor (CalEPA 2006). The scoping plan approved by ARB in December 2008 builds upon the overall climate policies of the Climate Action Team report and shows the 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), land use planning, and alternatives to petroleum-based fuels are slated to provide substantial reductions by 2020 (CalEPA 2006). The scoping plan includes a requirement for 33% of California's electrical energy to be provided from renewable sources by 2020 (implementing California's 33% RPS goal), aggressive energy efficiency targets, and a cap-and-trade system that includes the electricity sector (ARB 2008b).

It is likely that GHG reductions mandated by ARB will not be uniform across emitting sectors, in that reductions will be based on cost-effectiveness (i.e., the greatest effect for the least cost). For example, the ARB proposes a 40% reduction in GHG from the electricity sector, even though that sector currently only produces about 25% of the state's GHG emissions. In response, in September 2008 the Energy Commission and the Public Utilities Commission provided recommendations (CPUC 2008) to ARB on

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

[16] Governor Schwarzenegger has also issued Executive Order S-3-05 establishing a goal of 80% below 1990 levels by 2050.

how to achieve such reductions through both programmatic and regulatory approaches, and identified regulation points should ARB decide that a multi-sector cap and trade system is warranted.

The Energy Commission's *2007 Integrated Energy Policy Report* (IEPR) also addressed climate change within the electricity, natural gas, and transportation sectors (CEC 2007). For the electricity sector, it recommended such approaches as pursuing all cost-effective energy efficiency measures and meeting the Governor's stated goal of a 33% renewable portfolio standard. The Energy Commission's *2009 Integrated Energy Policy Report* continues to emphasize the importance of meeting greenhouse gas emissions reduction goals along with other important statewide issues such as backing out use of once-through cooling in coastal California power plants (CEC 2009d).

SB 1368[17], enacted in 2006, and regulations adopted by the Energy Commission and the Public Utilities Commission pursuant to the bill, prohibits California utilities from entering into long-term commitments with any base load facilities that exceed the Emission Performance Standard of 0.500 metric tonnes CO_2 per megawatt-hour[18] (1,100 pounds CO_2/MWh). Specifically, the SB 1368 Emission Performance Standard (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.[19] If a project, instate or out of state, plans to sell base load electricity to a California utility that utility will have to demonstrate that the project meets the EPS. *Base load* units are defined as units that operate at a capacity factor higher than 60%. As a renewable electricity generating facility, AMS is determined by rule to be compliant with the SB 1368 EPS.

In addition to these programs, California is involved in the Western Climate Initiative, a multi-state and international effort to establish a cap and trade market to reduce greenhouse gas emissions in the Western United States and the Western Electricity Coordinating Council (WECC). The timelines for the implementation of this program 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.

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 adequate and reliable electricity supply is complex and variable. But it operates as an integrated whole to meet demand, such that the dispatch of a new source of generation generally 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

[17] Public Utilities Code § 8340 et seq.

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

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

gigawatt-hours (GWh). Ancillary services[20] 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.

California is actively pursuing policies to reduce GHG emissions that include adding non-GHG emitting renewable generation resources to the system mix. The generation of electricity using fossil fuels, even in a back-up generator at a thermal solar plant, produces air emissions known as greenhouse gases in addition to the criteria air pollutants that have been traditionally regulated under the federal and state Clean Air Acts. Greenhouse gas emissions contribute to the warming of the earth's atmosphere, leading to climate change.

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 greenhouse gases. The construction would last approximately 26 months. The greenhouse gas emissions estimate, for the entire construction period, provided by the applicant[21] is below in **Greenhouse Gas Table 2**.

Greenhouse Gas Table 2
Estimated AMS Potential Construction Greenhouse Gas Emissions

	CO_2-Equivalent (MTCO2E) [a,b]
Onsite Equipment (all four phases)	29,661
Delivery Vehicles	2,984
Construction Worker Vehicles	10,369
Entire Construction Period Total	**43,015**

Source: ESH 2010g.
[a] One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms
[b] The vast majority of the CO2E emissions, over 99%, is CO_2 from construction combustion sources.

PROJECT OPERATIONS

Operations GHG emissions are shown in **Greenhouse Gas Table 3**. Operation of the AMS would cause GHG emissions from the auxiliary boiler, fire pump engine, emergency generator engine, maintenance fleet and employee trips, and sulfur hexafluoride emissions from new electrical component equipment.

[20] See page CEC 2009b, page 95.

[21] As noted in the Air Quality Section staff may be re-estimating certain construction emissions which would revise some of the values in **Greenhouse Gas Table 2.** If so, staff will provide a revised construction GHG emission estimate as part of a Staff Assessment Addendum.

Greenhouse Gas Table 3
Estimated AMS Potential Operating Greenhouse Gas Emissions

	Annual CO_2-Equivalent (MTCO2E)[a]
Auxiliary HTF Heaters [b]	10,018
Emergency Generator Engine [b]	183.2
Fire Pump Engine [b]	8.1
Maintenance Vehicles [b]	119.6
Delivery Vehicles [b]	31.3
Employee Vehicles [b]	512.7
Equipment Leakage (SF_6)	10.5
Total Project GHG Emissions – MTCO2E [b]	**10,884**
Facility MWh per year	600,000
Facility GHG Emission Rate (MTCO2E/MWh)	0.018

Sources: ESH 2010g
[a] One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms.
[b] The vast majority of the CO2E emissions, over 99%, is CO_2 from these emission sources.

Greenhouse Gas Table 3 shows what the proposed project, as permitted, could potentially emit in greenhouse gases on an annual basis. All emissions are converted to CO_2-equivalent and totaled. Electricity generation GHG emissions are generally dominated by CO_2 emissions from the carbon-based fuels; other sources of GHG are typically small and also are more likely to be easily controlled or reused/recycled. For this solar project the primary fuel, solar energy, is greenhouse gas free, but there is natural gas use in the two auxiliary HTF heaters used for morning startup and for freeze protection, and gasoline and diesel fuel use in the maintenance vehicles, offsite delivery vehicles, staff and employee vehicles, the two fire water pump engines, and the two emergency generator engines. Another GHG emission source for this proposed project is SF_6 from electrical equipment leakage.

The proposed project is estimated to emit, directly from primary and secondary emission sources on an annual basis, nearly 11,000 metric tonnes of CO_2-equivalent GHG emissions per year. AMS, 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]). Regardless, AMS has an estimated GHG emission rate of 0.018 MTCO2E/MWh, well below the Greenhouse Gas Emission Performance Standard of 0.500 MTCO2/MWh.

Solar Project Energy Payback Time

The beneficial energy and greenhouse gas impacts of renewable energy projects can also be measured by the *energy payback time*[22]. **Greenhouse Gas Tables 2** and **3** 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

[22] 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.

proposed 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 AMS, to be on the order of five months (Greenpeace 2005, Page 9); and the project life for AMS is on the order of 30 years. Therefore, the proposed project's GHG emissions reduction potential from energy displacement would be substantial[23].

Natural Carbon Uptake Reduction

This proposed project would cause the clearing of land and removal of vegetation, which would reduce the ongoing natural carbon uptake by vegetation. This project site is an agricultural brownfield site, but if the site were left fallow it would revert to desert. A study of the Mojave Desert indicated that the desert may uptake carbon in amounts as high as 100 grams per square meter per year (Wohlfahrt et. al. 2008). This would equate to a maximum reduction in carbon uptake, calculated as CO_2, of 1.48 MT of CO_2 per acre per year for areas with complete vegetation removal. For this 1,765 acre proposed project (SM 2010a), which does require the complete removal of vegetation over most of the project site, the maximum equivalent loss in carbon uptake would be 2,612 MT of CO_2 per year, which would correspond to 0.004 MT of CO_2 per MW generated. Therefore, the natural carbon uptake loss is negligible in comparison with the reduction in fossil fuel CO_2 emissions, which can range from 0.35 to 1.0 MT of CO_2 per MW depending on the fuel and technology, that is enabled by this proposed project.

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 as 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 project. The operation impacts result from the emissions of the proposed project during operation. Cumulative impacts analysis assesses the impacts that result from the proposed 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

[23] 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.

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 AMS.

PROPOSED PROJECT

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 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 greenhouse gas 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 power 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 project. If the project construction emissions were distributed over the estimated 30 year life of the proposed project they would only increase the project life time annual facility GHG emissions rate by 0.0024 MT CO2E per MWh.

Direct/Indirect Operation Impacts and Mitigation

The proposed Abengoa Mojave Solar Project 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 greenhouse gas emissions.

Net GHG emissions for the integrated electric system will decline when new renewable power plants are added to: 1) move renewable generation towards the 33% target; 2) improve the overall efficiency, or GHG emission rate, of the electric system; or 3) serve load growth or capacity needs more efficiently, or with fewer GHG emissions.

The Role of AMS in Renewables Goals/Load Growth

As California moves towards an increased reliance on renewable energy by implementing the Renewables Portfolio Standard (RPS), non-renewable energy resources will be displaced. These reductions in non-renewable energy, shown in **Greenhouse Gas Table 4**, are targeted to be as much as 36,500 GWh. These assumptions are conservative in that the forecasted growth in electricity retail sales assumes that the impacts of planned increases in expenditures on (uncommitted) energy efficiency are already embodied in the current retail sales forecast[24]. Energy Commission staff estimates that as much as 18,000 GWh of additional savings due to

[24] Energy efficiency savings are already represented in the current Energy Commission demand forecast adopted December 2009 (CEC 2009c).

uncommitted energy efficiency programs may be forthcoming.[25] This would reduce non-renewable energy needs by a further 12,000 GWh given a 33% RPS.

Greenhouse Gas Table 4
Estimated Changes in Non-Renewable Energy
Potentially Needed to Meet California Loads, 2008-2020

California Electricity Supply	**Annual GWh**	
Statewide Retail Sales, 2008, actual [a]	264,794	
Statewide Retail Sales, 2020, forecast [a]	289,697	
Growth in Retail Sales, 2008-20	24,903	
Growth in Net Energy for Load [b]	29,840	
California Renewable Electricity	**GWh @ 20% RPS**	**GWh @ 33% RPS**
Renewable Energy Requirements, 2020 [c]	57,939	95,600
Current Renewable Energy, 2008	29,174	
Change in Renewable Energy-2008 to 2020	28,765	66,426
Resulting Change in Non-Renewable Energy	176	(36,586)

Source: Energy Commission staff 2010.
Notes:
a. 2009 IPER Demand Forecast, Form 1.1c. Excludes pumping loads for entities that do not have an RPS.
b. 2009 IEPR Demand Forecast, Form 1.5a.
c. RPS requirements are a percentage of retail sales.

The Role of AMS in Retirements/Replacements

Abengoa Mojave Solar Project would be capable of annually providing 500 GWh of renewable generation energy to replace resources that are or will likely be precluded from serving California loads. State policies, including GHG goals, are discouraging or prohibiting new contracts and new investments in high GHG-emitting facilities such as coal-fired generation, generation that relies on water for once-through cooling, and aging power plants (CEC 2007). Some of the existing plants that are likely to require substantial capital investments to continue operation in light of these policies may be unlikely to undertake the investments and will retire or be replaced.

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, more than 18,000 GWh of energy procured by California utilities under these contracts will have to reduce GHG emissions or be replaced; these contracts are presented in **Greenhouse Gas Table 5**.

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[25] See *Incremental Impacts of Energy Efficiency Policy Initiatives Relative to the 2009 Integrated Energy Policy Report Adopted Demand Forecast* (CEC-200-2010-001-D, January, 2010), page 2. Table 1 indicates that additional conservation for the three investor-owned utilities may be as high as 14,374 GWh. Increasing this value by 25% to account for the state's publicly-owned utilities yields a total reduction of 17,967 GWh.

Greenhouse Gas Table 5
Expiring Long-term Contracts with Coal-fired Generation 2009 – 2020

Utility	Facility [a]	Contract Expiration	Annual GWh Delivered to CA
PG&E, SCE	Misc In-state Qual. Facilities [a]	2009-2019	4,086
LADWP	Intermountain	2009-2013	3,163 [b]
City of Riverside	Bonanza, Hunter	2010	385
Department of Water Resources	Reid Gardner	2013 [c]	1,211
SDG&E	Boardman	2013	555
SCE	Four Corners	2016	4,920
Turlock Irrigation District	Boardman	2018	370
LADWP	Navajo	2019	3,832
		TOTAL	**18,522**

Source: Energy Commission staff based on Quarterly Fuel and Energy Report (QFER) filings.
Notes:
a. All facilities are located out-of-state except for the Miscellaneous In-state Qualifying Facilities.
b. Estimated annual reduction in energy provided to LADWP by Utah utilities from their entitlement by 2013.
c. Contract not subject to Emission Performance Standard, but the Department of Water Resources has stated its intention not to renew or extend.

This represents almost half of the energy associated with California utility contracts with coal-fired resources that will expire by 2030. If the State enacts a carbon adder[26], all the coal contracts (including those in **Greenhouse Gas Table 5**, which expire by 2020, and other contracts that expire beyond 2020 but are not shown in the table) may be retired at an accelerated rate as coal-fired energy becomes uncompetitive due to the carbon adder or the capital needed to capture and sequester the carbon emissions. Also shown are the approximate 500 MW of in-state coal and petroleum coke-fired capacity that may be unlikely to contract with California utilities for baseload energy due to the SB1368 Emission Performance Standard. As these contracts expire, new and existing generation resources will replace the lost energy and capacity. Some will come from renewable generation such as this proposed project; some will come from new and existing natural gas fired generation. All of these new facilities will have substantially lower GHG emissions rates than coal and petroleum coke-fired facilities which typically average about 1.0 $MTCO_2$/MWh without carbon capture and sequestration. Thus, new renewable facilities will result in a net reduction in GHG emissions from the California electricity sector.

Retirement of Generation Using Once-Through Cooling

The State Water Resource Control Board (SWRCB) has proposed major changes to once-through cooling (OTC) units, shown in **Greenhouse Gas Table 6**, which would likely require extensive capital to retrofit, or retirement, or substantial curtailment of

[26] A carbon adder or carbon tax is a specific value added to the cost of a project for per ton of associated carbon or carbon dioxide emissions. Because it is based on, but not limited to, actual operations and emission and can be trued up at year end, it is considered a simple mechanism to assign environmental costs to a project.

dozens of generating units. In 2008, these units collectively produced almost 58,000 GWh. While the more recently built OTC facilities may well install dry or wet cooling towers and continue to operate, the aging OTC plants are not likely to be retrofit to use dry or wet cooling towers without the power generation also being retrofit or replaced to use a more efficient and lower GHG emitting combined cycle gas turbine technology. Most of these existing OTC units operate at low capacity factors, suggesting a limited ability to compete in the current electricity market. Although the timing would be uncertain, new resources would out-compete aging plants and would displace the energy provided by OTC facilities and likely accelerate their retirements.

Any additional costs associated with complying with the SWRCB regulation would be amortized over a limited revenue stream today and into the foreseeable future. Their energy and much of their dispatchable, load-following capability will have to be replaced. These units constitute over 15,000 MW of merchant capacity and 17,800 GWh of merchant energy. Of this, much but not all of the capacity and energy are in local reliability areas, requiring a large share of replacement capacity – absent transmission upgrades – to locations in the same local reliability area. **Greenhouse Gas Table 6** provides a summary of the utility and merchant energy supplies affected by the OTC regulations.

New renewable generation resources will emit substantially less GHG emissions on average than other energy generation sources. Existing aging and OTC natural gas facility generation typically averages 0.6 to 0.7 $MTCO_2$/MWh, which is much less efficient, higher GHG emitting, than a renewable energy project like AMS. A project like AMS, located far from the coastal load pockets like the Los Angeles Local Reliability Area (LRA), would more likely provide energy support to facilitate the retirement of some aging and/or OTC power plants, but would not likely provide any local capacity support at or near the coastal OTC units. Regardless, due to its low greenhouse gas emissions, AMS would serve to reduce GHG emissions from the electricity sector.

Closure and Decommissioning

Eventually the facility 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 to operate and thus impacts associated with those greenhouse gas 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 project, equipment used to dismantle the facility are assumed to have lower comparative GHG emissions due to technology advancement, and 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 greenhouse gas CEQA impacts during decommissioning they are determined to be less than significant.

Greenhouse Gas Table 6
Aging and Once-Through Cooling Units: 2008 Capacity and Energy Output [a]

Plant, Unit Name	Owner	Local Reliability Area	Aging Plant?	Capacity (MW)	2008 Energy Output (GWh)	GHG Emission Rate ($MTCO_2$/MWh)
Diablo Canyon 1, 2	Utility	None	No	2,232	17,091	Nuclear
San Onofre 2, 3	Utility	L.A. Basin	No	2,246	15,392	Nuclear
Broadway 3 [b]	Utility	L.A. Basin	Yes	75	90	0.648
El Centro 3, 4 [b]	Utility	None	Yes	132	238	0.814
Grayson 3-5 [b]	Utility	LADWP	Yes	108	150	0.799
Grayson CC [b]	Utility	LADWP	Yes	130	27	0.896
Harbor CC	Utility	LADWP	No	227	203	0.509
Haynes 1, 2, 5, 6	Utility	LADWP	Yes	1,046	1,529	0.578
Haynes CC	Utility	LADWP	No	560	3,423	0.376
Humboldt Bay 1, 2 [a]	Utility	Humboldt	Yes	107	507	0.683
Olive 1, 2 [b]	Utility	LADWP	Yes	110	11	1.008
Scattergood 1-3	Utility	LADWP	Yes	803	1,327	0.618
Utility-Owned				7,776	39,988	0.693
Alamitos 1-6	Merchant	L.A. Basin	Yes	1,970	2,533	0.661
Contra Costa 6, 7	Merchant	S.F. Bay	Yes	680	160	0.615
Coolwater 1-4 [b]	Merchant	None	Yes	727	576	0.633
El Segundo 3, 4	Merchant	L.A. Basin	Yes	670	508	0.576
Encina 1-5	Merchant	San Diego	Yes	951	997	0.674
Etiwanda 3, 4 [b]	Merchant	L.A. Basin	Yes	666	848	0.631
Huntington Beach 1, 2	Merchant	L.A. Basin	Yes	430	916	0.591
Huntington Beach 3, 4	Merchant	L.A. Basin	No	450	620	0.563
Mandalay 1, 2	Merchant	Ventura	Yes	436	597	0.528
Morro Bay 3, 4	Merchant	None	Yes	600	83	0.524
Moss Landing 6, 7	Merchant	None	Yes	1,404	1,375	0.661
Moss Landing 1, 2	Merchant	None	No	1,080	5,791	0.378
Ormond Beach 1, 2	Merchant	Ventura	Yes	1,612	783	0.573
Pittsburg 5-7	Merchant	S.F. Bay	Yes	1,332	180	0.673
Potrero 3	Merchant	S.F. Bay	Yes	207	530	0.587
Redondo Beach 5-8	Merchant	L.A. Basin	Yes	1,343	317	0.810
South Bay 1-4	Merchant	San Diego	Yes	696	1,015	0.611
Merchant-Owned				15,254	17,828	0.605
Total In-State OTC				23,030	57,817	

Source: Energy Commission staff based on Quarterly Fuel and Energy Report (QFER) filings.

a. OTC Humboldt Bay Units 1 and 2 are included in this list. They must retire in 2010 when the new Humboldt Bay Generating Station (not ocean-cooled), currently under construction, enters commercial operation.

b. Units are aging but are not OTC.

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 project alone would not be sufficient to change global climate, but would emit greenhouse gases 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

AMS, as a solar energy generation project, is exempt from the mandatory GHG emission reporting requirements for electricity generating facilities as currently required by the California Air Resources Board (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).

AMS, 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]).

Since AMS would have emissions that are below 25,000 MT/year of CO2E, the proposed project would not be subject to federal mandatory reporting of greenhouse gases. It would also be exempt from the state's greenhouse gas reporting requirements.

NOTEWORTHY PUBLIC BENEFITS

Greenhouse gas 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 AMS project would contribute to meeting the state's AB 32 goals.

CONCLUSIONS

The Abengoa Mojave Solar Project would emit considerably less greenhouse gases (GHG) 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, staff concludes that the proposed project's operation would result in a cumulative overall reduction in GHG emissions from the state's power plants that would create a beneficial CEQA and NEPA, would not worsen current conditions, and would thus not result in CEQA impacts that are cumulatively significant or result in adverse NEPA impacts.

Staff concludes that the GHG emission increases typical from construction and decommissioning activities would not be CEQA significant 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 greenhouse gas 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 greenhouse gas emissions during project operation. For all these reasons, staff would conclude that the short-term emission of greenhouse gases during construction would be sufficiently reduced and would be offset during proposed project operations and would, therefore, not be CEQA significant.

The AMS, 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]).

MITIGATION MEASURES/PROPOSED CONDITIONS OF CERTIFICATION

No Conditions of Certification related to project greenhouse gas emissions are proposed because the proposed project would create beneficial GHG impacts. The project owner would have to comply with any future applicable GHG regulations formulated by the ARB or the U.S.EPA, such as GHG reporting or emissions cap and trade markets.

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ACRONYMS

AMS	Abengoa Mojave Solar (the proposed project)
ARB	California Air Resources Board
CalEPA	California Environmental Protection Agency
CEE	California Energy Commissions
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
GCC	Global Climate Change
GHG	Green House Gas
GWh	Gigawatt-hour
HFC	Hydrofluorocarbons
IEPR	Integrated Energy Policy Report
IGCC	Integrated Gasification Combined Cycle
LADWP	Los Angeles Department of Water and Power
LRAs	Local Reliability Areas
MT	Metric tonnes
MW	Megawatt
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
PSD	Prevention of Significant Deterioration

QFER	Quarterly Fuel and Energy Report
RPS	Renewables Portfolio Standard
SB	Senate Bill
SF_6	Sulfur hexafluoride
SWRCB	State Water Resource Control Board
WECC	Western Electricity Coordinating Council

BIOLOGICAL RESOURCES

Testimony of Heather Blair

SUMMARY OF CONCLUSIONS

The proposed Abengoa Mojave Solar project would occupy approximately 1,765 acres in the West Mojave Desert adjacent to the western margin of Harper Dry Lake in unincorporated San Bernardino County. The proposed project footprint and size were iteratively modified by the Applicant to avoid continuous stands of undisturbed native vegetation, conservation areas, and high quality wildlife habitat. As a result approximately 90% of the habitat within the project area is developed, disturbed, fallow or active agricultural lands. Overall, the proposed project area is composed of degraded habitat, which is of marginal suitability for special-status species and does not support a diverse assemblage of native plants and wildlife. However, the proposed project area is adjacent to the Harper Dry Lake Area of Critical Environmental Concern (ACEC) and otherwise surrounded by known populations of listed species (e.g., desert tortoise, Mohave ground squirrel, desert cymopterus), desert tortoise critical habitat, Desert Wildlife Management Area, and Mohave Ground Squirrel Conservation Area. Therefore, transient individuals of special-status species may be occasionally present onsite as they move between areas of suitable habitat adjacent to the proposed project and potentially within areas of suitable habitat presently re-establishing at the edges of the proposed project area.

Given the proximity of the proposed project to the aforementioned biological resources, construction and operation of the proposed project would result in various direct and indirect effects. At this time, staff is able to conclude that with implementation of proposed conditions of certification, compliance with most laws, ordinances, regulations, and standards would be achieved and most direct, indirect, and cumulative impacts would be avoided, minimized, or mitigated to less than significant levels (refer to **Biological Resources Table 7** for a summary of the proposed project's impacts, applicable conditions of certification and determination of significance). However, without further information/analysis/coordination staff is unable to make a conclusion regarding the following issues:

- Revised Bald and Golden Eagle Protection Act (BGPA) compliance. Recent updates to the BGPA require acquisition of a permit for take of golden eagle. To determine whether take would occur, staff and USFWS have requested that the applicant conduct focused golden eagle surveys in spring 2010 and an assessment of eagle foraging behavior within the proposed project area. Staff is requesting this information and further coordination with USFWS as guidance becomes available to determine whether take (i.e., disturbance and/or loss of foraging habitat) would occur and whether compliance with this regulation can be achieved.
- Federal nexus for Endangered Species Act compliance. The U.S. Department of Energy (DOE) is currently reviewing the project's application for a federal loan guarantee for financing. Funding by DOE would serve as a federal nexus, triggering Section 7 as the appropriate mechanism for formal consultation with U.S. Fish and Wildlife Service (USFWS) under the federal Endangered Species Act (ESA).

However, without confirmation that DOE will participate as the consulting agency under Section 7, the permitting mechanism for compliance with the federal ESA is currently unresolved.

In addition, several documents need to be submitted by the applicant to the Energy Commission, and as appropriate the California Department of Fish and Game and/or USFWS. Of particular importance are the draft Desert Tortoise Exclusion Fencing, Clearance Survey, and Translocation Plan (Desert Tortoise Plan), draft Burrowing Owl Monitoring and Mitigation Plan, Swainson's hawk and golden eagle survey results and foraging habitat assessment, and compensatory mitigation details, all of which need to be addressed by staff in the Supplemental Staff Assessment. The final Desert Tortoise Plan must be submitted to USFWS with the Biological Assessment, which is currently scheduled to be submitted to DOE March 2010; therefore a draft plan must be reviewed and comments provided as soon as possible.

INTRODUCTION

This section provides the California Energy Commission (Energy Commission) staff's analysis of potential impacts to biological resources from the construction and operation of the Abengoa Mojave Solar Project (AMS or project) as proposed by Mojave Solar, LLC (applicant). This analysis addresses potential impacts to special-status species, wetlands and other waters of the U.S., and areas of critical biological concern. Information contained in this document includes a detailed description of the existing biotic environment, an analysis of potential impacts to biological resources and, where necessary, specifies mitigation measures (conditions of certification) to reduce potential impacts to less than significant levels. Additionally, this analysis assesses compliance with applicable laws, ordinances, regulations, and standards (LORS).

This analysis is based, in part, on information provided in the AMS Application for Certification – Volumes 1, 2, and 3 (AS 2009a), responses to data requests, staff's observations during field visits on November 17 and December 17, 2009, and discussions with U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), and Bureau of Land Management (BLM).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The applicant will need to abide by the LORS listed in **Biological Resources Table 1** during project construction and operation.

Biological Resources Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal	
Endangered Species Act (Title 16, United States Code, sections 1531 et seq.; Title 50, Code of Federal Regulations, part 17.1 et seq.)	Designates and provides for the protection of threatened and endangered plant and animal species and their critical habitat. The administering agency is U.S. Fish and Wildlife Service (USFWS).
Clean Water Act of 1977 (Title 33, United States Code, sections 1251–1376, and Code of Federal Regulations, part 30, Section 330.5(a)(26))	Prohibits the discharge of dredged or fill material into the waters of the United States without a permit. The administering agency is the U.S. Army Corps of Engineers (USACE).
Bald and Golden Eagle Protection Act (Title 16, United States Code, sections 668-668c)	Prohibits the take or trade of bald and golden eagles (or any part, nest or egg of such bird). September 2009 Final Rule provides for a regulatory mechanism under Act to permit take of bald or golden eagles comparable to incidental take permits under the Endangered Species Act. The administering agency is USFWS.
Migratory Bird Treaty Act (Title 16, United States Code, sections 703–711)	Prohibits the take or possession of any migratory nongame bird (or any part of such migratory nongame bird), including nests with viable eggs. The administering agency is USFWS.
California Desert Conservation Area (CDCA) Plan	Establishes goals for protection and use of the Desert, designates distinct multiple use classes for covered areas, and establishes a framework for managing the resources within these classes. The Plan covers 25 million acres in southern California; approximately 10 million of these acres are administered by the BLM. Management goals include establishing Areas of Critical Environmental Concern (ACEC). The proposed project area is located within the CDCA adjacent to the Harper Dry Lake ACEC.
West Mojave Plan	Provides management strategies for conservation of desert tortoise, Mohave ground squirrel, and over 100 other sensitive plants and animals throughout the western Mojave Desert, while establishing a streamlined program for compliance with the regulatory requirements of the federal and California endangered species acts for projects on BLM land. The West Mojave Plan is an amendment to the CDCA Plan. The administering agency is BLM. The proposed project area is located within the West Mojave Plan area.

Applicable Law	Description
State	
California Endangered Species Act (Fish and Game Code, sections 2050 et seq.)	Protects California's rare, threatened, and endangered species. The administering agency is CDFG.
California Code of Regulations (Title 14, sections 670.2 and 670.5)	Lists the plants and animals that are classified as rare, threatened, or endangered in California. The administering agency is CDFG.
California Code of Regulations (Title 14, sections 460)	Provides information regarding the protection and take of furbearing mammals. This regulation makes it unlawful to take fisher, marten, river otter, desert kit fox and red fox. The administering agency is CDFG.
California Code of Regulations (Title 20, sections 1702(q) and (v))	Protects "areas of critical concern" and "species of special concern" identified by local, state, or federal resource agencies within the project area, including the CNPS. The administering agencies are USFWS and CDFG.
Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515)	Designates certain species as fully protected and prohibits take of such species. The administering agency is CDFG.
Native Plant Protection Act (Fish and Game Code, section 1900 et seq.)	Designates rare, threatened, and endangered plants in California and prohibits the taking of listed plants. The administering agency is CDFG.
Nest or Eggs (Fish and Game Code, section 3503)	Prohibits take, possession, or needless destruction of the nest or eggs of any bird. The administering agency is CDFG.
Birds of Prey (Fish and Game Code, section 3503.5)	Specifically protects California's birds of prey in the orders Falconiformes and Strigiformes by making it unlawful to take, possess, or destroy any such birds of prey or to take, possess, or destroy the nest or eggs of any such bird. The administering agency is CDFG.
Migratory Birds (Fish and Game Code, section 3513)	Prohibits take or possession of any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame bird. The administering agency is CDFG.
Public Resources Code, sections 25500 and 25527	Prohibits siting of facilities in certain areas of critical concern for biological resource, such as ecological preserves, refuges, etc. The administering agency is the Energy Commission (with comment from CDFG).
Fish and Game Code, sections 4150	Prohibits the take or possession of any nongame mammal or parts thereof except as provided in the Fish and Game Code or in accordance with regulations adopted by the commission. The administering agency is CDFG.

Applicable Law	Description
California Desert Native Plants Act (CDNPA) (Food and Agricultural Code, sections 80001 et seq. 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 certain counties, unless a permit is secured from the Agricultural Commissioner or the sheriff in the county for which the action is to take place. Administering agency is CDFG and Department of Food and Agriculture.
The Porter-Cologne Water Quality Control Act (Porter-Cologne; Public Resource Code, sections 13000 et seq.)	Regulates discharges of waste and fill material to waters of the state, including “isolated” waters and wetlands. The administering agency is Regional Water Quality Control Board.
Lake and Streambed Alteration (Fish and Game Code, sections 1600 et seq.)	Requires notification to CDFG prior to any activity that may result in substantial modification of the natural flow, or alteration of the bed, or bank, of any river, stream, or lake that supports fish or wildlife resources. The administering agency is CDFG.
Local	
San Bernardino County General Plan, Land Use/Conservation/Open Space Element (2004)	Implements programs that maintain and enhance biological diversity and healthy ecosystems throughout San Bernardino County by ensuring that proposed development projects demonstrate a high degree of compatibility with sensitive biological resources and that coordination with state and federal agencies is exercised so that protection of biological resources parallels the goals of those agencies.
Plant Protection and Management (San Bernardino County Development Code, sections 89.0101 et seq.)	Promotes the continued health of plant resources by providing regulations and guidelines that assist with management of plant resources in the unincorporated areas of San Bernardino County on property or combinations of property under private or public ownership.

SETTING

REGIONAL SETTING

The proposed project is located in the western Mojave Desert, approximately nine miles northwest of Hinkley and five miles north of State Route (SR) 58, in unincorporated San Bernardino County, California. Surrounding land uses include the existing Harper Lake Solar Electric Generating Station (SEGS) VIII and IX, located directly northwest of the proposed project area. Harper Dry Lake, managed in part by BLM, is located directly northeast of the project; the southwestern shore near the project area includes a Watchable Wildlife Area and an Area of Critical Environmental Concern (ACEC). There is an existing transmission corridor containing three transmission lines located at the southern boundary of the proposed project area. Further south and southeast of the project area is largely undisturbed land, with a few scattered residences. As shown in **Biological Resources Figure 1** at the end of this Staff Assessment section, the majority of the lands within a 10-mile radius of the project area are designated conservation areas including Desert Wildlife Management Areas (DWMAs), ACECs, Mohave Ground Squirrel (MGS) Conservation Area, and desert tortoise critical habitat, as well as BLM land.

PROJECT AREA AND VICINITY DESCRIPTION

Proposed Project Facilities

The proposed project comprises two sites, Alpha (the northwest portion of the project area) and Beta (the southeast portion of the project area), covering approximately 884 and 800 acres, respectively. An additional 81 acres shared between the plant sites would be utilized for receiving and discharging offsite drainage improvements, for a total of 1,765 acres. All proposed project components including linear facilities would occur within the proposed AMS project boundary.

The proposed project components related to the generation and transmission of electricity are described below.

Solar Power Plant Process and Equipment

The proposed project would employ parabolic trough technology to collect solar thermal energy for a combined nominal electrical output of 250-megawatts (MW) from twin 125-MW power islands. Each Alpha and Beta site would require solar array fields, a power block, two evaporation ponds, and ancillary facilities. Engineered storm water drainage channels (described below) and access roads would traverse the project area. Existing Harper Lake Road runs north to south, bisecting the Alpha solar field and is currently paved, but would be widened during construction. The existing Lockhart Road, which provides access to the Harper Dry Lake Watchable Wildlife Area, divides the proposed Alpha and Beta sites. The project perimeter would be fenced with chain-link, metal-fabric fencing. In addition, desert tortoise exclusion fencing would be installed at the base of the perimeter (chain-link) fence and tortoise-proof gates would be installed at all points of access.

Natural Gas Pipeline

Natural gas for the AMS project’s ancillary needs (e.g., auxiliary boilers, space heating) would reach the proposed project via an existing pipeline that runs to the proposed project boundary near the Alpha site under Harper Lake Road. Construction to interconnect with the existing gas pipeline would occur within the project footprint.

Transmission System Interconnection and Upgrades

The Alpha and Beta generation units would interconnect to the existing Southern California Edison (SCE) Kramer-Cool Water No. 1 230-kV transmission line, which runs east-to-west adjacent to the southern boundary of the proposed project area. Interconnection would be facilitated by a new 230-kV substation at the southwestern corner of the Beta solar field. The entire length of the proposed transmission lines required for interconnection is located within the proposed project area; 23 new steel poles would be required to interconnect the Alpha site and nine steel poles would be required to interconnect the Beta site.

Pending SCE's determination regarding the Applicant's request to install a special protection system in lieu of downstream transmission upgrades, Staff may need to evaluate the biological impacts of any resultant upgrades to SCE's transmission system from interconnection of the AMS Project.

Water Supply and Discharge

Operation of the AMS project would use groundwater from existing onsite wells. Cooling water blowdown would be piped to onsite evaporation ponds located at both the Alpha and Beta sites. Each evaporation pond would be five acres; there would be two adjacent ponds at the Alpha site and two adjacent ponds at the Beta site for a total of ten acres per site and 20 acres for the entire proposed project. The maximum depth of water in the ponds during operation would be six feet, plus a minimum of two feet of freeboard, for a maximum pond depth of eight feet. Interior sides of the ponds would be at a 33% slope (3:1, horizontal:vertical).

Drainage, Erosion, and Sediment Control

Currently, precipitation entering the proposed project area flows across the site toward Harper Dry Lake as sheet flow. The applicant proposes to intercept and direct any sheet flow that enters the southern and western boundaries of the proposed AMS site to a series of engineered drainage channels, which would convey offsite storm water around the project and redirect it to its natural flow location and parameters toward Harper Dry Lake. There are six drainage channels proposed for the site, the largest of the channels, Channel A, runs west to east through the project area, with a discharge outlet at the Harper Dry Lake ACEC. Preliminary design estimates this channel to be 3.6 miles long, up to 15 feet deep, with banks at a 2:1 slope, and approximately 313 to 335 feet wide through the project area (AS 2009a, Appendix K); the channel would open up to 1200 feet wide at the discharge outlet to reduce the flow velocity. The smaller secondary drainage channels border the southern and western portion of the Beta field and the northern section of the Alpha site and would capture and convey storm water to Channel A. The proposed drainage channel would be earthen bottom with gabion mattress banks.

Onsite stormwater or process water (e.g., mirror washing excess) would be contained within the project site and allowed to percolate and evaporate within the solar fields. Containments would be established around hazardous areas (e.g., oil-filled transformers and chemical storage areas). Site runoff of stormwater or process water is not anticipated during power plant operation.

Existing Vegetation and Wildlife

The applicant conducted a reconnaissance-level survey of biological resources within the proposed project area and one-mile buffer in 2006. General botanical surveys, which included generating an inventory of all plant species observed and characterizing and mapping vegetation communities, were conducted in 2007, 2008, and 2009 generally between March and July. Surveys for common wildlife species were conducted concurrently with protocol special-status wildlife and general botanical surveys; all wildlife sign and sightings were recorded. The following description of biological resources presents the results of general biological surveys of the proposed AMS site and vicinity as well as observations from staff's site visits. Special-status species are discussed below.

As described above, the proposed AMS site, construction laydown areas, natural gas pipeline route, and transmission line right-of-way and interconnection facilities are all contained within the project boundary. The project design has changed extensively in both footprint and size since 2006. The project footprint and size were iteratively modified by the applicant to avoid continuous stands of undisturbed native vegetation, conservation areas, and high quality wildlife habitat.

Vegetation

Twelve vegetation communities occur within the proposed project area. Most of the project area has been converted from desert salt bush scrub and creosote bush scrub to agriculture and portions have been subsequently retired. **Biological Resources Table 2** (from AS 2009a, Table 5.3-7) presents the acreage of each vegetation community within the proposed project area. The vegetation communities are described following the table and illustrated in **Biological Resources Figure 2**, which can be found at the end of this Staff Assessment section.

Biological Resources Table 2
Vegetation Communities and Acreage Occurring in AMS Project Area

Vegetation Communities	Acres
Fallow Agricultural – Ruderal	832.7
Disturbed	256.1
Disturbed - Saltbush Scrub Regrowth	226
Fallow Agricultural – Saltbush Scrub Regrowth	202.9
Active Agricultural	122.6
Developed	66.6
Desert Sink Scrub	39.6
Tamarisk Scrub	13.2
Unvegetated Dry Lake Bed	9.3
Mojave Creosote Bush Scrub	6.0
Mojave Desert Wash Scrub	1.9
Disturbed – Desert Saltbush Scrub	1.1
Desert Saltbush Scrub	0.6
Total acreage	**1,778.6**[1]

[1] The total acreage for all vegetation communities and other cover types within the Project Area (approximately 1,779 acres) is slightly different than the area calculated during the AMS land survey performed by engineers (approximately 1,765 acres). The variation in acreage is attributed to a difference in equipment used for determining acreage of the project area (i.e., land survey versus GIS processing). Acreages in Table 2 are the habitat acreages from which habitat compensation is based.

Fallow agricultural-ruderal vegetation covers most of the proposed project area, occurring on land formerly used for agriculture. The dominant plant species are non-native such as Russian thistle (*Salsola tragus*), Saharan mustard (*Brassica tournefortii*), and split grass (*Schismus arabicus*).

Disturbed-saltbush scrub regrowth is the second most common plant community at the site, it occurs on lands not previously used specifically for agriculture. Non-native species are abundant in this cover type.

Fallow agriculture-saltbush scrub regrowth is the third most common vegetation cover at the proposed project area. It occurs on land used previously for agriculture and is now dominated by several native atriplex shrub species. The dominant species is allscale (*Atriplex polycarpa*), an effective colonizer of abandoned agriculture lands in the Mojave Desert, and spinscale (*Atriplex spinifera*). Other shrub species found within this vegetation community are winter fat (*Krascheninnikovia lanata*), horsebrush (*Tetradymia canescens*), and spiny senna (*Senna armata*).

Disturbed habitat is characterized as having been altered by previous human activity including grading, repeated clearing, and vehicle damage. The disturbed area within the proposed project area is more than 50% bare ground and lacking remnant native vegetation. Vegetation that occurs in this area mostly consists of Saharan mustard.

***Active agriculture** covers approximately 123 acres within the project vicinity. The current crop is alfalfa (*Medicago sativa*) and is irrigated with a center-point pivot system.*

Desert sink scrub is located in the northeastern portion of the project area intermixed with alkali marsh and desert saltbush scrub. Desert sink scrub is characterized as being dominated by chenopod-type plants that grow on poorly drained soils with high alkalinity. Dominant species of this vegetation community are annual bursage (*Ambrosia acanthicarpa*), bush seepweed (*Suaeda moquinii*), and five-hook bassia (*Bassia hyssopifolia*).

Tamarisk scrub occurs in several areas throughout the proposed project area, mainly near the western margin of Harper Dry Lake. This vegetation community is dominated by tamarisk (*Tamarix ramosissima*), a non-native shrub or small tree that is commonly planted for erosion control and wind breaks. Tamarisk is deep rooted and can outcompete native vegetation for water.

Dry lake bed refers to the playa at Harper Dry Lake, which is located at the northeastern portion of the proposed project area at the proposed drainage channel outlet location. This area is unvegetated but occurs between desert sink scrub and tamarisk shrub.

Mojave creosote bush scrub occurs at the southern most boundary of the proposed project area. This is an open shrub community dominated by creosote bush (*Larrea tridentate*) and white bursage (*Ambrosia dumosa*). Vegetation cover consists of widely spaced native shrubs, approximately 15 to 25 feet apart and two to six feet in height. Dominant non-native vegetation includes red-stemmed filaree (*Erodium cicutarium*) and Mediterranean grass (*Schismus* sp.). A well developed herbaceous layer exists within this cover type and is composed of native annual species including dwarf cottonrose (*Filago depressa*), Fremont's phacelia (*Phacelia fremontii*), and desert dandelion (*Malacothrix glabrata*).

Mojave desert wash scrub surrounds the proposed AMS site in ephemeral washes. This vegetation cover consists mostly of sandy, braided, shallow washes dominated by allscale and creosote bush. Other shrub species observed within this cover type are Johnson's indigo bush (*Psorothamnus arborescens* var. *minutifolius*), white bursage (*Ambrosia dumosa*), cheesbush (*Ambrosia* [*Hymenoclea*] *salsola*), Anderson's boxthorn (*Lycium andersonii*), and peachthorn (*Lycium cooperi*).

Disturbed desert saltbush scrub occurs along portions of the western and southern edges of the Beta site, at the edges of the abandoned agriculture fields. This vegetation community was subject to previous human activity including grading, repeated clearing, and vehicular damage, which contributed to the degradation of the naturally occurring desert saltbush scrub habitat, resulting in low shrub density and increased non-native vegetation. This cover type is dominated by allscale and spinescale with an understory of non-native herbaceous plants.

Desert saltbush scrub is located at the western edge of the AMS project. This cover type is dominated by four-wing saltbush (*Atriplex canescens*), spinescale, and allscale shrubs up to six feet in height. Other shrubs within this vegetation community include winter fat, horsebrush, and creosote.

Developed areas within the proposed project area include paved roads, dirt roads, and residential areas.

Wildlife

Active and fallow agricultural areas in the desert support a variety of common wildlife species. Additionally, the proposed project area's proximity to undisturbed native vegetation increases its wildlife habitat value. Reptiles detected by the applicant during 2007, 2008, and 2009 surveys include long-nosed leopard lizard (*Gambelia wislizenii*), zebra-tailed lizard (*Callisaurus draconoides*), side-blotched lizard (*Uta stansburiana*), and Great Basin whiptail (*Aspidoscelis tigris tigris*). Mammals recorded during the surveys include desert cottontail (*Sylvilagus audubonii*), black-tailed jack rabbit (*Lepus californicus*), Merriam's kangaroo rat (*Dipodomys merriami*), white-tailed antelope squirrel (*Ammospermophilus leucurus*), and bobcat (*Felis rufus*).

The proposed project's proximity to Harper Dry Lake marsh and its existing vegetation cover, including fallow and disturbed agriculture fields, provides resident and migratory bird species with cover, forage, nesting and roosting habitat. Some of the resident and migratory bird species observed during 2007, 2008 and 2009 surveys include great egret (*Ardea alba*), great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), white-faced ibis (*Plegadis chihi*), mallard (*Anas platyrhynchos*), red-tailed hawk (*Buteo jamaicensis*), osprey (*Pandion haliaetus*), kill deer (*Charadrius vociferous*), savannah sparrow (*Passerculus sandwichensis*), lesser nighthawk (*Chordeiles acutipennis*), horned lark (*Eremophils alpestris*), greater roadrunner (*Geococcyx californianus*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), American kestrel (*Falco *sparverius*), and Western snowy plover (*Charadrius alexandrines nivosus*). Several common ravens (*Corvus corax*) were observed by staff throughout the project area and perched on the fence along Harper Lake Road.

Noxious Weeds

Noxious weeds are species of non-native plants included on the weed list of the California Department of Food and Agriculture (CDFA 2009), the California Invasive Plant Council (Cal-IPC 2006), or those weeds of special concern identified by BLM. Noxious weeds species that occur within the proposed project area include Russian thistle (*Salsola tragus*), herb Sophia (*Descurania sophia*), Saharan mustard, London rocket (*Sisymbrium irio*), tamarisk, slender wild-oat (*Avena barbata*), red brome (*Bromus madritensis* ssp. *rubens*), cheat grass (*Bromus tectorum*), and hare barley (*Hordeum murinum*). The most abundant invasive weeds within the project vicinity, Russian thistle and tamarisk, occur in disturbed areas at the edges of Harper Dry Lake.

Special-Status Species

Special-status species include those listed as threatened or endangered under the federal or state endangered species acts, species proposed for listing, California species of special concern, and other species that have been identified by the USFWS or CDFG or another agency as unique or rare.

Special-Status Plant Surveys

Focused botanical surveys for special-status plants and sensitive vegetation communities were conducted by the applicant within the project area and one-mile buffer in 2007, 2008, and 2009 between March and August.

No special-status plants were observed within the proposed project area; however three special status plants were observed within the 1-mile survey area buffer: desert cymopterus (*Cymopterus deserticola*; CNPS List 1B.2), Mojave fish-hook cactus (*Sclerocactus polyancistrus*; CNPS List 4.2), and Mojave spineflower (*Chorizanthe spinosa*; CNPS List 4.2), as described below. Their locations relative to the proposed project area are illustrated in **Biological Resources Figure 2**.

- One occurrence of desert cymopterus was observed in an open area of small sandy wash approximately 4,000 feet (0.75 mile) south of the project area. A CNDDB occurrence of this species was recorded within the proposed temporary interconnection area in the southernmost portion of the project area. Five individuals were observed in 1998, which is a reduction from 78 plants observed in 1989 (CDFG 2009). This population was not re-located during surveys and may be extirpated; however this also could have been due to below average precipitation.
- One occurrence of Mojave fish-hook cactus was observed southeast of the desert cymopterus within the sandy wash approximately 4,975 feet (0.95 mile) south of the project area.
- Two populations of Mojave spineflower were identified. The western population comprises approximately 22 acres within the survey area and extends west outside of the survey area. This population is associated with Mojave creosote bush scrub and desert wash scrub and occurs approximately 4,625 feet (0.88 mile) west of the

project area. The eastern population of Mojave spineflower covers 3.2 acres and was observed at the edge of Harper Dry Lake, 4,500 feet (0.85 mile) east of the project area.

Special-status Wildlife Surveys

Focused or protocol surveys were conducted for desert tortoise (*Gopherus agassizii*), burrowing owl (*Athene cunicularia*), Mohave ground squirrel (MGS; *Spermophilus mohavensis*), and raptors according to established wildlife agency survey protocol (USFWS 1992a; USFWS 2009; CBOC 1993; CDFG 2003; CEC 2007). Focused surveys for Swainson's hawk (*Buteo swainsoni*) will be conducted in spring 2010.

Desert Tortoise

In the Mojave Desert, desert tortoise (federal and state-threatened) is most often found in association with creosote bush, Joshua tree woodland, and saltbush scrub with adequate annual forbs for foraging. Tortoises are not likely to occur on dry lake beds. The region encompassing Harper Dry Lake and the project area historically and recently have supported moderate densities of tortoise (BLM 2005). The proposed project area, particularly the eastern portion, includes disturbed areas that are re-establishing native vegetation (i.e., saltbush scrub re-growth), which provide suitable habitat for tortoise. Native vegetation surrounding the site, including desert saltbush scrub, Mojave creosote bush scrub, and Mojave desert wash scrub, provide fair to medium quality desert tortoise habitat (Karl 2008).

Reconnaissance surveys for desert tortoise and areas of suitable habitat were conducted in 2006. Protocol-level surveys were conducted in 2007, 2008, and 2009 between April and May, extending into early June with permission from USFWS. Between 2006 and 2009, the project boundary was reconfigured several times; however, surveys ultimately covered the entire project site as proposed in the AFC as well as a buffer up to one mile in some areas. Following is a description of the annual survey efforts for desert tortoise (EDAW 2007; EDAW 2009a; EDAW 2009b; EDAW 2009c):

- **2006.** The 2006 project area encompassed the entire Beta site, as currently proposed, and the south and west portions of Section 29 within the Alpha site. This previous project area is approximately 515 acres less than the current proposed project area and included a 0.1 square mile area in the northwest portion of Section 29 that has been eliminated from the current proposed project area. Reconnaissance surveys conducted in 2006 covered approximately 1,250 acres within the previous project area plus a one mile buffer surrounding the site.
- **2007.** The 2007 project area was the same as described for 2006. Protocol surveys conducted in 2007 covered approximately 1,250 acres within the previous project area plus a one mile buffer surrounding the site.
- **2008.** The 2008 project area is very similar to the current proposed project area except in the 2008 project area, a 0.1 square mile section within the northwest portion of Section 29 was removed and a 0.1 square mile section within the northeast corner of Section 5 was added to the southern boundary of the Beta site.

Protocol surveys conducted in 2008 covered the largest area, encompassing the entire current proposed project area plus an additional 3,146 acres surrounding the proposed project area.

- **2009.** The 2009 project area is the current proposed project area and protocol surveys of certain areas of suitable habitat identified by USFWS were conducted in 2009. These areas totaled approximately 660 acres and did not include Zone of Influence Transects, with concurrence by USFWS.

Relatively high concentrations of live tortoise and tortoise sign were documented immediately east and west of the project area. Only one live tortoise was observed within the proposed project area; this was an incidental observation during Mohave ground squirrel surveys in 2006. Survey results are presented below in **Biological Resources Table 3.**

Biological Resources Table 3
Desert Tortoise Survey Results

Survey Year	Live Tortoise Observed	Tortoise Sign Observed
Proposed Project Area[1]		
2006 (reconnaissance, not protocol)	1 adult female	1 scat
2007	0	7 carcass; 1 burrow
2008	0	5 carcass
2009	0	5 carcass; 1 burrow; 3 scat; 3 other
Zone of Influence Transects		
2007	1 adult male	1 carcass; 2 burrow; 14 scat
2008	41 (33 adults, 6 sub-adults, 2 juveniles)	86 carcasses; 220 burrows; 654 scat; 118 other

[1]Project area boundaries as proposed in AFC (AS 2009a).

Mohave Ground Squirrel

The Mohave ground squirrel (MGS) is state-listed as threatened and the USFWS is currently reviewing a petition to list the species as endangered under the federal Endangered Species Act (ESA). This species is limited to the west Mojave Desert; its range encompasses the proposed project area. MGS occurs in a variety of habitats including desert saltbush scrub and creosote bush scrub, which occur adjacent to the project area and which are beginning to re-colonize fallow and disturbed areas within the project site.

Protocol surveys were conducted in 2006 in support of the proposed Harper Lake Dairy Park, which covered a large portion of the current proposed project area, excluding the portion west of Harper Lake Road. No MGS were observed in visual surveys or captured in trapping efforts. The AMS project took over the area originally proposed for the Harper Lake Dairy Park and surveys were repeated in 2007 within the same project footprint, although in a different grid configuration. MGS was not observed during visual surveys, but one adult female was trapped south of the active alfalfa field, immediately adjacent to, but outside of, the proposed project area. Protocol surveys were not conducted within the proposed project area west of Harper Lake Road. Because MGS are notoriously difficult to capture, trapping surveys do not provide a definitive quantification of the number of individuals onsite.

A subsequent MGS habitat assessment (Leitner 2008a) determined that the native vegetation east (undisturbed creosote scrub) and west (undisturbed desert saltbush scrub and creosote scrub) of the proposed project area provides high quality suitable habitat for MGS. Disturbed habitat within the project area does not provide food resources to support a substantial permanent MGS population; however, transient individuals may be occasionally present as they move between areas of suitable habitat. This characterization includes the not-protocol-surveyed areas west of Harper Lake Road.

Western Burrowing Owl

Burrowing owl, a California Species of Concern, is a yearlong resident of open, dry grassland, prairie, and desert floor habitats, but is also known to occur in urban, disturbed areas and at the edges of agricultural fields. Burrowing owl protocol surveys were conducted during summer 2007 and spring 2008. All four phases of the surveys were completed, as required by the protocol. Reconnaissance surveys of the project area in 2006 identified four burrowing owls.

As with MGS, protocol surveys conducted in 2007 did not cover the entire proposed AMS project area as currently proposed; specifically the one-square mile portion west of Harper Lake Road had not been identified and was therefore excluded from site surveys. However, surveys within the one-mile buffer of the 2007 site allowed for coverage of this western portion of the proposed project area. In total for 2007, six burrows, three burrows with recent owl sign (e.g., white-wash, pellets), one roost, and one owl were observed within the proposed AMS project area; the owl was an incidental observation during desert tortoise surveys. Outside of the project area, but within the survey buffer, three owls, nine burrows, and six burrows with recent owl sign were documented.

As with desert tortoise, protocol surveys conducted in 2008 covered the largest area, encompassing the entire proposed project area. One burrowing owl and one instance of burrowing owl sign were observed within the project area. Outside of the project area, but within the survey buffer, one owl, 20 burrows with recent owl sign, and four instances of owl sign were documented. The highest concentrations of burrowing owls and sign were recorded in the undisturbed desert scrub habitat east and west of the proposed project boundaries.

Raptors

Raptor surveys, with emphasis on detection of northern harrier, prairie falcon, peregrine falcon, Swainson’s hawk, and short-eared owl were conducted during spring and winter 2007. As with MGS and burrowing owl surveys, the entire AMS project area as currently proposed had not been identified in 2007; specifically the one-square mile portion west of Harper was excluded from site surveys. However, surveys within the one-mile buffer of the 2007 site allowed for coverage of this western portion of the proposed project area.

Species observed during focused raptor surveys include American kestrel, Swainson's hawk, common raven, and turkey vulture. Other special status-bird species observed during reconnaissance and other focused surveys are noted below. The applicant will be conducting focused Swainson's hawk surveys in spring 2010. In addition, staff and USFWS request focused golden eagle surveys also be conducted in spring 2010, per recent updates to the Bald and Golden Eagle Protection Act (refer to the **Compliance with LORS** subsection below for additional information regarding the Final Rule).

Biological Resources Table 4 identifies the special-status species that were reported to or potentially occur within ten miles of the proposed project area, based on surveys of the proposed project area and vicinity, and searches of the California Natural Diversity Database (CNDDB) and California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants.

Biological Resources Table 4
Special-status Species Potentially Occurring in AMS Project Area

Species	Status*	Habitat	Likelihood of Occurrence in Project Area+
PLANTS			
Barstow woolly sunflower *(Eriophyllum mohavense)*	1B.2	Creosote bush scrub, desert saltbush scrub, playas; blooms April-May	**Moderate.** Marginal suitable habitat occurs onsite; 11 CNDDB records within five miles; not observed during surveys
Chaparral sand-verbena *(Abronia villosa* var. *aurita)*	1B.1	Chaparral, coastal scrub, and desert dunes or sandy areas; blooms January-September	**Low.** Marginal habitat occurs adjacent to project area; nearest record is five miles south of project area
Desert cymopterus *(Cymopterus deserticola)*	1B.2	Mojave desert scrub, sandy desert; blooms March- May	**Moderate to High.** Marginal habitat occurs onsite; observed 0.75 mile south of project area during surveys; historically robust population recorded onsite in 1998.
Mojave fish-hook cactus *(Sclerocactus polyancistrus)*	4.2	Mojave desert scrub, Joshua tree woodland, Great Basin scrub; blooms April-July	**Moderate.** Marginal habitat occurs onsite; observed 0.95 mile south of project area during surveys;
Mojave monkeyflower *(Mimulus mohavensis)*	1B.2	Mojave desert scrub and Joshua tree woodland; blooms April- June	**Low.** Not known from project area or vicinity; not observed onsite.
Mojave spineflower *(Chorizanthe spinosa)*	4.2	Mojave desert scrub, chenopod scrub, Joshua tree woodland; blooms March- July	**Moderate.** Marginal habitat occurs onsite; two populations observed 0.8 mile east and west of project area during surveys

Species	Status*	Habitat	Likelihood of Occurrence in Project Area+
Recurved larkspur *(Delpinium recurvatum)*	1B.2	Chenopod scrub, cismontane woodland, and valley/foothill grassland; blooms March- June	**Absent.** Suitable habitat does not occur onsite or adjacent or project area
Sagebrush loeflingia *(Loeflingia squarrosa* var. *artemisiarum)*	2.2	Desert dunes, great basin scrub, and Sonoran desert scrub; blooms April- May	**Absent.** Suitable habitat does not occur onsite or adjacent to project area
Utah glasswort *(Sarcocornia utahensis)*	2.2	Chenopod scrub, alkali playas and marshes; blooms August-September	**Moderate to High.** Suitable habitat occurs in northeast project area; not observed during surveys; recorded along west shore of Harper Lake, north of project area
REPTILES			
Desert tortoise *(Gopherus agassizii)*	FT; ST	Desert scrub and desert washes up to approximately 5,000 feet	**Present.** One live tortoise and several sign observed onsite; higher densities adjacent to project area
BIRDS			
American peregrine falcon *(Falco peregrinus)*	SE (PD), FP	Open habitats, usually adjacent to lakes, rivers, or marshes that support large populations of other bird species. Nests and roosts on protected ledges and high cliffs	**Present.** One individual observed onsite; marsh at Harper Dry Lake provides suitable foraging habitat
American white Pelican *(Pelecanus erythrorhynchos)*	CSC	Fresh water lakes with islands for breeding; inhabits river sloughs, freshwater marshes, estuaries, bays. Nests usually in brackish or freshwater lake islands	**Present.** Carcass observed in survey area; marsh at Harper Dry Lake provides stopover habitat during migration
Burrowing owl *(Athene cunicularia)*	BLMS; CSC	Sparse grassland, open desert scrub, and agriculture lands; strongly associated with ground squirrel burrows	**Present.** Owls, burrows, and sign were observed onsite during surveys.
Cooper's hawk *(Accipiter cooperi)*	WL	Forages in open woodlands; nests in riparian forest dominated by deciduous species.	**Present.** Observed soaring over project area; nesting habitat does not occur onsite
Golden eagle *(Aquila chrysaetos)*	FP; CSC	Forage in grassy and open shrub habitats; nest primarily on cliffs, secondarily in large trees	**High.** Suitable foraging habitat occurs throughout project area; not observed during surveys; known to occur southeast of project area, foraging radius likely overlaps project area
LeConte's thrasher *(Toxostoma lecontei)*	SSC	Yearlong residents of desert flats, washes and alluvial fans with sandy and/or alkaline soil and scattered shrubs	**Present.** Observed onsite; suitable foraging and nesting habitat occurs throughout the project area

Species	Status*	Habitat	Likelihood of Occurrence in Project Area+
Loggerhead shrike *(Lanius ludovicianus)*	CSC	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines or other perches	**Present.** Observed onsite; suitable foraging and nesting habitat occurs throughout the project area
Merlin *(Falco columbarius)*	WL	Forages in open grasslands, savannahs, woodlands, near wetlands	**Present.** Observed onsite in fallow agricultural fields
Mountain plover *(Charadrius montanus)*	CSC	Occupies open plains or rolling hills with short grasses or very sparse vegetation; may use newly plowed or sprouting grain fields	**Moderate.** Suitable wintering habitat occurs onsite; within range of species in San Bernardino County
Northern harrier *(Circus cyanus)*	CSC	Characteristically occurs in marshlands; forages over grasslands. Nests on the ground in thick grass, shrubbery, or other vegetation	**Present.** Two individuals observed in survey area; marsh at Harper Dry Lake and portions of the project area provide suitable foraging and ground-nesting habitat.
Prairie falcon *(Falco mexicanus)*	WL	Nests in cliffs or escarpments; forages in adjacent dry, open terrain or uplands, marshes	**Present.** Pair observed soaring and individual observed hunting onsite; suitable nesting habitat does not occur within survey
Short-eared owl *(Asio flammeus)*	CSC	Freshwater marshlands, seasonal wetlands, fallow fields, meadows, and alfalfa fields; needs dense vegetation for nesting (conceal female) and daytime cover	**Present.** Observed onsite; suitable nesting habitat occurs near active agricultural (alfalfa) field
Swainson's hawk *(Buteo swainsoni)*	ST;	Nests in oaks or cottonwoods in or near riparian habitat; forages in grasslands, irrigated pastures and grain fields	**Present.** Three individuals observed within project area and survey area; project area provides suitable foraging habitat.
Yellow warbler *(Dendroica petechia)*	CSC	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders in mature chaparral; may also use oaks, conifers, and urban areas near stream courses	**Present.** One transient individual was observed onsite; no suitable nesting habitat exists in survey area; marsh at Harper Dry Lake provides stopover habitat during migration
Yuma clapper rail *(Rallus longirostris yumanensis)*	FE; SE; FP	Fresh-water and brackish marshes dominated by cattail or bulrush, mosaic of densely vegetated areas interspersed with shallow open water areas.	**Low.** Marsh at Harper Dry Lake historically provided nesting habitat for this species; calling birds reported at marsh in 1977 (BLM 2005); retirement of agriculture has subsequently reduced habitat quality in the marsh.

Species	Status*	Habitat	Likelihood of Occurrence in Project Area+
Western snowy plover *(Charadrius alexandrinus nivosus)*	CSC (inland population)	Inland shores of salt ponds and alkali or brackish inland lakes.	**Moderate.** Marsh at Harper Dry Lake historically provided nesting habitat for this species; 94 birds reported in CNDDB at marsh in 1978; retirement of agriculture has subsequently reduced habitat quality in the marsh.
Willow flycatcher *(Empidonax traillii)*	SE	Riparian habitat dominated by willows or alder and permanent water, often in the form of low gradient watercourses, ponds, lakes, wet meadows, marshes, and seeps within and adjacent to forested landscapes.	**Present.** One transient individual was observed onsite; no suitable nesting habitat exists in survey area; marsh at Harper Dry Lake provides stopover habitat during migration
MAMMALS			
Desert kit fox (*Vulpes macrotis*)	CCR	Open desert, areas of desert scrub, grasslands, and sandy dunes; sandy and loamy soils	**Present.** Two dens, and juvenile female road kill observed onsite
Mohave ground squirrel (*Spermophilus mohavensis*)	ST	Saltbrush, alkali desert, and creosote bush scrub at elevations from 1,800 to 5,000 feet.	**Present.** One MGS trapped within the project area; high quality habitat adjacent to project area
Mojave River vole *(Microtus californicus mohavensis)*	CSC	Weedy herbaceous growth in wet areas along the Mojave River.	**Low.** Marsh at Harper Dry Lake historically provided suitable habitat; reported in ACEC in mid-1980's; retirement of agriculture has subsequently reduced habitat quality in the marsh
American badger *(Taxidea taxus)*	CSC	Open, arid habitats, grasslands, savannas, mountain meadows, and open areas of desert scrub.	**High.** One den observed during reconnaissance surveys.

***Status Legend** (Federal/State/California Native Plant Society (CNPS) lists, CNPS list is for plants only):
FE = Federally listed Endangered; **FT** = Federally listed Threatened; **FC** = Candidate Species for Listing; **SE** = State-listed Endangered; **ST** = State-listed Threatened; **CSC** = California Species of Concern; **FP** = Fully Protected; **SR** = State Rare; **WL** = State Watch List; **PD** = proposed for Delisting; **CCR** = protected under CDFG Code Title 14, CCR §460; **List 1B** = Rare or Endangered in California and elsewhere; **List 2** = Rare, threatened, or endangered in California but more common elsewhere; List 4 = Limited distribution – a watch list; .1 = Seriously threatened in California (high degree/immediacy of threat); **.2** = Fairly threatened in California (moderate degree/immediacy of threat) (Sources: CDFG 2009; CNPS 2009; AS 2009a).

+Definitions Regarding Potential Occurrence:
Present: Species or sign of its presence observed onsite
High: Species or sign not observed on the site, but reasonably certain to occur onsite
Moderate: Species or sign not observed on the site, but conditions suitable for occurrence
Low: Species or sign not observed on the site, conditions marginal for occurrence
Absent: Species or sign not observed on the site, conditions unsuitable for occurrence

Sensitive Habitat

Harper Dry Lake

The Harper Valley Basin is enclosed by the Tehachapi Mountains to the west and the San Gabriel and San Bernardino Mountains to the south. All surrounding areas within the Harper Valley Basin drain into Harper Dry Lake (CEC 1988), which is one of the largest dry lake beds in the Mojave Desert. The Harper Dry Lake marsh is restricted to a narrow band along the southwestern shore of Harper Dry Lake in the Harper Valley Basin. Historically, the Harper Dry Lake marsh comprised three wetland areas: northern, central, and southern. Currently, the central and southern wetlands are the most prolific; the northern wetland is non-functional.

Wetlands, particularly the Harper Dry Lake marsh, are a uniquely important resource in the Mojave Desert for resident wildlife and thousands of migratory birds (Cardiff 1998; BLM 2007). Some bird species known to utilize the wetlands and surrounding habitat at Harper Dry Lake marsh include, but are not limited to, white-faced ibis (*Plegadis chihi*), tricolor blackbird (*Agelaius tricolor*), killdeer (*Charadrius vociferus*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), black-crowned night herons (Nycticorax nycticorax), western snowy plover (Charadrius alexandrinus nivosus), marsh wren (*Cistothorus palustris*), cinnamon teal (*Anas cyanoptera*), mallard (*Anas platyrhynchos*), and many neotropical migratory birds and raptors. Golden eagles (*Aquila chrysaetos*) have also been known to utilize the marsh (BLM 2007). In addition to a diverse assemblage of birds, the Harper Lake ACEC provides water, shelter, and foraging habitat for a variety of terrestrial species including coyote, desert kit fox, snakes, and mice.

Several conservation organizations and resource agencies have formally recognized the resource value of the wetlands at Harper Dry Lake, including BLM and the National Audubon Society. In 1982, BLM designated 480 acres, including 20 acres of wetlands, as an ACEC (BLM 1982). In 2003, BLM constructed public viewing facilities within the ACEC to create a Watchable Wildlife Area, which is intended to encourage public interest in the ACEC. BLM also designated Harper Dry Lake as a Key Raptor Area, one of seven such areas in the Mojave Desert. The National Audubon Society designated the Harper Dry Lake marsh as an Important Bird Area because it was one of the most productive wetlands in the Mojave Desert (NAS 2008). In addition, preservation and enhancement of the Harper Dry Lake marsh has been identified as important to the long-term conservation of western snowy plover nesting habitat (BLM 1999a).

The groundwater table in the Harper Dry Lake area has been subjected to decades of water extraction for agricultural irrigation purposes causing the groundwater level below Harper Dry Lake to decline significantly. United States Geological Survey (USGS) records show that groundwater levels adjacent to Harper Dry Lake marsh were 16 feet below ground surface (bgs) in 1919 (USGS 2010). This is a strong indicator that the marsh was originally sustained by groundwater. Significant water usage from farming practices which utilized a flooding irrigation system were not established until 1930 (AS 2009a), when Lockhart and Evans ranches were constructed. USGS records indicate that groundwater levels west of Harper Dry Lake fell drastically from 1919 to 1986 (16 feet bgs in 1919, 95 feet bgs in 1953, 157 feet bgs in 1979, and 183 feet in 1986 (USGS 2010). Consequently, persistence of the Harper Dry Lake wetlands became reliant on surface runoff from agricultural irrigation as a water source. Agricultural runoff reaching the marsh peaked during the late 1970s early 1980s, supplying approximately 800 to 1,000 acre-feet per year. The Lockhart Ranch, which irrigated more than 3,080 acres, was taken out of production in 1983 and 1984. In 1989 and 1990, construction of SEGS VIII and IX retired approximately 800 acres of active agriculture, further reducing available irrigation runoff the marsh (CEC 1988-89). The estimated runoff during the late 1980s early 1990s to the central and southern marshes declined to 400 to 800 acre-feet per year (Luz 1988). In 1997, agriculture operations surrounding the marsh ceased almost entirely, cutting off this water supply to the marsh. Consequently, the northern, central, and southern wetlands were completely dry between 1998 and 2001 (AS 2009a).

The combined effects of groundwater drawdown and cessation of agricultural runoff have seriously degraded the habitat value within the Harper Dry Lake marsh and eliminated the local artesian wells and springs. Because of these adverse effects, groundwater does not exist at a depth that would allow water to collect at the surface through capillary action, which would let the wetland be self-sustaining.

Currently, BLM artificially maintains the central and southern wetlands of the Harper Dry Lake ACEC by pumping groundwater to the wetlands via underground pipes and a surface drainage channel. With the exception of extraordinary precipitation events, the BLM groundwater transfers are likely the only reason the wetlands persist today. However, this does not diminish their biological value for plants and wildlife. BLM's management plan for the Harper Dry Lake ACEC recognized the future threats of salination, lowered groundwater table, and reduction in agricultural production and established management objectives to "provide adequate protection to a sensitive and unique wetland habitat which has no independent water supply" (BLM 1982). In 2007, BLM completed NEPA review of their Harper Dry Lake ACEC Wetlands Restoration Project, which includes native tree planting, removal of invasive species, an upgraded and improved water delivery system, and water quality monitoring (BLM 2007). However, grant funding has not yet been available to complete the work.

The well currently used to pump groundwater to the marsh is located within the proposed Beta solar field. Consequently, this well would be decommissioned approximately six months after the initiation of project construction. As stated by the applicant during the January 15, 2009 Data Response Workshop, an existing well on BLM property would be retrofitted and deepened to serve the marsh.

Jurisdictional Wetlands and Waters

Ephemeral drainages within the Coyote-Cuttleback Lakes Watershed tributary to Harper Dry Lake flow from the adjacent Black Mountains, Rand Mountains, and other perimeter highlands towards the center of the basin at Harper Dry Lake. The majority of the proposed project area has been graded for agricultural uses and is relatively flat with a gentle downward slope (one percent grade) southwest-to-northeast toward Harper Dry Lake. Grading for agricultural operations eliminated any ephemeral washes within the proposed project area. Several relictual ephemeral washes leading to the site are intercepted at the SEGS VIII and IX drainage or abate into dirt roads or the perimeters of agricultural fields. During infrequent large precipitation events, water may reach Harper Dry Lake as sheet flow; however, much of the surface water infiltrates into the sandy alluvium.

Approximately 11.03 acres of potentially USACE-jurisdictional waters of the U.S occur within the project area along the west shore of Harper Dry Lake. The wetlands comprise a 1.59 acre monoculture of tamarisk scrub and meet the three parameters required for designation as potential waters of the U.S (i.e., wetland hydrology, hydric soils, and hydrophytic vegetation). The tamarisk stand is dying from lack of water. Other potentially jurisdictional waters include 9.44 acres of dry lakebed (alkali playa).

But for the Energy Commission's exclusive siting jurisdiction, waters of the State under the jurisdiction of CDFG and the RWQCB comprise 1.47 acres of lacustrine riparian extent (tamarisk scrub). This acreage of tamarisk scrub does not include 1.59 acres of the aforementioned potentially USACE-jurisdictional wetlands, although potential waters of the U.S. are also potential waters of the state. The acreages of potentially jurisdictional waters of the U.S and state within the proposed project area are presented below in **Biological Resources Table 5**.

Biological Resources Table 5
Potential Jurisdictional Waters of the U.S. and/or State within the AMS Project Area

Type of Jurisdictional Waters	Type of Habitat (Holland 1986)	Type of Habitat (Cowardin et al. 1979)	Regulatory Authority	Area of Resource (Acres)
Wetland	Tamarisk Scrub (63810)	Palustrine; Scrub/Shrub, Needle-Leaved, Evergreen, Seasonally Flooded/Saturated, Mixosaline, Alkaline	USACE, CDFG	1.59
Other Waters	Playa Lakebed (46000)	Lacustrine, Littoral, Unconsolidated Bottom, Sand, Intermittently Flooded/Temporary, Hypersaline, Alkaline	USACE, CDFG	9.44
Total USACE Waters =				**11.03**
Lacustrine Riparian Extent	Tamarisk Scrub (63810)	Palustrine; Scrub/Shrub, Needle-Leaved, Evergreen, Seasonally Flooded/Saturated, Mixosaline, Alkaline	CDFG, RWQCB	1.47
Total CDFG Waters =				**12.50**[1]

Source: EDAW 2009d
[1]This total includes the 11.03 acres of potentially jurisdictional waters of the U.S. which are also potentially jurisdictional waters of the State.

Desert Tortoise Critical Habitat

Critical habitat is a formal designation under the federal Endangered Species Act for specific, legally defined areas that are essential for the conservation of desert tortoise, that support physical and biological features essential for desert tortoise survival, and that may require special management considerations or protection. Desert tortoise critical habitat extends north, west, and south of the proposed project area. The proposed project area does not overlap with any designated or proposed critical habitat units; however, the Western Mojave Recovery Unit of desert tortoise critical habitat is located 0.7 mile southwest of the Beta site.

Superior-Cronese and Fremont-Kramer Desert Wildlife Management Areas

DWMAs are general areas recommended by the USFWS Desert Tortoise Recovery Plan (1994) within which recovery efforts for the desert tortoise would be concentrated. Nearest to the proposed project area are the Superior-Cronese and Fremont-Kramer DWMAs. Superior-Cronese DWMA is located north, east and south of the proposed project boundary and Fremont-Kramer is within five miles of the eastern boundary of the proposed project area. The Superior-Crones DWMA serves as a link between the east and west Mojave Desert tortoise populations, and it is likely that this is the only DWMA that will support the Recovery Plan target of 10 tortoises per square mile (USFWS 1994).

An 8-acre temporary equipment staging area for transmission line interconnection to the existing Kramer-Cool Water 230-kV transmission line would encroach on to private land within the Superior-Cronese DWMA at the southern edge of the Beta site.

Mohave Ground Squirrel Conservation Area

The West Mojave Plan designated the 1,726,712-acre MGS Conservation Area and outlined goals to reestablish the MGS population within this area. Goals for the MGS Conservation Area include ensuring the long term protection of MGS habitat and ensure the long-term viability of the species by controlling off-road vehicle use, grazing and commercial activities. As illustrated in **Biological Resources Figure 1**, the MGS Conservation Area surrounds the AMS project and vicinity, which is within a 30 square-mile area that was excluded from this designation.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

The threshold for determining significance is based on the biological resources present or potentially present within the proposed project area in consideration of the proposed project description. A proposed project would have a significant impact to biological resources, if it would:

- Have an adverse impact, either directly through take, or indirectly through habitat modification or interruption of migration corridors, on any state- or federally-listed species;
- Have an indirect or direct adverse effect on any sensitive natural community identified in federal, state or local plans, policies, or regulations;
- Interfere with the movement of any native wildlife species (resident or migratory) or with established native wildlife (resident or migratory) corridors; or
- Conflict with applicable federal, state, or local laws, ordinances, regulations, and standards protecting biological resources, as listed in **Biological Resources Table 1**.

DIRECT AND INDIRECT IMPACTS AND MITIGATION

The California Environmental Quality Act (CEQA) Guidelines define "direct" impacts as those impacts that result from the project and occur at the same time and place. Indirect impacts are caused by the project, but can occur later in time or farther removed in distance and are still reasonably foreseeable and related to the operation of the project. Significance of impacts is generally determined by compliance with applicable LORS; however, guidelines adopted by resource agencies may also be used.

This section analyzes the potential for direct and indirect impacts of construction and operation of the proposed project to biological resources and provides mitigation, as necessary, in an effort to reduce the severity of potentially adverse impacts. Staff recommends that a Designated Biologist and biological monitor(s) be assigned to ensure avoidance and minimization of the impacts described below and protection of the sensitive biological resources described above. Selection of the Designated Biologist and biological monitor(s) is described in staff's proposed Conditions of Certification **BIO-1** (Designated Biologist Selection) and **BIO-3** (Biological Monitor Qualifications); their duties and authority are described in staff's proposed Conditions of Certification **BIO-2** (Designated Biologist Duties) and **BIO-4** (Designated Biologist and Biological Monitor Authority), respectively. The Designated Biologist and/or biological monitor(s) would be responsible, in part, for developing and implementing the Worker Environmental Awareness Program (WEAP) (see Condition of Certification **BIO-5**), which is a mechanism for training the construction workers on protection of the biological resources described in this document.

Construction-Related Impacts and Mitigation

Construction Impacts to General Vegetation

Construction impacts to vegetation would occur through the direct removal of native plants during construction. These impacts are not usually considered significant unless the habitat type is regionally unique or is known to support special-status species. **Biological Resources Table 2** identifies the acreages of vegetation communities that would be subject to direct and permanent impacts within the project footprint. Several of these are disturbed native plant communities as well as active and fallow agriculture, with marginal habitat value for special-status species. However, the transmission line interconnection staging area would require temporary disturbance of six acres of undisturbed creosote bush scrub and 1.9 acres of undisturbed Mojave Desert wash scrub; this area is the highest quality habitat for special-status species. To mitigate impacts from loss of native vegetation within the transmission interconnection area, the temporary disturbance area would be revegetated after construction, per staff's proposed Condition of Certification **BIO-9** (Rehabilitation of Temporarily Disturbed Areas). Although desert vegetation takes a long time to recover once disturbed, staff expects that with implementation of **BIO-9** the creosote bush scrub within the interconnection area could be fully restored with time. Additionally, **BIO-7** (Impact Avoidance and Minimization Measures) requires the boundaries of all temporary and permanent disturbance areas to be delineated and all work, vehicles, and equipment to be confined to these areas thereby preventing disturbance of native vegetation outside of the proposed project area.

Construction of the proposed project would not result in substantial loss of native vegetation or a regionally unique habitat type; with implementation of staff's proposed Conditions of Certification **BIO-7** and **BIO-9**, impacts to general vegetation would be less than significant.

Construction Impacts to General Wildlife

Direct loss of small mammals, reptiles, and other less mobile species could occur during construction of the proposed project. This would result primarily from the use of construction vehicles and grading equipment at the AMS site. Small burrowing animals (e.g., lizards, snakes, and small mammals) could be harmed through crushing of burrows, loss of refugia from predators, and direct mortality from construction activities. Construction activities and human presence could also alter or disrupt breeding and foraging behavior of common wildlife species.

Wildlife could become entrapped in open trenches during construction, especially if trenches remain open during inactive construction periods. In addition, common wildlife could experience increased predation levels from ravens and other predators attracted to the project area by introduced perching opportunities within the proposed project area. Common wildlife could also be disturbed by increased levels of noise and lighting. Implementation of staff's proposed conditions of certification for special-status species, as described in the following subsections, would effectively avoid and minimize potential impacts to common wildlife. Impacts would be less than significant.

Construction Impacts to Special-status Plants

No special-status plants were observed within the proposed project area during focused botanical surveys in 2007, 2008, and 2009. Three CNPS-listed plants were detected within 4000 to 4975 feet of the project area during surveys. One of these CNPS-listed plants, desert cymopterus (List 1B.2), has moderate to high potential to occur within the project area at the Kramer-Cool Water transmission interconnection site, due to the presence of suitable habitat and historic CNDDB occurrences. Desert cymopterus was not observed at the reference populations in 2008, which may be attributable to below average precipitation levels and therefore the determination of species absence within the project area maybe a false negative. Between March and May 2010, staff plans to re-survey areas within the project site with suitable habitat for desert cymopterus to confirm the 2007-2009 survey results; this would include visiting the reference sites to ensure populations are in bloom .

To avoid direct impacts to desert cymopterus potentially occurring within the project area, the applicant proposes to survey the transmission interconnection site and 200-foot buffer prior to electrical interconnection activities to verify that no desert cymopterus are established in the work area. Staff agrees with this applicant-proposed avoidance measure and has incorporated it, along with measures to follow if the species is detected (i.e., avoidance or translocation), into staff's proposed Condition of Certification **BIO-8** (Rare Plant Pre-construction Surveys and Impact Avoidance).

Special-status plants adjacent to the proposed AMS project area may be crushed or otherwise damaged by construction equipment and vehicle or foot traffic. The potential for these direct impacts to occur is increased if construction equipment or personnel inadvertently work outside of the project boundary. Clear delineation of work areas and prohibition of work outside these areas, as proposed by the applicant (AS 2009a; pg. 5.3-41) and incorporated into staff's proposed Condition of Certification **BIO-7**, would avoid direct impacts to special-status plants.

Vegetation within the proposed Kramer-Cool Water transmission interconnection site at the southern boundary of the project area would be temporarily disturbed during electrical interconnection activities. As described above, this area provides suitable habitat for desert cymopterus and given records of a historic population and nearby observations during surveys, it is possible that this species could disperse and establish in suitable habitat within the interconnection site. Permanent or long-term degradation of the vegetation within the interconnection site would preclude any potential future establishment of desert cymopterus, or other rare plants. However, adequate revegetation and rehabilitation of temporarily disturbed areas, as described in staff's proposed Condition of Certification **BIO-9**, would minimize this impact. Staff, CDFG, and USFWS recommend avoidance of any areas of undisturbed vegetation south of the existing transmission lines within the proposed transmission interconnection site. If this is infeasible, staff's proposed Condition of Certification **BIO-7** would require impacts to be confined to the smallest area possible.

Rare plant populations adjacent to the AMS project area could also be indirectly affected by construction due to increases in wind-blown dust. Disturbance of the soil surface caused by construction traffic, grading, and other construction activities would result in increased wind erosion of the soil. Aeolian (wind-borne) transport of dust and sand can result in the degradation of soil and vegetation over a wide area (Okin et al. 2001). Impacts to vegetation may include killing plants by burial and abrasion, interrupting natural processes of nutrient accumulation, and allowing the loss of soil resources. Dust abatement, as described in Conditions of Certification **AQ-SC3** and **AQ-SC4** is recommended to minimize these impacts.

Direct and indirect impacts to special-status plants adjacent to the proposed AMS site would be avoided or minimized by implementation of staff's proposed Conditions of Certification **BIO-7**, **BIO-8**, **BIO-9**, **AQ-SC3,** and **AQ-SC4**. If rare plants (e.g., desert cymopterus) are detected in the project area during pre-construction surveys, measures outlined in Condition of Certification **BIO-8** would mitigate impacts to less than significant levels.

Construction Impacts to Special-status Wildlife

The loss of approximately 1,765 acres of habitat is expected to partially displace home ranges and reduce carrying capacity for Northern harrier, short-eared owl, loggerhead shrike, LeConte's thrasher, California horned lark, Swainson's hawk, golden eagle, burrowing owl, Mohave ground squirrel, and desert tortoise, all of which may utilize disturbed agricultural lands, particularly when they adjoin higher-quality habitats. The loss of access to habitat within the proposed project area and the resultant fragmentation, would lead to reduced reproductive success, increased adverse edge effects on adjoining lands, and an overall reduction in the area's capacity to support these species. Species-specific impacts and proposed avoidance, minimization, and mitigation measures are discussed in the following sub-sections. Elevated noise and lighting from construction activities may also affect special-status species; these potential impacts are discussed below under **GENERAL CONSTRUCTION IMPACTS**.

Migratory/Special-status Birds

The majority of the proposed project area is devoid of trees due to current and past agricultural operations. Scattered tamarisk trees, which provide suitable nesting substrate for a variety of birds, occur along the western edge of Harper Lake and along some roadsides adjacent to agricultural fields. Suitable nesting habitat is also available within the desert saltbush scrub and Mojave creosote bush scrub within the project area. Northern harrier, short-eared owl, loggerhead shrike, LeConte's thrasher, and California horned lark are special-status species likely to breed and forage at the proposed project area. Focused surveys for nesting Swainson's hawk will be conducted in spring 2010. However, 95% of the California population exists in the Central Valley (CDFG 2005) and there are no known breeding pairs east of Palm Springs (Anderson 2009). Therefore, it is unlikely that nesting Swainson's hawks occur in the vicinity of the AMS project area. Western burrowing owls, which also occur at the proposed AMS site, are discussed below. Additionally, some common bird species adapted to disturbed and transitional environments could nest in equipment or other available substrate within and surrounding the proposed project area.

The loss of active bird nests or young is regulated by the federal Migratory Bird Treaty Act and Fish and Game Code section 3503. Additionally, impacts to golden eagles are regulated by the Bald and Golden Eagle Protection Act (BGPA). Construction activities during the nesting season (February through September) could adversely affect breeding birds through direct take or indirectly through disruption or harassment, which may ultimately result in nest failure or abandonment.

The applicant proposes to conduct pre-construction breeding bird surveys (AS 2009a, pg. 5.3-49). Staff incorporated this applicant-proposed measure into Condition of Certification **BIO-10** (Pre-construction Nest Surveys and Impact Avoidance Measures for Migratory Birds), which provides additional detail on survey timing and measures to avoid disturbance to active nests and ensure compliance with the Migratory Bird Treaty Act. With implementation of staff's proposed Condition of Certification **BIO-10**, significant impacts to nesting birds would not result from proposed project construction activities. Potential impacts to nesting golden eagle are discussed below.

In addition to the aforementioned special-status bird species, Swainson's hawk, American peregrine falcon, Cooper's hawk, Merlin, and prairie falcon are special-status birds that are known to forage within the proposed AMS site. Due to observations proximate to the project area and the presence of suitable habitat, it is likely golden eagles could also utilize the project area for foraging. Project construction would result in the loss of 1,644 acres of suitable foraging habitat, including fallow and active agricultural areas and scrub habitat. Although Swainson's hawk are adapting to the conversion of natural habitat throughout the Central Valley by foraging within agricultural lands, Swainson's hawk, especially in the desert, do not rely solely on agricultural lands for foraging. In desert habitat, Swainson's hawks will eat animals not associated with agriculture, such as reptiles and other small birds.

Siting large-scale solar projects on disturbed agricultural land is preferable to siting them on undisturbed land, both of which provide foraging habitat for Swainson's hawk and other raptors, because development of undisturbed land in the Mojave Desert results in greater biological impacts to more species (e.g., desert tortoise and MGS). However, conservation of Swainson's hawk foraging habitat in the desert is necessary given the rapid pace of development in the Mojave; to this end, CDFG is developing a region-wide plan (Weiss 2009). However, approved guidance is not in place. In light of the tradeoffs to developing undisturbed land and given the availability of natural lands nearly surrounding the project area, loss of Swainson's hawk foraging habitat in the form of active and fallow agricultural land within the project area is considered adverse, but less than significant, and no mitigation is proposed.

Golden eagles are extremely susceptible to disturbance during the breeding season. Given the lack of suitable nesting substrate proximate to the project area (i.e., cliff ledges, rocky outcrops, or large trees), it is unlikely that golden eagles are nesting close enough to the proposed project area to be disturbed by construction or operation activities. However, golden eagle nesting surveys are necessary to substantiate this. Although disturbance to nesting eagles is not anticipated, the project would result in loss of foraging habitat for this species. Significant impacts to golden eagle would occur if the indirect effects of a reduced prey base caused by development of the AMS result in loss of productivity or abandonment of nesting territories. To determine whether the proposed project area constitutes an important foraging area for golden eagle, a nesting survey is required to determine whether the project area is within foraging distance of an active nest (an average of 7.7 to 12.7 square miles (Kochert 2002)) and an assessment of this species usage of the area for foraging needs to be conducted. As guidance becomes available regarding implementation of the revised BGPA, staff encourages the applicant to coordinate closely with USFWS to determine the scope of golden eagle nesting survey and foraging habitat assessment. Further coordination with USFWS and analysis of the applicant's survey results and foraging habitat assessment are required to determine whether construction of the proposed project would result in significant impacts to golden eagles.

Desert Tortoise

Protocol surveys conducted in 2007, 2008, and 2009 did not identify a resident population of desert tortoise within the project area. However, in 2006 a single live tortoise was observed in the project area. Higher concentrations of desert tortoise and sign were recorded immediately east and west of the project area. Although the majority of the 1,765-acre proposed project area is disturbed and lacks suitable forage and burrow sites for this species, transient individuals occur within the portions of the site that support disturbed fallow saltbush scrub and desert wash scrub. Desert tortoise likely access this habitat from the Mojave creosote bush scrub and desert saltbush scrub to the east south and west of the AMS site. A burrow was observed in 2009 within the temporary transmission interconnection area and several other sign were recorded along the eastern edge of the project area, suggesting that tortoise may be attempting to move into the disturbed areas of the project site that are re-establishing saltbush scrub vegetation. The 8-acre proposed transmission interconnection site provides the highest quality undisturbed desert tortoise habitat within the project area and is within the Superior-Cronese DWMA.

Direct mortality, injury, or harassment of desert tortoise could result from encounters with construction vehicles or heavy equipment. Tortoises could be crushed or entombed in their burrows during site grading or other ground disturbing activities. Increased human activity in tortoise-occupied areas and excessive noise or vibration from the heavy equipment would disrupt the breeding and foraging behavior of desert tortoises. Desert tortoise would be attracted to any pooled water in the construction area that resulted from application of water to control dust, placing them at higher risk of injury or mortality from construction activities or predators (e.g., ravens, coyotes) that are also attracted to the water and human-provided scavenging opportunities. Also, tortoise may take shelter under parked vehicles and be killed, injured, or harassed when the vehicles are moved. These potential impacts to desert tortoise would be considered significant without mitigation. Impacts to tortoise from increased traffic during construction are discussed below under **CONSTRUCTION TRAFFIC**.

To avoid and minimize these direct and indirect impacts, the applicant proposes to control standing water, reduce speed limits to prevent road kills, conduct worker environmental awareness training programs, and implement other general measures. Staff has incorporated these applicant-proposed measures into Condition of Certification **BIO-7**. In addition, installation of tortoise-proof exclusion fencing and gates to keep desert tortoise out of construction areas followed by comprehensive clearance surveys and translocation of any individuals in the project area would ensure that there are no tortoise in the project area prior to construction activities. Based on survey results and habitat quality within the proposed project area, it is anticipated by staff, USFWS, and CDFG that few, if any, tortoises would require translocation. These efforts to exclude tortoise from the project area would avoid direct construction related impacts; refer to staff's proposed Condition of Certification **BIO-11** (Desert Tortoise Exclusion Fencing, Clearance Surveys, and Translocation Plan) for additional detail about clearance survey, exclusion, and translocation procedures. Also, the applicant is preparing a draft Desert Tortoise Translocation Plan for review and approval by staff, USFWS, and CDFG. Additional measures from this Plan will be included in conditions of certification or incorporated by reference, as deemed appropriate.

In addition, the proposed project would result in the loss of approximately 430 acres of marginal desert tortoise habitat (refer to **Biological Resources Table 6**) and would exclude tortoise by fencing approximately 1,765 acres within an area surrounded by land designated as critical habitat or DWMA. Construction of a desert tortoise exclusion fence at the perimeter of the plant site could adversely affect desert tortoise by further constricting connectivity between established populations on the east and west sides of the proposed project and precluding future establishment within the proposed project area. An existing barrier to connectivity is the desert tortoise exclusion fencing along 95% of Harper Lake Road between Highway 58 and Lockhart Road (Nicholson 2009). It is uncertain whether there is currently any contact between these populations; however, the potential for gene flow between them exists through randomly interspersed gaps in the fence. Interpopulation connectivity is essential to maintaining genetic diversity within the species; this was identified as an integral factor to desert tortoise recovery (USFWS 2008). The Harper Lake area has not been identified as a regional linkage (CalWild 2000) and although fencing the project area and Harper Lake Road could potentially constrict local connectivity, this is not likely essential to the continued persistence of the populations within the Superior-Cronese DWMA on the east side of Harper Lake Road and the Western Mojave Recovery Unit on the west side of Harper Lake Road. Although impacts to population connectivity would be adverse but less than significant, loss of 430 acres of desert tortoise habitat would be significant without mitigation. Preservation and enhancement of land within the range of this species, particularly high quality habitat within existing critical habitat, would fully mitigate impacts from loss of marginal desert tortoise habitat within the proposed project area. Refer to **HABITAT COMPENSATION** below for additional information and acreage amounts.

In summary, potential direct and indirect impacts to desert tortoise within and adjacent to the proposed AMS site would occur during construction activities through mortality, injury, disruption, harassment, and habitat loss. These potential impacts to desert tortoise would be considered significant without mitigation. Ensuring that no tortoise are within the construction area by translocating any individuals found onsite and excluding tortoise from hazardous construction areas (**BIO-11**) as well as implementing general impact avoidance and minimization measures (**BIO-7**) would minimize impacts. Mitigation for loss of 430 acres of habitat would be achieved through preservation and enhancement of compensatory habitat as described below under **HABITAT COMPENSATION** and in staff's proposed Condition of Certification **BIO-15** (Compensatory Mitigation). Implementation of these conditions of certification would fully mitigate direct and indirect impacts to the federally and state-threatened desert tortoise.

Mohave Ground Squirrel

As describe above, the majority of the project area lacks suitable habitat to support a substantial resident MGS population; however, the native vegetation east (undisturbed creosote scrub) and west (undisturbed desert saltbush scrub and creosote scrub) of the proposed project area provides high quality suitable habitat for MGS and therefore transient MGS may occur onsite. An adult female was trapped immediately south of the proposed project area at the edge of the active alfalfa field.

MGS moving through the project area or across access roads between patches of adjacent suitable habitat may be struck by construction vehicles of equipment. There is the potential that resident MGS may establish within the project area in patches of suitable habitat in advance of construction activities; these individuals may be crushed or entombed in their burrow by site grading or other ground disturbing activities. Resident MGS proximate to the proposed project boundary may be disturbed or harassed by ground vibration and noise as well as human presence during construction; this could adversely affect breeding and/or foraging behavior. In addition, the impermeable fence may lead to increased predation on MGS because the fence could impede escape routes. Assuming construction activities are confined to the fenced perimeter of the site, destruction of MGS burrows surrounding the project area would not occur.

Exclusion or relocation of MGS is difficult because this species is difficult to trap and can easily burrow under or climb over exclusion fencing. Also, MGS are difficult to visually detect because they spend the majority of their time underground in burrows. Nonetheless, direct impacts to MGS within the project area would be avoided and minimized to the extent possible by attempting to trap and relocate any individuals within the exclusion fence surrounding the project area. Visual surveys subsequent to installation of exclusion fence and immediately prior to ground disturbing activities would be conducted to identify MGS. Traps would be set for these individuals and if captured, they would be safely relocated to suitable habitat adjacent to the proposed AMS site. These proposed relocation measures are detailed in staff's proposed Condition of Certification **BIO-12** (Mohave Ground Squirrel Clearance Survey). In addition, the general impact avoidance and minimization measures described in Condition of Certification **BIO-7** would require escorts immediately ahead of equipment during vegetation removal and grading activities and removal of any MGS attractants (e.g., human food, trash) from the project area, thereby further reducing the potential for adverse impacts to MGS.

In addition, the proposed project would result in the loss of approximately 430 acres of marginal MGS habitat (refer to **Biological Resources Table 6**) and would fence approximately 1,765 acres within an area surrounded by land designated by BLM as Mohave Ground Squirrel Conservation Area. Within this conservation area, four core MGS populations and four other major populations have been identified (Leitner 2008b). The proposed project is located between the Edwards Air Force Base core population and Coolgardie Mesa-Superior Valley core population, which are separated by approximately 25 to 30 miles. Ensuring sufficient connectivity to allow gene flow between core populations is an important conservation goal. However, there is not a wildlife movement corridor across the Harper Valley area between the Edwards Air Force Base and Coolgardie Mesa-Superior Valley core populations (Leitner 2008b). Therefore, development of the proposed project is not expected to constrain regional MGS population connectivity. Although impacts to population connectivity would be adverse but less than significant, loss of MGS habitat is considered significant without mitigation. Preservation and enhancement of land within MGS range, particularly high quality habitat within or adjacent to the MGS Conservation Area, would fully mitigate impacts from loss of marginal MGS habitat within the proposed project area. Refer to **HABITAT COMPENSATION** below for additional information and acreage amounts.

In summary, potential direct and indirect impacts to MGS within and adjacent to the proposed AMS site would occur during construction activities through mortality, injury, disruption, harassment, and habitat loss. These potential impacts to MGS would be considered significant without mitigation. Attempting to relocate any individuals onsite (**BIO-12**) and implementing the general impact avoidance and minimization measures (**BIO-7**) would minimize impacts. Mitigation for the loss of 430 acres of habitat would be achieved through preservation and enhancement of compensatory habitat as described below under **HABITAT COMPENSATION** and in staff's proposed Condition of Certification **BIO-15**. Implementation of these conditions of certification would fully mitigate direct and indirect impacts to state-threatened MGS.

Western Burrowing Owl

Burrowing owls, a California species concern, nest and forage within the proposed project area and could be directly and indirectly impacted by construction of the AMS project. Potential impacts to this species include direct mortality from encounters with construction equipment, burrow/nest destruction during site clearing/grading, entombing burrowing owl adults, eggs, or young, and disruption or harassment. Disruption or harassment may result in nest abandonment or otherwise reduced reproductive success. In addition, project construction would result in the loss of approximately 1,644 acres of suitable foraging habitat, including fallow and active agricultural areas and scrub habitat. These potential impacts to burrowing owls would be considered significant without mitigation.

To identify burrowing owls within the proposed project impact area, the applicant has proposed conducting preconstruction surveys on the AMS site, using methods recommended by CDFG (CBOC 1993; CDFG 1995). To avoid direct take of owls, the applicant has also proposed passive relocation of individuals from the construction area to adjacent areas of contiguous suitable habitat. Passive relocation involves excluding the owls by use of one-way doors, at which point they may take residency in nearby artificial or natural burrows or disperse to another area (CDFG 1995). Passive relocation of owls is only implemented during the non-breeding season in order to avoid egg and dependent chick separation from adult owls, which would likely result in death of those eggs and young. In order to monitor relocation success and at the request of USFWS, burrowing owls within the AMS project area would be trapped and color-banded prior to implementation of passive relocation efforts. The applicant proposes to monitor the relocation area for a minimum of five years after initiation of passive relocation. Staff agrees with this condition and has incorporated it as well as preconstruction survey and other passive relocation requirements as well as monitoring and reporting requirements into Condition of Certification **BIO-13** (Burrowing Owl Impact Avoidance, Minimization, and Habitat Compensation).

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; therefore habitat compensation is required to reduce these impacts to less than significant levels. The location and amount of compensatory habitat required to fully mitigate impacts to burrowing owl is based on the number of impacted owls and assumes that currently occupied habitat will be replaced with nearby occupied habitat. Due to variation in the number of burrowing owls observed during annual surveys of the proposed project area and vicinity (4 in 2006, 3 in 2007, 1 in 2008, 1 in 2009), CDFG has determined that the appropriate census to use to calculate habitat compensation for this species shall be determined based on 2010 pre-construction surveys. The methodology for this calculation is pursuant to CDFG guidance, which recommends 6.5 acres of habitat per unpaired individual or pair of relocated owl(s) and a 5:1 replacement ratio for creation of artificial burrows (CDFG 1995). These mitigation requirements are described in staff's proposed Condition of Certification **BIO-13**.

In summary, direct and indirect impacts to burrowing owl resulting from construction of the proposed project would be mitigated to less than significant levels through pre-construction surveys and passive relocation of owls within the project footprint as well as acquisition of compensatory habitat and monitoring the relocated owls on the acquired parcel(s). These measures were adapted, in part, from the applicant-proposed Western Burrowing Owl Management and Monitoring Plan (AS 2009a, pg. 5.3-48), in consultation with CDFG and USFWS; refer to Condition of Certification **BIO-13** for details.

American Badger and Desert Kit Fox

One American badger den and two desert kit fox dens were observed within the proposed project area; these species are considered present on the proposed project area. Construction activities, including site grading and heavy equipment operation, could kill or injure American badgers and desert kit foxes from contact with construction equipment or entombment in their den. Construction activities could also result in disturbance or harassment of individuals. Impacts to American badger and desert kit fox would be avoided or minimized by excluding these animals from the project area prior to construction activities. To this end, staff proposes Condition of Certification **BIO-14** (American Badger and Desert Kit Fox Impact Avoidance and Minimization Measures), which requires that a qualified biologist perform a preconstruction survey for badger and kit fox dens in the project area and a 250-foot buffer concurrent with desert tortoise surveys. Outside of the whelping season (i.e., not February 1 to September 30), individuals would be excluded from dens and the dens would be collapsed once confirmed vacant. This passive relocation technique encourages excluded animals to take residency in nearby habitat or disperse to another area. Implementation of this condition would avoid and minimize impacts to American badger and desert kit fox potentially resulting from project construction activities.

Construction Traffic

Roads and highways are ubiquitous landscape features that have a variety of direct (e.g., road mortality) and indirect effects (e.g., habitat fragmentation, proliferation of non-native and predatory species) on surrounding wildlife populations, including desert tortoise (Boarman and Sazaki 2006; Boarman 2002; Jennings 1997; USFWS 2008). The proposed project would not require construction of a new road; however, access by construction personnel and equipment would increase existing traffic levels along Harper Lake Road between State Route 58 and the proposed AMS site. During the peak project construction phase, it is estimated that approximately 490 additional trips per day would be required to transport 1,162 workers (AS 2009a, pg. 5.13-16).

The majority of Harper Lake Road has desert tortoise exclusion fencing; however, some areas along the roadway are unfenced at the request of private property owners or at intersections with utility crossings and roads (Nicholson 2009). Tortoise and other wildlife can access Harper Lake Road at these gaps in the exclusion fence and be forced to travel along the road, unable to cross the fence at the other side. These animals are especially vulnerable to vehicle collisions. Increased mortality of desert tortoise and other special-status wildlife due to collisions with project vehicles is a significant impact.

Further, roads and highways are the primary barrier to habitat connectivity and species movement in the west Mojave Desert (CalWild 2000; USFWS 2008); local connectivity constraints within the conservation areas (i.e., DWMA, desert tortoise critical habitat, MGS conservation area) would be exacerbated by increased traffic levels associated with project construction.

Environmental awareness training for workers traveling to and from the project area as well as adherence to posted speed limits may reduce traffic mortality to wildlife along Harper Lake Road and project access roads. These impact avoidance and minimization measures are described in staff's proposed Conditions of Certification **BIO-5** and **BIO-7**, respectively. In addition, monitoring Harper Lake Road during construction and moving any desert tortoises or other vulnerable wildlife found within the roadway or shoulder would further reduce the potential for vehicle/wildlife collisions and may even prevent mortality of wildlife along Harper Lake Road and project access roads. Road monitoring requirements are presented in staff's proposed Condition of Certification **BIO-7**, which include moving any tortoises trapped within the fenced roadways, escorting equipment or vehicles moving though unfenced areas, and checking beneath vehicles for tortoises or other wildlife before driving. Road kill reporting, per Condition of Certification **BIO-7**, would serve as an indicator of the effectiveness of these measures. Implementation of the impact avoidance and minimization measures in staff's proposed Conditions of Certification **BIO-5** and **BIO-7** would reduce impacts to special-status wildlife from construction traffic to less than significant levels.

Habitat Compensation

The objective of compensatory mitigation is to offset, to the extent practicable, adverse impacts (i.e., take, displacement effects, and habitat loss) of the proposed project by providing compensatory mitigation lands with some biologically relevant nexus to the impact. The mitigation lands should maintain the number and the range of the impacted species by creating new functional habitat, enhancing or restoring existing functional habitat, and/or initiating management actions in habitats to increase function (carrying capacity) and reduce/control adverse conditions (exotics, nest predators).

The California Code of Regulations, Section 783.4 stipulates that an incidental take of a state-listed species can be issued only when an applicant has minimized and fully mitigated the impacts of the proposed taking, including all impacts on the species that result from any act that would cause the proposed taking. Section 783.4 also states that measures must be capable of successful implementation.

Compensatory Mitigation Acreage and Location

Staff recommends that a minimum of 118.2 acres of high quality suitable habitat be managed and protected in perpetuity by conservation easement in order to fully mitigate the permanent direct, indirect, and cumulative impacts to desert tortoise and MGS resulting from development of the AMS project area. This is in addition to any compensatory habitat requirements for burrowing owl, which are described above under **WESTERN BURROWING OWL**.

The recommended acreage of compensation land reflects consideration of several factors. The habitat quality of the project area, proximity to the compensation area to natural lands (e.g., DWMA, desert tortoise critical habitat, MGS conservation area), and the habitat quality of the compensatory mitigation lands affects the number of individuals those lands can support. Given this, the objective is to determine the acreage within the applicant-proposed compensation area that will offset the reduced carrying capacity from developing the AMS site.

To this end, CDFG proposed the following methodology for calculating compensatory acreages of each affected suitable habitat type within the proposed project area:

Biological Resources Table 6
Recommended Compensatory Habitat Acreages for Impacts to Desert Tortoise and MGS

Suitable Habitat Type	Acreage in AMS Site	Mitigation Ratio	Compensation Acreage
Undisturbed Desert Saltbush Scrub	0.6	5:1	3
Disturbed – Desert Saltbush Scrub	1.1	2:1	2.2
Disturbed - Saltbush Scrub Regrowth	226	0.5:1	113
Fallow Agricultural – Saltbush Scrub Regrowth	202.9	0:1	0
TOTAL	**430.6**	**----**	**118.2**

Source: Moore 2009

Staff and USFWS concur with these ratios. The 5:1 mitigation ratio for impacts to undisturbed desert saltbush scrub is based the proposed project's adjacency to a DWMA and desert tortoise critical habitat, as well as proximity to high concentrations of desert tortoise, known locations of MGS, and the potential for this habitat type to support several other special-status species, including rare plants and raptors. This is CDFG's standard for projects in the Hinkley area (Moore 2010) and was implemented for SEGS VII and IX (CEC 1988; CEC 1989).

The details of the project's compensatory mitigation requirements are found in staff's proposed Condition of Certification **BIO-15** (Compensatory Mitigation), which was developed in close coordination with CDFG and USFWS. Impacts to the federally and state-threatened desert tortoise and the state-threatened Mohave ground squirrel from habitat loss would be significant without mitigation; however, acquisition and enhancement of 118.2 acres of high quality suitable habitat would reduce permanent impacts to less than significant levels. Effectively, habitat compensation would also mitigate impacts to the other affected special-status mammals (i.e., American badger and desert kit fox) as well as raptor foraging habitat because of similar habitat requirements.

To satisfy compensatory mitigation requirements, the applicant proposes to permanently protect under conservation easement a portion of 647 acres of applicant-owned land located approximately 1.25 miles west of the proposed project area (AS 2009e). Vegetation communities within the applicant-owned land include desert saltbush scrub and desert wash scrub. Approximately 414 acres along the eastern portion of this land is encumbered under a Flood Runoff Easement, which leaves 233 acres available for compensatory mitigation; 118.2 acres would be required for compensatory mitigation as described above. As illustrated in **Biological Resources Figure 1**, the proposed compensation lands are entirely located within designated desert tortoise critical habitat and MGS Conservation Area. Surveys conducted in 2008 within the one-mile buffer of an earlier iteration of the proposed project area covered the majority of the compensation lands with the exception of approximately 158 acres in the northernmost portion. No desert tortoises or sign or MGS were observed within the surveyed part of the proposed compensation area. However, a tortoise carcass and other sign were observed immediately west of the proposed compensation area and a high concentration of desert tortoise occur immediately south east of the compensation area.

Staff, CDFG, and USFWS concur that the applicant-proposed compensation land is of higher quality than the habitat that would be developed within the AMS project area and are currently reviewing the applicant's compensatory mitigation proposal as presented to CDFG and the Energy Commission via a California ESA Section 2081 Permit Application (AS 2009e). CDFG typically determines suitability of the proposed compensation lands through the Incidental Take Permit process once the Proposed Land Acquisition Form is completed; however, this process is subsumed in the Energy Commission's facility licensing process per the Warren-Alquist Act (Pub. Resources Code § 25500). The Energy Commission consults with CDFG regarding the acceptability of compensation lands and incorporates their determination into the Commission Decision. In order for CDFG to determine the acceptability of the proposed mitigation lands, staff and CDFG need to know exactly which portion of the 233 acre parcel is proposed for habitat compensation. After the location of compensation land is identified, the applicant must evaluate the degree of disturbance, dumping, historical structures, etc. that may require cleaning, fencing, repairs, demolition, etc. In addition CDFG and staff need to know if the applicant would conduct this work (if required) prior to conserving the land or if additional lands or monies will be required to off-set the aforementioned impediments.

Construction Impacts to Jurisdictional Waters

Approximately 1.59 acres of tamarisk scrub along the edge of Harper Dry Lake have been identified as potentially USACE jurisdictional waters of the U.S because they meet the three parameters required for designation as potential waters of the U.S (i.e., wetland hydrology, hydric soils, and hydrophytic vegetation). Other potentially jurisdictional waters include 9.44 acres of dry lakebed (alkali playa). Impacts to approximately 10.76 acres (1.32 acres of tamarisk + 9.44 acres of lakebed) of potential waters of the U.S would be avoided by establishing a construction exclusion zone within which no equipment or personnel would enter and no work would be conducted. Approximately 0.27 acres would be directly impacted (i.e., removed) during construction.

The USACE has determined that all aquatic features occurring within the proposed project area are isolated and therefore not under their jurisdiction. A permit is not required for the AMS Project under Section 404 of the Clean Water Act (Estes 2010).

Construction of the proposed project, specifically the drainage channel outlet at Harper Dry Lake, would result in direct impacts (i.e., removal) to 1.47 acres of tamarisk scrub. The applicant classified tamarisk scrub as lacustrine riparian extent given its proximity to Harper Dry Lake. However, CDFG and RWQCB do not typically exert jurisdiction over monotypic stands of tamarisk scrub because it is an invasive species with little habitat value. Direct impacts to tamarisk would not require mitigation. Rather, removal of tamarisk would be considered an environmental benefit because tamarisk is an invasive species that out-competes native vegetation and alters the desert ecosystem functions and values by converting habitats into monocultures, which reduces the diversity required to support native plants and wildlife populations. To ensure effective eradication of this invasive species, monitoring and reporting over a five year period would be required consistent with CDFG 1600 authorization practices (refer to Condition of Certification **BIO-16** [Tamarisk Eradication Monitoring and Reporting Program]). Impacts to waters of the state would be less than significant and no mitigation is proposed.

General Construction Impacts

Construction activities, including noise and lighting impacts, have the potential to create a variety of temporary impacts to biological resources. In addition, construction activities could spread noxious weeds in areas adjacent to the proposed AMS site. These general construction impacts are discussed below.

Noise

Construction activities would primarily occur between 7:00 AM and 6:00 PM and would result in a short-term, temporary increase in the ambient noise level. Although sporadic, existing noise sources from traffic on Harper Lake Road and Lockhart Road and overhead military aircraft from neighboring Edwards Air Force Base, create elevated ambient noise levels to which most local wildlife species have acclimated. Excessive construction noise could disrupt the nesting, roosting, or foraging activities of sensitive wildlife. The Harper Dry Lake marsh, immediately southeast of the proposed project, is an especially sensitive noise receptor due to the presence of breeding birds. Studies have shown that noise levels over 60 A-weighted decibels (dBA) can result in nest abandonment and intense, long-lasting noise can mask bird calls which can reduce reproductive success (Dooling and Popper 2007; Hunsaker 2001). In addition, 60 dBA has been used by the USFWS and the Energy Commission as a reference point for evaluating noise impacts on wildlife (CEC 2002; CEC 2003).

During construction, the noise levels from the project area to the nearest biologically sensitive receptor, Harper Dry Lake marsh, would range from 54 dBA to 60 dBA (ESH 2009c, Table 5). However, the applicant's construction noise level analysis utilizes averaged emission levels, and actual "noise levels at a particular location may be higher or may be lower than the tabled values on any given day and at any given time" (ESH 2009c, Table 5). Therefore, grading work on the proposed drainage channel outlet at the northeast corner of the site, which is the area of construction closest to the sensitive marsh habitat, could yield higher noise levels than the projected level of 59 dBA (ESH 2009c, Table 5) and may exceed the 60 dBA significance threshold for noise impacts to wildlife.

Pre-construction clearance surveys followed by surrounding the entire site with appropriate exclusion fencing prior to construction activities would ensure that no nesting birds or other sensitive wildlife are present onsite during construction. To minimize noise impacts to breeding birds at the marsh staff recommends Condition of Certification **BIO-10**, which requires a qualified biologist to monitor any areas expected to exceed 60 dBA during construction for nesting birds. With implementation of this condition, impacts to nesting birds from proposed project construction activities would be less than significant. For a complete analysis of construction noise impacts, refer to the **NOISE** section of this Staff Assessment.

Lighting

The majority of construction activities would occur between 7:00 AM and 6:00 PM; however, construction activities outside of these hours may be required to maintain schedule. For construction activities at night, lighting would mostly occur in the Solar Collection Assembly buildings located in the northeast corner of the Alpha site; however, some outside lighting may also be necessary. Bright lighting at night could disturb the nesting, foraging, or mating activities of wildlife and make wildlife more visible to predators. Night lighting could be especially disruptive to nocturnal animals, including desert kit fox and owls, which were observed onsite. Also, night lighting could be disorienting to migratory birds and, if placed on tall structures, may increase the likelihood of collision, as discussed under **AVIAN COLLISION AND ELECTROCUTION**.

Nocturnal mammals would be excluded from the project area prior to construction as described in staff's proposed Condition of Certification **BIO-14**. To minimize light visible outside of the project area, Condition of Certification **BIO-7** requires the use of light shields, light direction, and low intensity lighting and requires that side-cast light not be directed at the edges of the project boundary or the Harper Dry Lake marsh, thereby avoiding sensitive wildlife habitat. Lighting impacts during construction would be temporary and with implementation of staff's proposed Conditions of Certification **BIO-7** and **BIO-14**, impacts to wildlife from proposed project construction lighting activities would be less than significant. For a complete analysis of construction lighting impacts, refer to the **VISUAL** section of this Staff Assessment, including Condition of Certification **VIS-3**.

Spread of Noxious Weeds

The spread of noxious weeds is a major threat to biological resources in the Mojave Desert, particularly where disturbance has occurred and is ongoing. Non-native weeds frequently outcompete native plants resulting in several synergistic indirect effects: increased fire frequency by providing sufficient fuel to carry fires, especially in the inter-shrub spaces that are mostly devoid of native vegetation (Brown and Minnich 1986; Brooks and Esque 2002) as well as decreased quality and quantity of plant foods available to desert tortoises and other herbivores and thereby affecting their nutritional intake (Hazard et al. 2002; Nagy et al.1998). The entire proposed AMS site would be permanently disturbed and graded to eliminate existing vegetation and level the site. Construction activities and soil disturbance would aid the transport and dispersal of invasive weed propagules, thereby potentially introducing new species of noxious weeds to lands adjacent to the AMS plant site and exacerbating invasions already present in the project vicinity. There are several species of noxious weeds within the proposed project area and within its immediate vicinity including Saharan mustard and split grass, two of several species that are rapidly spreading and invading the Mohave Desert (LaBerteaux 2006). Staff's proposed Condition of Certification **BIO-7** requires construction vehicles to be inspected and washed offsite within an approved area or commercial facility prior to use, monitoring and eradication of any weed invasions, and quick revegetation of temporarily disturbed areas. Implementation of this Condition would reduce potential permanent, indirect impacts from the spread of noxious weeds to less than significant levels.

Operation Impacts and Mitigation

Potential operation-related impacts include: impacts to birds due to collision with and/or electrocution by the transmission line and exhaust stacks; disturbance to wildlife due to increased noise and lighting or glare; impacts to sensitive habitats from alterations in quality or quantity of water currently reaching Harper Dry Lake; and indirect impacts to wildlife from road mortality, exposure to evaporation ponds and other pitfalls, and raven predation.

Avian Collision and Electrocution

Proposed project components that may present an electrocution and/or collision hazard to wildlife include two 72.5-foot-tall steam generator buildings, two 44-foot-tall cooling tower stacks, and 31 80-100-foot-tall transmission line support structures. Existing infrastructure proximate to the AMS site that currently presents an electrocution and/or collision hazard includes the existing SCE Kramer-Cool Water No. 1 230-kV transmission line (100-foot-tall lattice towers), LADWP Mead-Adelanto 500-kV transmission line (150-foot-tall lattice towers) and low-voltage transmission line, which run parallel and adjacent to the southern boundary of the proposed project area. The tallest existing facilities at SEGS VIII and IX adjacent to the AMS site are the cooling tower stacks, which are approximately 50 feet tall.

Collision

Bird collisions with power lines and structures generally occur when a power line or other structure transects a daily flight path used by a concentration of birds and these birds are traveling at reduced altitudes and encounter tall structures in their path (Brown 1993). 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 inclement weather (e.g., fog, which is rare in the desert), during strong winds, and during panic flushes when birds are startled by a disturbance or are fleeing from danger. 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). Marsh habitat at Harper Dry Lake adjacent to the project attracts resident and migratory birds and has been known to support thousands of birds during the spring months (Cardiff 1998; BLM 2009).

It is possible that bird collisions with the AMS buildings, cooling tower stacks, transmission poles and other facilities would occur. Structures over 500 feet tall present a greater risk to migratory songbirds than shorter structures (Kerlinger 2000); bird mortality is significantly lower at towers shorter than 350 feet (Karlsson 1977; Longcore et al 2008). The tallest proposed AMS facilities are the transmission poles, which would be an average of 80 feet tall and a maximum of 100 feet tall. The solar trough mirrors would be approximately 21 feet tall.

Bird response to glare from the proposed solar trough technology is not well understood. Although the proposed AMS facilities are significantly shorter than 350 feet (the height above which is considered a collision danger for migrating birds), there is concern that the mirrors may appear to a bird as a no-hazard flight area. The mirrors reflect light and take on the color of the image being reflected (Ho et al. 2009). For example, when the mirrors reflect the sky, they can have a blue lake-like appearance, and the reflection tends to be similar to the reflection off a body of water. The reflection may also appear as clouds or terrain. Birds may fly directly into the mirrors not expecting to encounter a hard surface thereby suffering an injury or death. Staff, CDFG, and USFWS have determined that the potential for bird injury and mortality is heightened due to the proposed project's proximity to and east-facing orientation toward the Harper Dry Lake marsh, a concentration area for migratory birds.

Given the lack of research-based data on these impacts, staff cannot conclude that they are significant. However, due to potential for significant impacts, staff recommends monitoring so that if impacts do occur, they can be addressed (refer to Condition of Certification **BIO-17** [Monitoring Impacts of Solar Collection Technology on Birds]). Glare impacts with regard to potential ocular injury from beam intensity is discussed below.

Electrocution

Egrets, herons, raptors, and other large aerial perching birds, including those accorded state and/or federal protection, are susceptible to transmission line electrocution if they simultaneously contact two energized phase conductors or an energized conductor and grounded hardware. This happens most frequently when a bird attempts to perch on a transmission tower/pole with insufficient clearance between these energized elements. 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 AMS transmission lines would be 230-kV; therefore, phase-to-phase and phase-to-ground clearances are expected to be sufficient to minimize bird electrocutions.

Potential impacts to wildlife resulting from electrocution by transmission lines required for AMS project interconnection may be mitigated by incorporating the construction design recommendations provided in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (APLIC 2006). Specifically, the phase conductors shall be separated by a minimum of 60 inches and bird perch diverters and/or specifically designed avian protection materials should be used to cover electrical equipment where adequate separation is not feasible (APLIC 2006). This is further described in staff's proposed Condition of Certification **BIO-7** (Impact Avoidance and Minimization Measures); implementation of Condition of Certification **BIO-7** would prevent bird mortality from electrocution.

Operation Lighting – Glare

The proposed solar mirrors and heat collection elements (HCEs) or receiver tubes are sources of bright light caused from the diffuse reflection of the sun. The first row of solar mirrors and receiver tubes would be approximately 200 meters (650 feet) west and southwest of the marsh. The solar mirrors would face east at dawn toward the Harper Dry Lake marsh and would be reflective at the marsh until approximately noon, at which time the mirrors would track the sun into a horizontal position. Glare intensity from the solar mirrors at distances beyond 100 feet would not be any different than the sun's intensity (URS 2008). The illuminated receiver tubes would be visible to an observer who is not looking directly at the mirrors axis or center, however this illumination would be much less than that of the sun (ESH 2009d). The light reflecting from the solar mirrors and the receiver tubes would not pose a significant impact to wildlife at the marsh given the distance of the marsh from the first row of solar mirrors and the absorptive properties of the receiver tubes. However, glint and glare studies of solar trough technology found that pedestrians standing within 20 meters (60 feet) of the perimeter fence when the mirrors rotate from the stowed position to a vertical position may see a light intensity equal or greater to levels considered safe for the human retina (CESF 2008; URS 2008). Staff concludes that any wildlife on the ground at a distance of 20 meters or closer could experience similar hazards from unsafe light intensity. Implementation of staff's proposed Condition of Certification **VIS-4**, which requires slatted fencing 10 feet in height be used as the perimeter fencing along the southern and eastern project boundaries, would prevent glare exposure to wildlife on the ground, thereby reducing potential impacts to less than significant levels.

Operation Noise

In consideration of existing ambient noise levels and the proposed project's operational noise, cumulative operational noise levels would not increase above existing ambient conditions, which is approximately 42 to 52 dBA (AS 2009a, Table 5.8-6). The majority of operational noise would originate from the power blocks, which would be roughly centered at each Alpha and Beta site and surrounded by solar fields; this creates a buffer for noise to attenuate before reaching the AMS property boundary and the Harper Dry Lake marsh. Other minor operational noise sources include mirror rotation and maintenance activities (e.g., mirror washing). Operational noise from the existing SEGS XIII and IV, which is anticipated to be nearly identical to the proposed project, was observed by staff during several site visits and determined to be diminutive. Staff concludes there would be no significant impacts to biological resources by increased operational noise and no mitigation is proposed. For a complete analysis of operational noise impacts, refer to the **NOISE** section of this Staff Assessment.

Operation Impacts to Desert Tortoise

Stormwater Drainage Channels

The proposed stormwater drainage channels present a serious entrapment hazard to desert tortoise and other wildlife. As described above, the main drainage Channel A would be at approximately 15 feet deep and 300 feet wide through the project area, opening to 1200 feet wide at the outlet. Any wildlife unable to fly that fell into this drainage channel would likely be injured from the fall and would be unable to escape, resulting in increased vulnerability to predation and mortality. Further, wildlife could become entangled in the gabion mattress and energy dissipation materials as well as any debris within the drainage channels. To avoid injury and mortality to wildlife, staff recommends that exclusion fencing be reinforced around the drainage channels, particularly at the headwalls, outlet, and road crossings, and monitored for breaches or disrepair (refer to Condition of Certification **BIO-11**). Implementation of staff's proposed Condition of Certification **BIO-11** would avoid and minimize impacts to desert tortoise and other wildlife by excluding them from the stormwater drainage channels within the project area.

Raven Predation

The common raven is the most highly visible predator of juvenile desert tortoises (USFWS 2008). Predation pressure by ravens is increased through elevated raven populations as a result of resource subsidies associated with human activities. Ravens are attracted to food in the form of organic garbage in trash containers, water from dust abatement and evaporation ponds, and nesting substrates on transmission line towers and other infrastructure (Boarman et al. 2006). Transmission lines and other infrastructure provide perching opportunities that enhance a raven's ability to kill tortoise, in part, by allowing them to spot slow-moving juveniles outside of the burrow. Loss of juvenile tortoise due to raven predation could have a long-term effect on the regional tortoise population by reducing the recruitment of juvenile tortoises into the adult life stages (Boarman 2003).

Decreasing raven subsidies would discourage their residence and proliferation at the project area, thereby reducing the risk of predation on juvenile tortoises. To this end, staff's proposed Condition of Certification **BIO-7** requires trash control and disposal offsite; **BIO-7** also requires minimal water application and monitoring to ensure water does not puddle; **BIO-18** (Common Raven Monitoring, Management, and Control) requires installation of physical deterrents to raven nesting and perching (e.g., bird spikes) on proposed AMS facilities as well as nest removal and monitoring to ensure the effectiveness of these project design features. Evaporation ponds are discussed below. These and potentially other measures to prevent raven predation as well as raven monitoring and reporting strategies will be included in a project-specific Common Raven Monitoring, Management, and Control Plan, which is currently under review by staff, USFWS, and CDFG; an approved plan must be in place prior to project construction (refer to Condition of Certification **BIO-18**). Additional measures from this final approved Plan will be included in conditions of certification or incorporated by reference, as deemed appropriate.

Long-term effects of reduced recruitment on the regional tortoise population may not be apparent for years because tortoises do not typically reach sexual maturity until approximately 15 to 20 years of age. In response, USFWS is proactively developing a comprehensive, regional raven management plan that would implement recommendations in the USFWS *Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2008b). To minimize the proposed project's contribution to the regional impacts on desert tortoise from raven predation, USFWS requests that the applicant submit payment to a third party account set up by the USFWS to support the regional monitoring plan (Blackford 2009). These fees would contribute to a region-wide raven management and monitoring program in the California Desert Conservation Area. However, the regional program is under development and a formal funding process has not been established (Blackford 2009). Once established, the applicant has proposed payment of approximately $50,000 toward the fund (AS 2009c); this proposal is currently being considered by staff, USFWS, and CDFG.

Implementation of the project-specific raven management requirements presented in **BIO-7** and **BIO-18** would reduce impacts to desert tortoise from raven predation to less-than-significant levels. In addition, payment toward the USFWS regional raven management program would offset contributions of the AMS project to cumulative impacts associated with regional increases in raven numbers.

Operation Traffic

Operation of the AMS project would generate a maximum of 250 trips per day (AS 2009a, pg. 5.13-23); thereby resulting in an increase in traffic along Harper Lake Road. Direct impacts to wildlife, including desert tortoise, are the same for operational traffic as described for construction traffic, above. Similarly, implementation of staff's proposed Condition of Certification **BIO-5**, which requires environmental awareness training for workers and staff's proposed Condition of Certification **BIO-7**, which requires adherence to posted speed limits, periodic monitoring for desert tortoise within the roadway, and checking beneath parked vehicles for tortoises or other wildlife before driving, would avoid and minimize potential impacts from operation traffic. Road kill reporting, per Condition of Certification **BIO-7**, would serve as an indicator of the effectiveness of these measures. Implementation of the impact avoidance and minimization measures in staff's proposed Conditions of Certification **BIO-5** and **BIO-7** would reduce impacts to special-status wildlife from operation traffic to less than significant levels.

Evaporation Ponds

The proposed project includes four, five-acre evaporation ponds that would collect blowdown water from the cooling towers. It is estimated that operational capacity depth would be approximately six feet with at least two feet of freeboard; side slopes would be 3:1 (horizontal: vertical) or steeper (AS 2009d).

A variety of waterfowl and shorebirds seasonally inhabit or utilize evaporation ponds as resting, foraging, and nesting areas. Evaporation ponds in the Mojave Desert pose several threats to wildlife: increased exposure to predators, salt toxicosis, and bioaccumulation of selenium and other hazardous water quality constituents. Wildlife predation on prey having accumulations of selenium and other constituents provides a trophic pathway for exposure of these wildlife species to hazardous water quality constituents in the evaporation pond. Impacts to wildlife from evaporation ponds are considered significant if they: increase mortality, reduce growth or conditions, result in reproductive impairment, cause post-hatch juvenile mortality, or cause or contribute to substantial short- or long-term reductions in species abundance (EPTC 1999).

Although effects of selenium uptake are species specific, exposure of waterfowl and shorebirds to selenium has been shown to contribute to sub-lethal effects that include, but are not limited to, changes in enzyme activity, histological abnormalities, impaired growth, and increased susceptibility to disease (EPTC 1999). In turn, these effects are likely to adversely affect species growth, survival, and reproductive success. Selenium concentrations in water over 0.005 mg/L (or 5 µg/L) in combination with invertebrates with concentrations greater than 5 parts per million (dry weight) are considered hazardous to the health and long-term survival of wildlife populations (Lemly 1996).

Water quality samples taken from wells proximate to the proposed project indicated that selenium levels in the groundwater are between 0.005 mg/L (5 µg/L) and 0.013 (13 µg/L), which is already at or in exceedance of the impact threshold; cooling water processes would concentrate selenium. However, the proposed AMS project includes a precipitation unit that captures minerals (e.g., selenium) and metals (e.g., chromium) in cooling water prior to discharging it into the evaporation ponds. This is expected to remove the majority of selenium and chromium from the wastewater stream. Conservatively assuming that no selenium is removed in the clarifier and filter processes (as the applicant has done in its Report of Waste Discharge), 0.25 mg/L (250 µg/L) would be discharged into the AMS evaporation ponds (AS 2009b), which is approximately 50 times the aforementioned impact threshold.

Salt accumulation on bird tail feathers adversely affects the bird's ability to fly and avoid predators and also increases the weight of a bird, which increases energy expenditure for movement. Elevated salinity levels in evaporation ponds may contribute to reduced hatching success, increased juvenile mortality, and cause salt toxicosis. Salt toxicosis occurs when the bird can no longer excrete salt at levels equal to ingestion, but can be reversed if the birds ingest fresh water. Salt toxicosis in waterfowl has been reported in ponds with sodium concentration over 17,000 mg/L (USFWS 1992b; Windingstad et al. 1987). Birds spending a minimum of three hours at evaporation ponds with 52,000 to 66,000 mg/L of sodium were considered to have toxic brain sodium concentrations (USFWS 1992b). It is estimated that sodium concentrations in the AMS evaporation ponds would range from 27,996 mg/L to 35,870 mg/L (AMS 2009a, pg. 5.3-36).

In August 2007, 19 ducks died of salt toxicosis and encrustation at SEGS VIII evaporation ponds. Abnormally low water levels in the evaporation ponds caused total dissolved solids (TDS), including salt, to concentrate to lethal levels. At that time, it is likely that sodium concentrations were approximately 80,000 mg/L to 102,000 mg/L. A second mortality incident occurred in October 2007, but the cause was not determined. Both the proposed AMS and the existing SEGS VIII and XI use groundwater within the Harper Lake groundwater sub-basin for cooling. Minor differences in water quality are expected between the projects due to the use of different groundwater wells and the associated variability in groundwater quality within the basin; TDS are expected to be lower at AMS. Nonetheless, wildlife issues at SEGS VIII and XI are a good proxy for potential impacts from the AMS evaporation ponds.

Because water quality can vary markedly in the evaporation ponds depending on depth, concentration of solids, and/or contamination, evaporation ponds are hazardous to wildlife. Further, USFWS is opposed to the use of wet cooling in the desert (Blackford 2009). Dry cooling is being evaluated by staff as an alternative to wet cooling (refer to the **ALTERNATIVES** section of this Staff Assessment) and zero liquid discharge (ZLD) remains a viable wastewater disposal alternative to evaporation ponds (refer to the **SOIL & WATER RESOURCES** section of this Staff Assessment for a detailed analysis of ZLD). These alternatives would eliminate impacts from wildlife exposure to the evaporation ponds and are recommended by staff, CDFG, and USFWS. If either of these alternatives is not adopted and evaporation ponds would be constructed for the proposed project, ensuring wildlife avoidance of the evaporation pond would minimize the potential for impacts from exposure to contaminants. To this end, staff proposes Condition of Certification **BIO-19** (Evaporation Pond Netting and Monitoring), 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.

Function and Value of Harper Dry Lake

Potential impacts to the wetlands at Harper Dry Lake would occur if the quality or quantity of water currently reaching the marsh is degraded or diminished; these are described below as they pertain to surface water and groundwater.

Surface Flow Quantity and Quality

The proposed stormwater drainage channel would convey offsite surface flow around the project and redirect it to its natural flow location and parameters toward Harper Dry Lake ACEC. The channel is designed to accommodate a 100-year precipitation event (AS 2009a); however, given that annual average precipitation is approximately five inches, it is not likely that the drainage channels would convey surface flows that would ultimately reach the ACEC during normal precipitation years. Rather, the limited precipitation entering the channel during normal precipitation years is anticipated to percolate into the earthen channel bottoms. In a heavy precipitation event, sheet flow within the drainage channels would be returned to its historical flow volume via energy dissipaters and diffusers before discharge to the ACEC. Sediment control practices would be implemented to allow sediment to settle and be trapped prior to discharge at the ACEC (refer to the **SOIL & WATER RESOURCES** section of this Staff Assessment for additional detail regarding sedimentation and Condition of Certification **SOIL&WATER-1** for the Drainage Erosion and Sediment Control Plan requirements. Given that the habitat at the proposed drainage channel outlet is degraded and does not support standing water, the energy of stormwater flow would be dissipated, and sediment control would be implemented, stormwater discharged to the ACEC at this location would not adversely affect sensitive vegetation or wildlife.

Prior to groundwater transfers by BLM, the wetlands at Harper Dry Lake were sustained by runoff from agricultural irrigation. Agricultural operations proximate to Harper Dry Lake and their irrigation runoff to the marsh have entirely ceased with the exception of approximately 123 acres, which would be retired under the proposed project. Irrigation runoff from this remaining parcel of active agriculture does reach the marsh; therefore, its retirement would not affect the quantity of surface water reaching the marsh.

Groundwater Quantity

Due to historic groundwater extraction in the Harper Lake groundwater sub-basin for agricultural irrigation, the Harper Dry Lake wetlands ceased to rely on groundwater to sustain saturation. The perched water table at the marsh no longer communicates with the groundwater aquifer (AS 2009e); therefore, groundwater drawdown resulting from pumping to support AMS project operations would not affect water availability at the marsh.

However, retirement of local agricultural operations has resulted in a significant decrease in groundwater extraction over the past twenty years. Consequently, the Harper Dry Lake area is the only area in the Mojave River groundwater basin[1] where water levels increased more than five feet since 2000 (Smith et. al 2004). In the absence of any drawdown, there is the potential for the groundwater table to rise over time to potentially sustain the marsh; however, this is unlikely given the proposed

[1] The Harper Lake groundwater sub-basin is within the Mojave River groundwater basin.

development and groundwater usage within the basin and the time it would require given that the current groundwater level below the marsh is approximately 140 feet below ground surface (USGS 2010).

The well currently used to pump groundwater to the marsh is located within the proposed Beta solar field, on Abengoa-owned property. Consequently, this well would be decommissioned approximately six months after the initiation of project construction. As stated by the applicant during the January 15, 2009 Data Response Workshop, an existing well on BLM property would be retrofitted and deepened to serve the marsh in lieu of the well on Abengoa-owned property. Significant impacts to the marsh and the biological resources therein could occur if groundwater transfers to the marsh were suspended due to a delay between well decommissioning and retrofitting. To avoid this potentially significant impact, staff recommends Condition of Certification **BIO-20** (Harper Dry Lake Marsh Water Delivery and Water Quality Monitoring), which would require that a well capable of providing at least 75 acre feet per year of water to the marsh be in service prior to decommissioning the well on Abengoa-owned property.

Groundwater Quality

The applicant reports that concentrations of total dissolved solids generally increase towards Harper Dry Lake, suggesting that poor quality groundwater may exist in the main aquifer beneath the playa (AMS 2009a). However, no data exist to support or refute this assumption. Modeling results prepared by the applicant show that AMS project groundwater pumping will induce the lateral movement of groundwater from beneath the playa towards the AMS project wells and any wells between the playa lake area and the AMS project wells (e.g., the aforementioned existing well on BLM property).

Between 1930 and 1997, groundwater was pumped for agricultural use from wells on the proposed project site at a rate approximately five times greater than is proposed for the AMS project. It does not appear that groundwater quality from project site wells decreased from the lateral movement of water induced by this historical pumping for agricultural operations. However, it is possible that travel times from beneath the playa to adjacent wells are so long that an impact has not yet been detected. For example, the applicant’s modeling results indicate travel times could be on the order of 50 to 100 years (AMS 2009a). Alternatively, groundwater in the main aquifer beneath the playa may not be sufficiently degraded to show an impact at adjacent wells. Therefore, Energy Commission Soil & Water staff has concluded there is no evidence to confirm that a water quality impact would occur, and based on limited historical groundwater quality data any impact to the groundwater quality in other wells in the Harper lake area would likely be less than significant (refer to the **SOIL & WATER RESOURCES** section of this Staff Assessment).

Degradation of the quality of the groundwater delivered to the marsh would adversely impact the biological resources therein. To ensure that potential impacts to groundwater quality would be less than significant, staff recommends groundwater quality monitoring at the well intended to serve the Harper Dry Lake marsh so that if impacts do occur, they can be immediately addressed by the applicant, as described in Conditions of Certification **SOIL & WATER-6** (Groundwater Level Monitoring and Reporting Plan).

Implementation of this condition would mitigate potentially adverse impacts to the marsh from degraded groundwater quality attributable to the proposed project.

CUMULATIVE IMPACTS

“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 AMS project’s potential incremental effects in consideration of past, present, and future projects.

Geographic Extent

As defined in the following subsections, the geographic extent under consideration for cumulative impacts to biological resources encompasses the range of the key species potentially affected by the proposed project, including the western Mojave Desert and beyond. The threats to these species, which may be exacerbated by construction and operation of the proposed project, are also described below.

Desert Tortoise

The range of the Mojave population of desert tortoise encompasses the area north and west of the Colorado River in the Mojave and Sonoran/Colorado deserts in California, southern Nevada, southwestern Utah, and extreme north western Arizona (USFWS 1994). The Mojave population occurs in valleys, flat areas, fans, bajadas and washes below 4,000 feet in native desert vegetation (e.g., creosote bush, saltbush scrub, Joshua tree, Mohave yucca, and ocotillo-creosote vegetation communities). Desert tortoises occupy a variety of soil types, ranging from sand dunes to rocky hillsides, and utilize caliche caves in washes in addition to sandy soils and desert pavements. Desert tortoises require suitable soils and terrain for constructing a burrow as well as an adequate supply of annual and perennial plants for foraging.

The reasons for listing the desert tortoise as threatened include several factors, each of which tends to be exacerbated by the next and all of which are associated with human development activities. Habitat degradation and loss to due to development and habitat conversion, grazing, mining, geothermal development, highway construction and expansion have all contributed to the rapid decline of this species. Off-road vehicle use is a popular recreation activity in the desert that causes direct mortality from vehicle collision or crushed burrows and destruction of habitat. Desert tortoises are also susceptible to vehicle collisions on existing or newly constructed roads and highways. Drought, habitat degradation and associated noxious weed invasion decrease nutrients available to desert tortoise in food items; this makes them susceptible to upper respiratory tract disease, which can be fatal and is transmittable between populations (Jacobson 1992). Infrastructure development creates perching opportunities for ravens, which elevates predation pressure on juvenile tortoise. Habitat fragmentation and development can isolate tortoise populations, further increasing risk of disease and lowering genetic diversity.

In an effort to create substantial populations of desert tortoises within the Mojave population range, the 1994 Recovery Plan (USFWS) designated six Recovery Units traversing all four abovementioned states. The establishment of the Recovery Units is intended to protect the species and its habitat requirements in order to elevate populations to levels acceptable for delisting, (i.e. 50,000 breeding adults per recovery unit). However, desert tortoises are slow-growing animals that don't reach sexual maturity until 15-20 years and have a low reproductive rate over a long period of reproductive potential; these life history characteristics makes recovery of the species difficult since tortoises experience high mortality rates prior to reaching sexual maturity (USFWS 2008a).

Mohave Ground Squirrel

MGS is endemic to the western Mojave Desert, California (Best 1995). It's historic range covers approximately 20,000 km^2 from Palmdale in the southwest to Lucerne Valley in the southeast, extending northeast to Fort Irwin National Training Center (NTC) and west to Sequoia National Forest terminating north at Owens Dry Lake (Leitner 2008). According to BLM, the entire range of the MGS is contained in the Western Mojave Planning Area and significant populations occur in the Indian Wells Valley, Kramer Hills, Edwards Air Force Base (AFB), China Lake Naval Air Weapons Station (NAWS), southern Sierra Nevada canyons and portions of Fort Irwin NTC. These populations essentially surround the proposed project area.

MGS is currently listed as threatened under the California Endangered Species Act and USFWS is reviewing a petition to list the species as endangered under the federal ESA. The steady decline of this species since the 1970's is due to a combination of factors that are not mutually exclusive. Rapid growth and development occurring in the desert including the development and expansion of three large military reservations (i.e., Fort Irwin NTC, China Lake NAWS and Edwards AFB), construction and expansion of highways and energy transmission corridors, land conversion activities such as grazing, mining and agriculture operations all interact to effect MGS habitat loss and degradation. Off road vehicle recreation is common in the desert and contributes to these combined effects. Other threats that contribute to the species' decline are poisoning, predation by cats and dogs, and collision with vehicles. Indirect threats, including habitat fragmentation, vegetation community changes, and reduced genetic diversity attributable to small population sizes occur as the result of the abovementioned actions and are also reasons for the species decline (BLM 1999b).

Existing Cumulative Conditions

Over the past two hundred years, California's southern deserts have been subject to major human-induced changes that have threatened native plant and animal communities by habitat loss, fragmentation, and degradation. Some of the most conspicuous threats are those activities that have resulted in large scale habitat loss due to urbanization, agricultural uses, landfills, military operations, mining activities, as well as activities that fragment and degrade habitats such as roads, off-highway vehicle activity, recreational use, and grazing (Berry et al. 1996; Boarman and Sazaki 2006; Avery 1997; Jennings 1997). In addition, these development pressures facilitated the introduction of non-native plant species and increases in predators such as ravens, which contribute to population declines and range contractions for many special-status plant and animal species (Boarman 2002).

In the Harper Lake area, the construction of SEGS VIII and IX in 1989 and 1990 resulted in the loss of approximately 800 acres of potential desert tortoise and MGS habitat as well as the construction of 45 acres of evaporation ponds. SEGS VIII and IX is the only project in the existing cumulative scenario. Otherwise, existing development in the area consists of sparse rural residences and one active agricultural operation on 123 acres. Former agricultural fields within the proposed project area are in the early stages of recolonization by native vegetation, which over time would provide suitable habitat for desert tortoise and Mohave ground squirrel as well as rare plants. Construction of the proposed AMS project would develop 1765 acres of land, including more than 1260 acres of this early successional scrub habitat and establish 20 acres of evaporation ponds.

In consideration of the existing cumulative conditions encompassing the Harper Lake area and the greater west Mojave Desert, the AMS project would contribute to the loss of habitat for sensitive species including desert tortoise and MGS. The proposed project's incremental effect of habitat loss, when combined with habitat loss created by existing development throughout the range of these affected species would be less than significant with acquisition and enhancement of compensatory habitat (refer to Condition of Certification **BIO-15**).

In addition, the proposed project would exacerbate the proliferation of non-native weeds, provide additional subsidies for predators (e.g., ravens), and present additional wildlife hazards (e.g., evaporation ponds, project traffic); these incremental effects of the AMS project on desert tortoise and other sensitive wildlife would be cumulatively considerable given the existing stressors on these species through their ranges. However, with implementation of staff's proposed conditions of certification, particularly **BIO-7**, **BIO-18**, and **BIO-19**, the project's contribution to cumulative impacts would be less than cumulatively considerable.

Future Foreseeable Projects

Foreseeable Renewable Projects in the Western Mojave Desert

Solar and wind projects are proposed on approximately 553,000 acres of BLM land and 13,900 acres of non-federal land in the Western Mojave Planning Area (refer to the **CUMULATIVE IMPACTS** section of this Staff Assessment). In consideration of the existing cumulative conditions in the western Mojave Desert, these proposed renewable energy projects have the potential to further reduce and degrade native plant and animal populations, especially sensitive species such as desert tortoise. The proposed AMS project would similarly contribute to the cumulative loss and degradation of habitat for desert plants and wildlife within the western Mojave Desert. As described above under **EXISTING CUMULATIVE CONDITIONS**, implementation of staff's proposed conditions of certification would render the proposed project's incremental effects less than cumulatively considerable.

Foreseeable Projects in the Project Area

The reasonably foreseeable future projects in the Harper Lake area are listed below and described further in **Cumulative Impacts Table 3**. Their locations relative to the proposed project are illustrated in **Cumulative Impacts Figure 2.**

- Hawes Composting Facility
- State Route (SR) 58 via Hinkley
- Solar Photovoltaic Project (BLM: CACA 48941)
- Wind Project (BLM: CACA 46805)

Of particular importance in considering cumulative biological resource impacts of the AMS project is the proposed solar photovoltaic (PV) project located on approximately 5,000 acres of BLM land adjacent to the Harper Lake ACEC on the east side of Harper Dry Lake. Construction of the proposed project and the PV project would essentially surround the ACEC with solar fields thereby reducing its habitat quality. The Harper Lake marsh is an important local water source for wildlife including desert tortoise and desert kit fox. Development of these projects would make the ACEC and marsh less accessible to wildlife; however, access would be maintained south of the ACEC, which is the most used area by wildlife based on surveys of the AMS project vicinity. Additional groundwater extraction in the Harper Lake groundwater sub-basin could also exacerbate the water quality impacts to water conveyed to the marsh. Refer to the **SOIL & WATER RESOURCES** section of this Staff Assessment for an analysis of cumulative impacts to groundwater resources.

While no precise estimate can be made of the future habitat loss associated with the proposed projects listed above, collectively these projects, especially the PV project and the 10,000 acre wind project, would remove and fragment over 16,000 acres of habitat for desert wildlife and plants. The majority of habitat within the project area is degraded and comprises developed, disturbed, fallow or active agricultural land. Therefore, the proposed project's incremental effect of habitat loss would be less than cumulatively considerable with acquisition and enhancement of compensatory habitat (refer to Condition of Certification **BIO-15**).

In addition, the reasonably foreseeable future development projects in the Harper Lake area combined with the AMS project present the same threats to sensitive wildlife as discussed above under **EXISTING CUMULATIVE CONDITIONS**. Traffic impacts to desert tortoise would be exacerbated by increased traffic volumes along SR-58 resulting from the SR-58 via Hinkley project. Predation pressure on juvenile desert tortoises and other vulnerable wildlife would be increased through elevated raven populations as a result of resource subsidies at the proposed Hawes Composting Facility, which would process green material and biosolids. Noxious weed proliferation would be facilitated by the construction of new roads and movement of vehicles and equipment. These incremental effects of the proposed project would be mitigated through implementation of staff's proposed conditions of certification, particularly **BIO-7**, **BIO-18**, and **BIO-19**; therefore, the proposed project's impacts would not be cumulatively considerable and impacts would be less than significant.

Overall Conclusion

In consideration of the proposed project, these past, present, and reasonably foreseeable future projects contribute to the cumulative loss and degradation of vegetation communities, wildlife habitat, and special-status species in the Harper Valley and west Mojave Desert. The majority of habitat within the project area is degraded and comprises developed, disturbed, fallow or active agricultural land. Staff considers the incremental effects of habitat degradation attributable to the AMS project to be less than cumulatively considerable with implementation of staff's proposed conditions of certification, particularly **BIO-7**, **BIO-18**, and **BIO-19**. The 1,765-acre proposed project was reconfigured to avoid high-quality habitat to the extent possible and would result in the loss of 430 acres of marginally suitable habitat for desert tortoise, MGS, and other special-status species. The AMS project's incremental effect of the loss of marginal habitat, when combined with habitat loss from other past, present, and reasonably foreseeable future projects would be less than significant with acquisition of compensatory habitat, as described in staff's proposed Condition of Certification **BIO-15**.

COMPLIANCE WITH LORS

The proposed project must comply with state and federal LORS that address state and federally listed species, as well as other sensitive species and their habitats. Applicable LORS are presented in **Biological Resources Table 1**.

FEDERAL LORS

Endangered Species Act (ESA; 16 USC Section 1531 et seq.)

Potential take of federally-listed species (i.e., federally threatened desert tortoise) requires compliance with the federal Endangered Species Act. "Take" of a federally-listed species is prohibited without a permit, which may be obtained through Section 7 consultation if there is a federal nexus (i.e., involvement of a federal agency other than USFWS that would fund, permit, or authorize the proposed project). The applicant has submitted an application to the U.S. Department of Energy (DOE) for a federal loan guarantee to finance the AMS project. It is anticipated that the DOE will approve the application in March 2010. If approved, DOE funding would serve as the proposed project's federal nexus, triggering Section 7 as the appropriate consultation process for ESA compliance. Federal ESA compliance under section 7 requires the DOE to determine whether the proposed action will affect any federally listed species. Because the proposed project would affect desert tortoise, as described in this Staff Assessment, the DOE is obligated to initiate consultation with the USFWS. Formal consultation is initiated by submitting a Biological Assessment (BA) to DOE. The BA, which is jointly prepared by the applicant and DOE, presents the proposed project's effects analysis and measures to avoid, minimize and mitigate impacts to federally listed species. The timeline for section 7 consultation allows for a 90 day consultation period followed by 45 days of analysis for a total review time of 135 days. After 135 days, the USFWS is required to issue a Biological Opinion, which analyzes the impact of the proposed project and presents avoidance and minimization measures. The Biological Opinion may also include an incidental take statement, if USFWS's determines that the impacts of the project do not jeopardize the recovery of the listed species. Assuming the federal loan guarantee application is approved by DOE and the Biological Assessment is determined by USFWS to be complete, it is anticipated that a Biological Opinion could be issued by USFWS in August 2010. A Biological Opinion is required prior to site mobilization (refer to Condition of Certification **BIO-21** (USFWS Biological Opinion)).

Staff's proposed conditions of certification were developed in coordination with USFWS and are likely to be consistent with the terms and conditions required in the Biological Opinion. Therefore, implementation of the conditions pertaining to federally listed species would ensure compliance (in part) with the federal ESA. However, the permitting mechanism for compliance with the federal ESA is currently unresolved. Confirmation that DOE will participate as the consulting agency under Section 7 is also required to ensure compliance with the federal ESA.

Waters of the U.S. (Clean Water Act Section 404)

Discharge or fill into water of the U.S, including wetlands requires a permit from the USACE. Project design features (i.e., exclusion fencing) would avoid impacts to 1.59 acres of potentially jurisdictional waters of the U.S (tamarisk scrub). The applicant submitted a Jurisdictional Letter Report and a request for concurrence that a Clean Water Act Section 404 permit was not required for the AMS project (EDAW 2009b). The USACE has determined that all aquatic features occurring within the proposed project area are isolated and therefore not under their jurisdiction. A permit is not required for the AMS Project under Section 404 of the Clean Water Act (Estes 2010).

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 BGPA 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 BGPA defines the ''take'' of an eagle to include a broad range of actions, including disturbance. ''Disturb'' is defined in regulations at 50 CFR 22.3 as: ''to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.''

The proposed project may result in "take" of the golden eagle from disturbance to nesting pairs as well as loss of foraging habitat, which may result loss of productivity for this species. However, it is unknown whether nesting eagles occur proximate to the proposed project area or whether the proposed project area constitutes an important foraging area for golden eagle. Results of golden eagle nesting surveys and foraging habitat assessment are required to determine whether construction of the proposed project would result in take of the species and therefore require a permit.

The USFWS Migratory Bird Division is in the process of developing guidance regarding implementation of this final rule, including establishing take thresholds within each Bird Conservation Region that must not be exceeded. If it is ultimately determined that take of golden eagle would occur as a result of the proposed project, an individual (non-programmatic) permit would be required. Permit issuance would be conditioned on various criteria, the most important of which is that the permitted take is compatible with the preservation of the bald eagle and the golden eagle (i.e., consistent with the goal of stable or increasing breeding populations). Staff encourages the applicant to coordinate closely with USFWS as guidance becomes available regarding implementation of the revised BGPA. At this time, staff is unable to determine whether the proposed project would be in compliance with the BGPA.

STATE LORS

Under the Warren-Alquist Act (Pub. Resources Code § 25500), the Energy Commission's certificate for thermal power plants rated 50 MW or more is "in lieu of" other state, local, and regional permits Staff has incorporated all required terms and conditions that might otherwise be included in state permits into the Energy Commission's certification process. Staff's proposed conditions of certification 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 Section 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. Staff coordinated closely with CDFG regarding impacts to state-threatened desert tortoise, state-threatened Swainson's hawk, and state-threatened MGS in order to capture any measures that would be required in an Incidental Take Permit (ITP) under section 2081(b) of CESA. To facilitate this, the applicant submitted a draft ITP application to the Energy Commission and CDFG. Staff's proposed conditions of certification were developed in coordination with CDFG and are likely to be consistent with the terms and conditions required in the ITP, if it were issued. Therefore, implementation of the conditions pertaining to state-listed species would ensure compliance with CESA.

Streambed Alteration Agreement: Fish and Game Code Sections 1600-1607

CDFG regulates any changes to the natural flow, bed, or bank, of any river, stream, or lake that supports fish or wildlife resources. As described above, construction and operation of the proposed project would result in direct impacts to 11.18 acres of waters of the state (1.74 acres of tamarisk scrub and 9.44 acres of dry lakebed). CDFG does not typically exert jurisdiction over these habitat types as waters of the state. The applicant submitted an application for a Streambed Alteration Agreement (SAA) in February 2010, which provided information in a format familiar to CDFG. But for the Commission's exclusive authority, CDFG would otherwise issue a SAA (1600 permit) that requires removal of tamarisk as mitigation for impacts to waters of the state. In addition, the terms and conditions of CDFG's SAA would require a five year monitoring and reporting program to ensure complete eradication of tamarisk; this has been incorporated into staff's proposed Condition of Certification **BIO-16**. With implementation of this condition, staff and CDFG conclude that the proposed project would be in compliance with LORS protective of waters of the state.

NOTEWORTHY PUBLIC BENEFITS

Construction and operation of the proposed project would not result in any noteworthy public benefits with regard to biological resources.

CONCLUSIONS

The proposed Abengoa Mojave Solar (AMS) Project would occupy approximately 1,765 acres in the West Mojave Desert adjacent to the western margin of Harper Dry Lake in unincorporated San Bernardino County. The proposed project footprint and size were iteratively modified to avoid continuous stands of undisturbed native vegetation, conservation areas, and high quality wildlife habitat. As a result approximately 90% of the habitat within the project area is developed, disturbed, fallow or active agricultural lands. Overall, the proposed project area is composed of degraded habitat, which is of marginal suitability for special-status species and does not support a diverse assemblage of native plants and wildlife. However, the proposed project area is adjacent to the Harper Dry Lake Area of Critical Environmental Concern (ACEC) and otherwise surrounded by known populations of listed species (e.g., desert tortoise, Mohave ground squirrel [MGS], desert cymopterus), desert tortoise critical habitat/desert wildlife management area (DWMA), and MGS Conservation Area. Therefore, transient individuals may be occasionally present onsite as they move between areas of suitable habitat adjacent to the proposed project and potentially within areas of suitable habitat re-establishing at the edges of the proposed project area. Given the proximity of the proposed project to the aforementioned biological resources, construction and operation of the proposed project would result in the direct and indirect effects presented in **Biological Resources Table 7**. With implementation of staff's proposed conditions of certification, presently identifiable impacts to biological resources would be mitigated to less than significant levels (impacts to golden eagles are uncertain pending receipt and analysis of additional information as well as guidance from U.S. Fish and Wildlife Service [USFWS]).

Biological Resources Table 7
Summary of Impacts to Biological Resources from the AMS Project

Impact	Condition of Certification	Significance Determination
CONSTRUCTION IMPACTS		
General vegetation: disturbance of native vegetation	• **BIO-9** requires restoration of temporarily disturbed areas;	Less than significant
Special-status plants: direct mortality of plants potentially within and adjacent to project area; permanent degradation of habitat; damage from dust	• **BIO-8** requires pre-construction rare plant surveys and impact avoidance; • **BIO-7** confines work to delineated areas; • **BIO-9** requires restoration of temporarily disturbed areas; • **AQ-SC3** and **AQ-SC4** require dust abatement	Less than significant with COCs
Migratory/special-status birds: loss of active bird nests or young; loss of foraging habitat	• **BIO-10** requires pre-construction nest surveys and impact avoidance	**Nesting**: Less than significant with COC **Foraging**: Less than significant (impacts to golden eagle are uncertain in light of recent revisions to the BGPA)
Desert tortoise: direct mortality, injury, harassment; constrained population connectivity; habitat loss and degradation	• **BIO-7** requires control of standing water, reduced speed limits, other impact avoidance; • **BIO-11** requires pre-construction clearance surveys, exclusion fencing, translocation; • **BIO-15** requires habitat compensation	Less than significant with COCs
Mohave ground squirrel: direct mortality, injury, harassment; constrained population connectivity; habitat loss and degradation	• **BIO-7** requires monitors ahead of grading equipment, removal of MGS attractants, other impact avoidance; • **BIO-12** requires pre-construction clearance surveys, relocation; • **BIO-15** requires habitat compensation	Less than significant with COCs

Impact	Condition of Certification	Significance Determination
Western burrowing owl: direct mortality, injury, harassment; habitat loss and degradation	•**BIO-13** requires pre-construction clearance surveys, passive relocation, burrow construction, habitat compensation;	Less than significant with COC
American badger and desert kit fox: direct mortality, injury, harassment	•**BIO-14** requires pre-construction clearance surveys, passive relocation;	Less than significant with COC
Construction traffic: special-status wildlife mortality	•**BIO-5** requires worker awareness training to identify animals in road; •**BIO-7** requires reduced speed limits, monitoring along roads, wildlife checks beneath parked vehicles, road kill reporting	Less than significant with COCs
Jurisdictional waters: direct impacts to isolated wetlands and waters of the U.S. and state (tamarisk and dry lakebed)	•**BIO-16** requires tamarisk eradication monitoring (per CDFG requirements);	Less than significant
Construction noise: disruption of wildlife nesting, roosting, and/or foraging activities, especially at Harper Lake ACEC	•**BIO-10** requires pre-construction nest surveys and monitoring areas louder than 60 dBA	Less than significant with COC
Construction lighting: disruption of wildlife nesting, roosting, and/or foraging activities, especially at Harper Lake ACEC	•**BIO-7** and **VIS-3#** requires minimization of side-cast lighting •**BIO-14** requires nocturnal mammals to be cleared from the project area before construction	Less than significant with COCs
Spread of noxious weeds	•**BIO-7** requires inspection and cleaning of construction equipment, eradication and monitoring of weed populations, quick re-vegetation	Less than significant with COC
OPERATION IMPACTS		
Avian collision: blinding/confusion by glare or reflection resulting in collision	•**BIO-17** requires monitoring impacts of technology birds and adaptive management if impact is identified	Unknown (likely less than significant with COC)
Avian electrocution	•**BIO-7** requires transmission lines to be in conformance with APLIC guidelines	Less than significant with COC
Glare: ocular injury from beam intensity	•**VIS-4** requires 10-foot high slatted perimeter fencing	Less than significant with COC

Impact	Condition of Certification	Significance Determination
Operation noise	N/A	Less than significant
Desert tortoise: entrapment/injury from drainage channel	• **BIO-11** requires exclusion fencing to be reinforced and monitored around drainage channel	Less than significant with COC
Desert tortoise: raven predation	• **BIO-7** requires minimization of raven subsidies • **BIO-18** requires preparation of an approved Raven Plan and contribution of payment toward USFWS's regional raven control effort	Less than significant with COCs
Operation traffic: special-status wildlife mortality	• **BIO-5** requires worker awareness training to identify animals in road; • **BIO-7** requires reduced speed limits, monitoring along roads, wildlife checks beneath parked vehicles, road kill reporting	Less than significant with COCs
Evaporation ponds: injury or mortality to wildlife from exposure to toxic levels of salt and selenium	• **BIO-19** requires netting the evaporation ponds and monitoring for wildlife usage	Less than significant with COC
Harper Dry Lake ACEC: reduction in amount or quality of surface flow reaching the marsh	• **SOIL&WATER-1** requires implementation of sediment controls in drainage channel discharge outlet at ACEC	**Quantity**: Less than significant **Quality**: Less than significant with COC
Harper Dry Lake ACEC: reduction in amount or quality of groundwater pumped to the marsh	• **BIO-20** ensures that the wetland well is not decommissioned until an alternate well is able to convey water to the marsh and requires implementation of a groundwater quality monitoring program as described in **SOIL & WATER-6**	Less than significant with COC

Cumulative Impacts

The incremental effects of the proposed project as listed above would contribute to the cumulative loss and degradation of vegetation communities, wildlife habitat, and special-status species in the Harper Valley and west Mojave Desert. However, staff considers the incremental effects of habitat loss and degradation attributable to the AMS project to be less than cumulatively considerable with implementation of staff's proposed conditions of certification, particularly **BIO-7**, **BIO-15**, **BIO-18**, and **BIO-19**.

LORS Compliance

Staff's proposed conditions of certification were developed in coordination with the California Department of Fish and Game (CDFG) and USFWS and are likely to be consistent with the terms and conditions required in the Biological Opinion (Condition of Certification **BIO-21**), Incidental Take Permit, and Streambed Alteration Agreement (if these were issued by CDFG). Therefore, implementation of the conditions pertaining to federally and listed species would ensure compliance (in part) with the federal Endangered Species Act (ESA), California ESA, and Fish and Game Code §1600. However, the permitting mechanism for compliance with the federal ESA is currently unresolved; confirmation that the U.S. Department of Energy will participate as the consulting agency under Section 7 is also required to ensure compliance with the federal ESA.

The U.S. Army Corps of Engineers (USACE) has determined that all aquatic features occurring within the proposed project area are isolated and therefore not under their jurisdiction. A permit is not required for the AMS Project under Section 404 of the Clean Water Act.

Recent updates to the Bald and Golden Eagle Protection Act (BGPA) require acquisition of a permit for take of golden eagle. To determine whether take (i.e., disturbance and/or loss of foraging habitat) would occur, staff and USFWS have requested that the applicant conduct focused golden eagle surveys in spring 2010 and an assessment of eagle foraging behavior within the proposed project area. In light of this recent guidance and without focused survey results or a foraging habitat assessment, staff is unable to determine whether take would occur and whether compliance with this regulation can be achieved.

Outstanding Information and Pending Analysis

The document listed below **has been submitted** by the applicant to Energy Commission staff in response to data requests set 1A (ESH 2009f) and is currently under review by staff, CDFG, and USFWS. It is anticipated that agency comments on this plan will be provided to the applicant on or before March 12, 2010.

- Draft Common Raven Monitoring, Management, and Control Plan

The documents and information listed below **need to be submitted** by the applicant to Energy Commission staff, USFWS, and CDFG:

- Draft Desert Tortoise Exclusion Fencing, Clearance Survey, and Translocation Plan (Desert Tortoise Plan)
- Draft Burrowing Owl Monitoring and Mitigation Plan (Burrowing Owl Plan)
- Swainson's Hawk and Golden Eagle Survey Results – Spring 2010
- Golden Eagle Foraging Habitat Assessment
- Compensatory Mitigation Details:
    - Identification of which 118.2 acre portion of the 233 acre applicant-owned parcel is proposed for mitigation;

- o Evaluation of the degree of disturbance, dumping, historical structures, etc. that may require cleaning, fencing, repairs, demolition, etc.; and
  - o Determination of whether the applicant would conduct the aforementioned work (if required) prior to conserving the land or if additional lands or monies will be required to off-set the aforementioned impediments.
- Tamarisk Eradication Monitoring and Reporting Plan
- Study Design for Monitoring Impacts of Solar Collection Technology on Birds

It is requested that these plans, survey results, and information be submitted as soon as possible to allow time for review, analysis, and incorporation into conditions of certification, as necessary, in advance of the Supplemental Staff Assessment (publication scheduled for early May 2010). Of particular importance are the draft Desert Tortoise Plan, draft Burrowing Owl Plan, Swainson's hawk and golden eagle survey results and foraging habitat assessment, and compensatory mitigation details, all of which need to be addressed by staff in the Supplemental Staff Assessment. Conditions of Certification **BIO-11** and **BIO-13**, present substantive guidance for preparation of and measures to include in the Desert Tortoise and Burrowing Owl plans, respectively. The final Desert Tortoise Plan must be submitted to USFWS with the Biological Assessment, which is currently scheduled to be submitted in March 2010; therefore a draft plan must be reviewed and comments provided as soon as possible.

Overall Conclusion

At this time, staff is able to conclude that with implementation of proposed conditions of certification, compliance with most laws, ordinances, regulations, and standards (LORS) would be achieved and most direct, indirect, and cumulative impacts would be avoided, minimized, or mitigated to less than significant levels. However, without further information/analysis/coordination staff is unable to determine whether the proposed project would be in compliance with the federal ESA and the revised BGPA. It is anticipated that all outstanding issues will be resolved and compliance with applicable LORS will be demonstrated prior to publication of the Supplemental Staff Assessment.

PROPOSED CONDITIONS OF CERTIFICATION

Staff proposes the following Conditions of Certification.

DESIGNATED BIOLOGIST SELECTION

BIO-1 The project owner shall assign a Designated Biologist to the project. The project owner shall submit the resume of the proposed Designated Biologist, with at least three references and contact information, to the Energy Commission Compliance Project Manager (CPM), CDFG, and USFWS for approval.

The Designated Biologist must meet the following minimum qualifications:

1. Bachelor's Degree in biological sciences, zoology, botany, ecology, or a closely related field; and

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; and

3. At least one year of field experience with biological resources found in or near the project area.

4. Meet current USFWS Authorized Biologist criteria[2] and demonstrate familiarity with protocols and guidelines for the desert tortoise; and

5. Possess a recovery permit for desert tortoise and a California ESA Memorandum of Understanding pursuant to Section 2081(a) for desert tortoise and Mohave ground squirrel or have adequate experience and qualifications to obtain these authorizations. It is possible that two biologists may be utilized – each with an MOU for desert tortoise or MGS.

In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the CPM, that the proposed Designated Biologist or alternate has the appropriate training and background to effectively implement the conditions of certification.

Verification: The project owner shall submit the specified information at least 90 days prior to the start of any site (or related facilities) mobilization. The CPM, CDFG, and USFWS have 30 days to approve or deny proposed Designated Biologist(s). No site or related facility activities 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 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 following during any site (or related facilities) mobilization, ground disturbance, grading, construction, operation, and closure activities. The

[2] USFWS designates biologists who are approved to handle tortoises as “Authorized Biologists.” Such biologists have demonstrated to 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. 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.

Designated Biologist may be assisted by the approved Biological Monitor(s), but remains the contact for the project owner and CPM.

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 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. Halt any and all activities in any area when determined that there would be an unauthorized adverse impact to biological resources if the activities continued or a violation of federal or state environmental laws or a violation of any environmental agreements/conditions made between the applicant and the CPM and/or the regulatory agencies;

5. Clearly mark sensitive biological resource areas, if present and inspect these areas at appropriate intervals for compliance with regulatory terms and conditions;

6. 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 (i.e. parking lots) for animals in harm’s way;

7. Notify the project owner and the CPM of any non-compliance with any biological resources condition of certification;

8. Respond directly to inquiries of the CPM regarding biological resource issues;

9. 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 Report; and

10. Train the Biological Monitors as appropriate, and ensure their familiarity with the BRMIMP, Worker Environmental Awareness Program (WEAP) training and all permits.

Verification: The Designated Biologist shall submit in the Monthly Compliance Report to the CPM copies of all written reports and summaries that document biological resource compliance activities, including those conducted by Biological Monitors.

If actions may affect biological resources during operation, a Designated Biologist or Biological Monitor under the supervision of the 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 their duties are ceased as approved by the CPM. Monthly and Annual Compliance Reports shall be also be submitted to CDFG and USFWS.

BIOLOGICAL MONITOR SELECTION, QUALIFICATIONS, AND DUTIES

BIO-3 The project owner's CPM-approved Designated Biologist shall submit the resume, at least three references and contact information, of the proposed Biological Monitors to the CPM, CDFG, and USFWS for approval. The resume shall demonstrate to the satisfaction of the CPM, the appropriate education and experience to accomplish the assigned biological resource tasks, including:

- Biological Monitor(s) involved in any aspect of desert tortoise surveys or handling must meet the criteria to be considered a USFWS Authorized Biologist (USFWS 2008) and demonstrate familiarity with the most recent protocols and guidelines for the desert tortoise.
- Biological Monitor(s) involved in any aspect of Mohave ground squirrel surveys or handling must possess a California ESA Memorandum of Understanding pursuant to Section 2081(a) for Mohave ground squirrel or have adequate experience and qualifications to obtain this authorizations.

Biological Monitor(s) training by the Designated Biologist shall include familiarity with the conditions of certification and the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP), Worker Environmental Awareness Program (WEAP), and all permits.

The Biological Monitors shall assist the Designated Biologist in conducting surveys and in monitoring of site mobilization activities, construction-related ground disturbance, grading, boring or trenching. The Designated Biologist shall remain the contact for the Project owner, BLM's Authorized Officer and the CPM.

Verification: The project owner shall submit the specified information to the CPM, CDFG, and USFWS for approval at least 90 days prior to the start of any site (or related facilities) mobilization. The CPM, CDFG, and USFWS have 30 days to approve or deny proposed Biological Monitor(s).

The Designated Biologist shall submit a written statement to the CPM confirming that the individual Biological Monitor(s) have 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 10 days prior to their first day of monitoring activities.

DESIGNATED BIOLOGIST AND BIOLOGICAL MONITOR AUTHORITY

BIO-4 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.

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, construction, and operation activities in areas specified by the Designated Biologist.

The Designated Biologist shall:

1. Halt any and all activities in any area when determined that there would be an unauthorized adverse impact to biological resources if the activities continued or a violation of federal or state environmental laws or a violation of any environmental agreements/conditions made between the applicant and the CPM and/or the regulatory agencies;

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 the CPM of any corrective actions that have been taken, or will be instituted, as a result of the work stoppage.

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 immediately (and no later than the following morning of 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, and operation activities. 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 within five working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

WORKER ENVIRONMENTAL AWARENESS PROGRAM

BIO-5 The project owner shall develop and implement a CPM-approved Worker Environmental Awareness Program (WEAP) in which each of its employees, as well as employees of contractors and subcontractors who work on the project site or any related facilities during site mobilization, ground disturbance, grading, construction, operation, and closure are informed about sensitive biological resources associated with the project.

The WEAP must:

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 is made available to all participants;

2. Discuss the locations and types of sensitive biological resources on the project site and adjacent areas, if present;

3. Present the reasons for protecting these resources;

4. Present the meaning of various temporary and permanent habitat protection measures as necessary;

5. Discuss penalties for violation of applicable LORS (e.g., federal and state endangered species acts);

6. Identify whom to contact if there are further comments and questions about the material discussed in the program; and

7. 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.

Verification: At least 60 days prior to the start of any site (or related facilities) mobilization, the project owner shall provide to the CPM the proposed 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 site and related facilities mobilization submit two copies of the CPM-approved materials.

Training acknowledgement forms signed during construction shall be kept on file by the project owner for a period of at least six months after the start of commercial operation.

During project operation, signed statements for operational personnel shall be kept on file for six months following the termination of an individual's employment.

BIOLOGICAL RESOURCES MITIGATION IMPLEMENTATION AND MONITORING PLAN (BRMIMP) DEVELOPMENT AND COMPLIANCE

BIO-6 The project owner shall develop a BRMIMP and submit two copies of the proposed BRMIMP to the CPM (for review and approval) and to CDFG and USFWS (for review and comment) if applicable and shall implement the measures identified in the approved BRMIMP. A copy of the BRMIMP shall be kept onsite and made readily available to biologists, regulatory agencies, the project owner, contractors, and subcontractors as needed.

The BRMIMP shall be prepared in consultation with the Designated Biologist and shall identify:

1. All biological resource mitigation, monitoring, and compliance measures proposed and agreed to by the project owner;

2. All applicant-proposed mitigation measures presented in the Application for Certification, data request responses, and workshop responses;

3. All biological resource conditions of certification identified as necessary to avoid or mitigate impacts;

4. All biological resource mitigation, monitoring, and compliance measures required in federal agency terms and conditions, such as those provided in the Biological Opinion;

5. All biological resource mitigation, monitoring, and compliance measures required in local agency permits, such as site grading and landscaping requirements;

6. All sensitive biological resources to be impacted, avoided, or mitigated by project construction, operation, and closure;

7. All required mitigation measures for each sensitive biological resource;

8. A detailed description of measures that shall be taken to avoid or mitigate temporary disturbances from construction activities;

9. All locations on a map, at an approved scale, of sensitive biological resource areas subject to disturbance and areas requiring temporary protection and avoidance during construction;

10. Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities — one set prior to any site (and related facilities) mobilization disturbance and one set subsequent to completion of project construction. Include planned timing of aerial photography and a description of why times were chosen;

11. Duration for each type of monitoring and a description of monitoring methodologies and frequency;

12. Performance standards to be used to help decide if/when proposed mitigation is or is not successful;

13. All performance standards and remedial measures to be implemented if performance standards are not met;

14. A preliminary discussion of biological resources-related facility closure measures; and

15. A process for proposing plan modifications to the CPM and appropriate agencies for review and approval.

<u>Verification:</u> The project owner shall provide the specified document at least 60 days prior to start of any site (or related facilities) mobilization.

The CPM, in consultation with other appropriate agencies, will determine the BRMIMP's acceptability within forty-five (45) days of receipt. If there are any permits that have not yet been received when the BRMIMP is first submitted, these permits shall be submitted to the CPM within five (5) days of their receipt, and the BRMIMP shall be revised or supplemented to reflect the permit condition within 10 days of their receipt by the project owner. Ten days prior to site and related facilities mobilization the revised BRMIMP shall be resubmitted to the CPM. Site mobilization will not occur without an approved BRMIMP.

The project owner shall notify the CPM no less than five working days before implementing any modifications to the approved BRMIMP to obtain CPM approval.

Any changes to the approved BRMIMP must also be approved by the CPM in consultation with other appropriate agencies to ensure no conflicts exist.

Implementation of BRMIMP measures will be reported in the Monthly Compliance Reports by the Designated Biologist (i.e., survey results, construction activities that were monitored, species observed). Within thirty (30) days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction closure report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the project's site mobilization, ground disturbance, grading, and construction phases, and which mitigation and monitoring items are still outstanding.

IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-7 The project owner shall implement the following measures during construction and operation to manage their project site and related facilities in a manner to avoid or minimize impacts to the local biological resources:

1. <u>Limit Disturbance Area.</u> The boundaries of all areas to be temporarily or permanently 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 shall be stockpiled in disturbed areas, 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, vehicles, and equipment shall be confined to the flagged areas.

2. <u>Minimize Road Impacts.</u> 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 will do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads

(e.g. new spur roads) or the construction zone, the route will 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 on Harper Lake Road and 15 miles per hour within the project area and secondary access roads.

4. Monitor During Construction. The Designated Biologist or Biological Monitor shall be present at the construction site during all project activities that have potential to disturb soil, vegetation, and wildlife. The USFWS-approved Designated Biologist or Biological Monitor shall walk immediately ahead of equipment during vegetation removal and grading activities.

5. Minimize Impacts of Transmission/Pipeline Alignments, Roads, 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. Temporary disturbance 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 2004) to reduce the likelihood of bird electrocutions and collisions.

6. Avoid Use of Toxic Substances. Road surfacing and sealants as well as soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to wildlife and plants.

7. Minimize Lighting Impacts. Facility lighting shall be designed, installed, and maintained to prevent side casting of light towards the project boundaries and the Harper Dry Lake marsh. Lighting shall be shielded, directional, and at the lowest intensity required for activity.

8. Avoid Vehicle Impacts to Desert Tortoise. Parking and storage shall occur within 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. During construction, a Biological Monitor shall drive along project access roads, particularly Harper Lake Road at least every three hours during the desert tortoise active period (April through May and September through October) looking for desert tortoise or other vulnerable wildlife within the roadway. Outside of the active period, roads shall be monitored at least twice a day in advance of peak AM and PM traffic periods. During operation, employees shall report any

desert tortoise sightings along roadways to the Biological Monitor. If a desert tortoise is observed in the roadway or beneath a parked vehicle, it will be left to move on its own. If it does not move within 15 minutes, a Biological Monitor may remove and transfer the animal to a safe location if temperatures are within the range described in the USFWS Field Manual (www.fws.gov/ventura/speciesinfo/protocols_guidelines).

9. Avoid Wildlife Pitfalls. At the end of each work day, the Designated Biologist shall ensure that all potential wildlife pitfalls (trenches, bores, and other excavations) outside the permanently fenced area 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 tortoise-exclusion fencing. All trenches, bores, and other excavations outside the areas permanently fenced with desert tortoise exclusion fencing shall be inspected periodically throughout and at the end of each workday by the Designated Biologist or a Biological Monitor. Should a tortoise or other wildlife become trapped, the Designated Biologist or Biological Monitor shall remove and relocate the individual to a safe location. Any wildlife encountered during the course of construction shall be allowed to leave the construction area unharmed.

10. Avoid Entrapment of Wildlife. Any construction pipe, culvert, or similar structure with a diameter greater than three inches, stored less than eight inches above ground for one or more days/nights, shall be inspected for wildlife before the material is moved, buried, or capped. As an alternative, all such structures may be capped before being stored, or placed on pipe racks.

11. Report Wildlife Injury and Mortality. Report all inadvertent deaths of sensitive species to the appropriate project representative, including road kill. Species name, physical characteristics of the animal (sex, age class, length, weight), and other pertinent information shall be noted and reported in the Monthly Compliance Reports. Injured animals shall be reported to CDFG or USFWS and the CPM and the project owner shall follow instructions that are provided by CDFG or USFWS. If CDFG or USFWS cannot be immediately reached, consideration should be given to taking the animal to a veterinary hospital;

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, common ravens, and other wildlife to construction sites. A Biological Monitor shall patrol these areas to ensure water does not puddle and attract desert tortoise, common ravens, and other wildlife to the site and shall take appropriate action to reduce water application where necessary.

13. 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.

14. 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.

15. Avoid Spread of Noxious Weeds. The project owner shall implement the following Best Management Practices during construction and operation to prevent the spread and propagation of noxious weeds:

    A. Limit the size of any vegetation and/or ground disturbance to the absolute minimum and limit ingress and egress to defined routes;

    B. Reestablish vegetation quickly on disturbed sites temporarily disturbed areas, including pipelines, transmission lines, and staging areas (see **BIO-9**);

    C. 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 and construction vehicles shall be cleaned within an approved area or commercial facility prior to transport to the construction site. The number of cleaning stations shall be limited and weed control/herbicide application shall be used at the cleaning station(s);

    D. Use only weed-free straw, hay bales, and seed for erosion control and sediment barrier installations;

    E. Invasive non-native species shall not be used in landscaping plans and erosion control; and

    F. Monitor and rapidly implement control measures to ensure early detection and eradication of weed invasions.

16. Implement Erosion Control Measures. Standard erosion control measures shall be implemented for all phases of construction and operation. All disturbed soils and roads within the project site shall be stabilized to reduce erosion potential, both during and following construction. Areas of

disturbed soils (access and staging areas) with slopes toward an ephemeral drainage or Harper Dry Lake shall be stabilized to reduce erosion potential.

17. Monitor Ground Disturbing Activities Prior to Site Mobilization. If ground disturbing activities are required prior to site mobilization, 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. Actions not included in the project description are prohibited.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP. Implementation of the measures will be reported in the Monthly Compliance Reports by the Designated Biologist. Within thirty (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. Additional copies shall be provided to CDFG and USFWS.

RARE PLANT PRE-CONSTRUCTION SURVEYS AND IMPACT AVOIDANCE

BIO-8 The project owner shall conduct surveys to determine the presence or absence of desert cymopterus within the transmission interconnection site and implement the following measures to minimize impacts if desert cymopterus is detected:

1. A qualified biologist shall conduct a focused botanical survey at least 30 days prior to the start of initial ground disturbance activities, or as appropriate to capture the blooming period (March 1 to June 30) and ensure detection success.

2. If the target species is detected in the project area then the project owner shall contact Energy Commission staff to determine appropriate mitigation for impacts which may include the following:

   A. Complete avoidance of rare plants through project modification.

   B. Complete avoidance by flagging and mapping the population prior to construction to avoid direct impacts.

   C. Relocate plants and/or collect seeds from existing populations that would be impacted and then plant/seed these plants in adjacent suitable habitat that would not be affected by proposed project and then monitor for five years.

Verification: The project owner shall submit a report to the CPM, CDFG, and USFWS at least 30 days prior to the start of any project-related site disturbance activities that describes when rare plant surveys were completed, observations, mitigation measures, and the results of the mitigation.

REHABILITATION OF TEMPORARILY DISTURBED AREAS

BIO-9 For all project areas subject to temporary disturbance (e.g., the 8-acre transmission interconnection site), the following shall be implemented to restore native vegetation:

1. Stockpile Topsoil. To increase chances for revegetation success in temporary disturbed areas, topsoil shall be stockpiled from the project site for use in revegetation. Native topsoil from the least disturbed locations and only areas that are free of noxious weeds shall be used as a source of topsoil. Approximately 6-8 inches of topsoil shall be scraped from the borrow sites and stockpiled, with the top one inch from the borrow site used as top-dressing in revegetation areas. All other elements of topsoil use shall be as described in *Rehabilitation of Disturbed Lands in California* (Newton and Claassen 2003, pp. 39-40).

2. Restore Temporarily Disturbed Areas. Only seed from locally occurring species shall be used for revegetation. Seeding shall be conducted as described in Chapter 5 of *Rehabilitation of Disturbed Lands in California* (Newton and Claassen 2003). A list of plant species suitable for Mojave Desert region revegetation projects, including recommended seed treatments, are included in Appendix A-8 of the same report. The list of native plants observed during surveys of the project area can also be used as a guide to site-specific plant selection for revegetation.

3. Control Noxious Weeds. Maintain percent cover of noxious weeds (species considered “moderate” or “high” threat to California wildlands as defined by CAL-IPC [2006] and noxious weeds rated “A” or “B” by the California Department of Food and Agriculture and any federal-rated pest plants [CDFA 2009]) below current levels in rehabilitated areas.

4. Performance Standard. Native plants in the vegetation shall reach over the first 10 years of growth 80% of the initial density, absolute cover, and species richness, with progressive improvement during the 10-year period. Exotic species shall reach over the first 10 years of growth no more than four times the absolute cover of exotic plants in the original vegetation. Every effort shall be made to minimize invasion by exotic species, and the performance standards shall include a maximum allowable cover of exotic species.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP. Implementation of the measures will be reported in the Monthly Compliance Reports by the Designated Biologist.

Within thirty (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. Additional copies shall be provided to CDFG and USFWS.

After completion of project construction and initial revegetation, the project owner shall submit an annual report to the CPM for 10 years thereafter that describes the methods and results of the long term biological monitoring of the rehabilitated areas to ensure that native vegetation is reestablishing and noxious weeds are being controlled. The report shall be submitted no later than January 31 of every year. Additional copies shall be provided to CDFG and USFWS.

PRE-CONSTRUCTION NEST SURVEYS AND IMPACT AVOIDANCE AND MINIMIZATION MEASURES FOR MIGRATORY BIRDS

BIO-10 Pre-construction nest surveys shall be conducted if construction activities will occur from February 1 through August 1. At all times of the year, noise generating activities shall be limited during early morning and evening to avoid impacts to birds protected under the Migratory Bird Treaty Act. The Designated Biologist or Biological Monitor shall perform surveys in accordance with the following guidelines:

1. Surveys shall cover all potential nesting habitat in the project site and within 500 feet of the boundaries of the plant site as well as any areas potentially exposed to noise levels above 60 dBA;

2. At least two pre-construction surveys shall be conducted, separated by a minimum 10-day interval. One of the surveys needs to 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 in any given area, an interval during which birds may establish a nesting territory and initiate egg laying and incubation;

3. If active nests are detected during the survey, a no-disturbance buffer zone (protected area surrounding the nest, the size of which is to be determined by the Designated Biologist in consultation with CDFG and USFWS) and monitoring plan shall be developed. Nest locations shall be mapped using GPS technology and submitted, along with a weekly report stating the survey results, to the CPM; and

4. The Designated Biologist 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 (e.g., excessive noise above 60 dBA), shall be prohibited within the buffer zone until such a determination is made.

Verification: At least 10 days prior to the start of any ground disturbing activities or construction equipment staging, 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 nests are detected during the survey, the report shall include a map or aerial photo identifying the location of the nest and shall depict the boundaries of the no-disturbance buffer zone around the nest. Additional copies shall be provided to CDFG and USFWS.

DESERT TORTOISE EXCLUSION FENCING, CLEARANCE SURVEYS, AND TRANSLOCATION PLAN

BIO-11 A Desert Tortoise Exclusion Fencing, Clearance Surveys, and Translocation Plan shall be developed in consultation with the CPM, CDFG, and USFWS. This plan shall include detailed measures to avoid and minimize impacts to desert tortoise in and near the construction areas as well as methods for clearance surveys, fence installation, tortoise handling, artificial burrow construction, egg handling and other procedures, which shall be consistent with those described in the USFWS Desert Tortoise Field Manual (www.fws.gov/ventura/speciesinfo/protocols_guidelines) or more current guidance provided by CDFG and USFWS. At a minimum, the following measures shall be included in the plan and implemented by the project owner to manage their construction site, and related facilities, in a manner to avoid, minimize, or mitigate impacts to desert tortoise.

1. Fence Installation. Prior to ground disturbance, the entire project site shall be fenced with desert tortoise exclusion fence. To avoid impacts to desert tortoise during fence construction, the proposed fence alignment shall be flagged and the alignment surveyed within 24 hours prior to fence construction. Surveys shall be conducted by the Designated Biologist using techniques approved by the USFWS and CDFG. Biological Monitors may assist the Designated Biologist under his or her supervision. These surveys shall provide 100% coverage of all areas to be disturbed during fence construction and an additional transect along both sides of the proposed fence line. This fence line transect shall cover an area approximately 90 feet wide centered on the fence alignment. Transects shall be no greater than 30 feet apart. All desert tortoise burrows, and burrows constructed by other species that might be used by desert tortoises, shall be examined to assess occupancy of each burrow by desert tortoises and handled in accordance with USFWS-approved protocol.

   A. Timing and Supervision of Fence Installation. The exclusion fencing shall be installed prior to site clearing and grubbing. 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. The permanent tortoise exclusionary fencing shall consist of galvanized hard wire cloth 1 by 2 inch mesh sunk 12 inches into the ground, and 24 inches above ground (refer to parameters for USFWS-approved tortoise exclusion fencing at www.fws.gov/ventura/speciesinfo/protocols_guidelines). For temporary exclusion fencing, a “folded bottom” technique shall be implemented. This method follows the same guidelines as installation of permanent fencing except instead of burying the bottom 12 inches of the fencing, it is bent at a approximately 90 degree angle (to follow the contour of the ground) and spikes or other retaining methods are driven into the ground every two linear feet in such a manner as to “anchor” the bottom of the fence. This method eliminates the need for trenching, which for short-term temporary impacts may be more beneficial to the recovery of the landscape, and thus the species.

C. Security Gates. Security gates shall be designed with minimal ground clearance to deter ingress by tortoises. The gates shall remain closed except during vehicle passage and may be electronically activated to open and close immediately after vehicle(s) have entered or exited to prevent extended periods with open gates, which might lead to a tortoise entering. Cattle grating designed to safely exclude desert tortoise shall be installed at the gated entries to discourage tortoises from gaining entry.

D. Transmission Interconnection Fencing. The Transmission Interconnection Area shall be temporarily fenced with tortoise exclusion fencing to prevent desert tortoise entry during construction. Temporary fencing must follow guidelines for permanent fencing and supporting stakes shall be sufficiently spaced to maintain fence integrity. Temporary exclusion and translocation of desert tortoise in the Transmission Interconnection Area shall be addressed in the Desert Tortoise Translocation Plan.

E. Stormwater Drainage Fencing. The onsite stormwater drainage channels, including the headwalls, outlet, and road crossings, shall be permanently fenced to ensure exclusion of desert tortoise during AMS operation.

F. Fence Inspections. Following installation of the desert tortoise exclusion fencing for both the permanent site and stormwater drainage fencing and temporary fencing in the interconnection area, the fencing shall be regularly inspected. Permanent fencing shall be inspected monthly and during/immediately following all major rainfall events. Any damage to the fencing shall be temporarily repaired immediately to keep tortoises out of the site, and permanently repaired within two days of observing damage. Inspections of permanent site fencing shall occur for the life of the project. Temporary fencing must be inspected immediately 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 utility corridor or tower site for tortoise.

2. Desert Tortoise Clearance Surveys. Following construction of the tortoise exclusionary fencing around the Plant Site, all fenced areas shall be cleared of tortoises by the Designated Biologist, who may be assisted by Biological Monitors. A minimum of two, 100% coverage protocol clearance surveys with negative results must be completed and these must coincide with heightened desert tortoise activity from April through May and September through October. Non-protocol clearance surveys may be conducted in areas of certainly unsuitable habitat (e.g., developed) with

prior approval of specific areas by USFWS and CDFG (these proposed areas shall be identified in the draft Desert Tortoise Plan). To facilitate seeing the ground from different angles, the second clearance survey shall be walked at 90 degrees to the orientation of the first clearance survey. Additional clearance survey guidelines provided in the USFWS *Desert Tortoise Field Manual* (www.fws.gov/ventura/speciesinfo/protocols_guidelines).

3. Translocation of Desert Tortoise. If desert tortoises are detected during clearance surveys within the project impact area, the Designated Biologist shall safely translocate the tortoise the shortest possible distance to the nearest suitable habitat as described below. Any handling efforts shall be in accordance with techniques described in the USFWS *Desert Tortoise Field Manual* (www.fws.gov/ventura/speciesinfo/protocols_guidelines).

    A. If a tortoise is discovered within the project site, it shall be safely translocated to the nearest desert saltbush scrub or Mojave creosote bush scrub east and south of section 33 or the nearest desert saltbush scrub west and south of section 30.

    B. If a tortoise will be moved a distance greater than 5 km, disease testing and monitoring shall be conducted in accordance with the approved final Desert Tortoise Translocation Plan.

    C. If a visibly diseased tortoise is encountered onsite, procedures shall be implemented in accordance with the approved final Desert Tortoise Plan.

4. Burrow Inspection. All potential desert tortoise burrows within the fenced area shall be searched for presence. To prevent reentry by a tortoise or other wildlife, all burrows shall be collapsed once absence has been determined. Immediately following excavation and if environmental conditions warrant immediate translocation, tortoises excavated from burrows shall be translocated to unoccupied natural or artificial burrows within the location approved by USFWS and CDFG per the final Desert Tortoise Translocation Plan.

5. Burrow Excavation. Burrows inhabited by tortoises shall be excavated by the Designated Biologist using hand tools, and then collapsed or blocked to prevent re-occupation. If excavated during May through July, the Designated Biologist shall search for desert tortoise nests/eggs. All desert tortoise handling and removal, and burrow excavations, including nests, shall be conducted by the Designated Biologist in accordance with the USFWS *Desert Tortoise Field Manual* (www.fws.gov/ventura/speciesinfo/protocols_guidelines).

6. Monitoring During Clearing. Following the installation of exclusionary fencing and after ensuring desert tortoises are absent from the project site, heavy equipment shall be allowed to enter the project site to perform earth work such as clearing, grubbing, leveling, and trenching. A Biological

Monitor shall be onsite at all times during initial clearing and grading activities. Should a tortoise be discovered, it shall be relocated as described above in accordance with the final Desert Tortoise Translocation Plan.

7. 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 tortoise as described in the paragraph below. Desert tortoise moved from within project areas shall be marked for future identification as described in USFWS *Desert Tortoise Field Manual* (www.fws.gov/ventura/speciesinfo/protocols_guidelines). Digital photographs of the carapace, plastron, and fourth costal scute shall be taken. Scutes shall not be notched for identification.

Verification: At least 60 days prior to start of any project-related ground disturbance activities (and/or pre-construction surveys), the project owner shall provide the CPM with the final version of the Desert Tortoise Translocation Plan that has been approved by Energy Commission staff in consultation with USFWS and CDFG. The CPM will determine the plan's acceptability within 15 working days of receipt of the final plan. All modifications to the approved final Desert Tortoise Translocation Plan must be made only after approval by the Energy Commission staff in consultation with USFWS and CDFG. The project owner shall notify the CPM no fewer than five working days before implementing any CPM-approved modifications to the Translocation Plan.

Within 30 days of completing of desert tortoise clearance surveys the Designated Biologist shall submit a report to the CPM, USFWS, and CDFG describing how each of the mitigation measures described above has been satisfied. The report shall include the desert tortoise survey results, capture and release locations of any translocated desert tortoises, and any other information needed to demonstrate compliance with the measures described above.

MOHAVE GROUND SQUIRREL CLEARANCE SURVEYS

BIO-12 The project owner shall implement the following measures to manage their construction site, and related facilities, in a manner to avoid or minimize impacts to Mohave ground squirrels (MGS):

1. Clearance Survey. After the installation of the desert tortoise exclusion fence and immediately prior to any ground disturbance, the Designated Biologist(s) shall examine the construction disturbance area for MGS and their burrows. The survey shall provide 100% coverage of suitable habitat

within the project site (undisturbed desert saltbush scrub, disturbed desert saltbush scrub, disturbed desert saltbush scrub regrowth, fallow agriculture-saltbush scrub regrowth).

A. If potentially occupied burrows are identified, an attempt shall be made to trap and relocate the individual(s). Potentially occupied burrows shall be fully excavated by hand.

B. Trapping, relocation, and MGS burrow excavation shall only be conducted by individual(s) possessing an MOU with CDFG for such activities.

2. <u>Records of Capture.</u> If MGS are captured via trapping or burrow excavation, the Designated Biologist shall maintain a record of each Mohave ground squirrels handled, including: a) the locations (Global Positioning System [GPS] coordinates and maps) and time of capture and/or observation as well as release; b) sex; c) approximate age (adult/juvenile); d) weight; e) general condition and health, noting all visible conditions including gait and behavior, diarrhea, emaciation, salivation, hair loss, ectoparasites, and injuries; and f) ambient temperature when handled and released.

3. <u>Relocation.</u> Any MGS captured via trapping or burrow excavation shall be relocated to suitable habitat adjacent to the project site, which provides conditions suitable for the long-term survival of relocated MGS.

<u>Verification:</u> Within 30 days of completion of MGS clearance surveys, the Designated Biologist shall submit a report to the CPM and CDFG describing how the measures described above were implemented. The report shall include the MGS survey results, capture and release locations of any relocated squirrels, and any other information needed to demonstrate compliance with the measures described above.

BURROWING OWL IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-13 Prior to preconstruction surveys, a Burrowing Owl Monitoring and Mitigation Plan (Burrowing Owl Plan) shall be developed by the project owner in consultation with the CPM and CDFG. This plan shall include detailed measures to avoid and minimize impacts to burrowing owls in and near the construction areas (if indentified during surveys) and shall be consistent with CDFG guidance (CDFG 1995). In addition, the plan shall identify the optimal time to concurrently relocate both desert tortoise and burrowing owl. At a minimum, the following measures shall be included in the plan and implemented by the project owner to manage their construction site, and related facilities, in a manner to avoid, minimize, or mitigate impacts to breeding and foraging burrowing owls.

1. <u>Pre-Construction Surveys and Nest Avoidance.</u> The Designated Biologist shall conduct pre-construction surveys for burrowing owls within the project site and a 160-foot buffer. These surveys shall be conducted concurrent with desert tortoise clearance surveys, to the maximum extent

possible. The following shall be included in the Plan and implemented to avoid and minimize impacts to burrowing owls onsite:

A. Ground-disturbing actions should be carried out from September 1 to January 31, which is prior to the burrowing owl nesting season and also potentially within the desert tortoise active season, depending on ground and climate conditions.

B. A 250-foot exclusion area around occupied burrows will be flagged and this area will not be disturbed during the nesting season (February 1 through August 31) unless a qualified biologist verifies through non-invasive methods that either: (1) the birds have not begun egg-laying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival. The exclusion area shall remain connected to natural area(s) to the extent possible, to avoid completely surrounding the owl with construction activities and/or equipment.

2. Artificial Burrow Installation. Prior to any ground-disturbing activities, the project owner shall install five artificial burrows for each identified burrowing owl burrow in the project area that would be destroyed, within in the approved compensatory habitat area. The Designated Biologist shall survey the site selected for artificial burrow construction to verify that such construction will not affect desert tortoise or Mohave ground squirrel or existing burrowing owl colonies in the relocation area. Installation of the artificial burrows shall occur after baseline surveys of the relocation area and prior to ground disturbance or heavy equipment staging. Design of the artificial burrows shall be consistent with CDFG guidelines (CDFG 1995) and shall be approved by the CPM in consultation with CDFG.

3. Passive Relocation. Prior to passive relocation, any owls that will be relocated shall be color banded in accordance with the guidance provided by USGS bird banding lab (http://www.pwrc.usgs.gov/bbl) to monitor relocation success; this shall not be conducted during the breeding season. During the non-breeding season, owls would be given a minimum of three weeks to become familiar with the new artificial burrows, after which eviction of owls within the project site could begin. Use of one-way doors described by Trulio (1995) and Clark and Plumpton (2005) would be used to facilitate passive relocation of owls.

A. Monitoring and Success Criteria. The Designated Biologist shall survey the relocation area during the nesting season to assess use of the artificial burrows by owls using methods consistent with Phase II and Phase III Burrowing Owl Consortium Guideline protocols (CBOC 1993). Surveys shall start upon completion of artificial burrow construction and shall continue for a period of five years. If survey results indicate burrowing owls are not nesting on the relocation area, remedial actions shall be developed and implemented in consultation with the CPM, CDFG and USFWS to correct conditions at the site that might be preventing owls from nesting there. A report describing survey results and remedial actions taken shall be submitted to the CPM, CDFG and USFWS no later than January 31 of each year for five years.

4. Preserve and Manage Compensatory Habitat. For each individual owl or pair identified on the project site during pre-construction surveys, 6.5 acres shall be preserved and managed in perpetuity for the occupation of burrowing owls. This compensatory habitat shall be in addition to the acreage required to mitigate impacts to desert tortoise and Mohave ground squirrel.

   The compensatory habitat shall be managed for the benefit of burrowing owls, with the specific goals of:

   A. Maintaining the functionality of artificial and natural burrows; and

   B. Minimizing the occurrence of weeds (species considered “moderate” or “high” threat to California wildlands as defined by CAL-IPC [2006] and noxious weeds rated “A” or “B” by the California Department of Food and Agriculture and any federal-rated pest plants [CDFA 2009]) at less than 10% cover of the shrub and herb layers.

   The Burrowing Owl Plan shall also include monitoring and maintenance requirements for the compensatory habitat, details on methods for measuring compliance goals, and remedial actions to be taken if management goals are not met.

The final Burrowing Owl Plan is due before preconstruction surveys begin to ensure that an approved relocation methodology will be followed for any owls occurring within the project area. Therefore, it is understood that the compensatory mitigation acreage (if required) will not be identified in the Burrowing Owl Plan. However, the Plan shall propose a location for compensatory mitigation land and the methodology to quantify the acreage required, as outlined above. If owls are identified during the pre-construction survey, the project owner shall submit an addendum to the Burrowing Owl Plan, which identifies the number of owls identified and the exact acreage to be preserved and managed in perpetuity for burrowing owl based on the results of the preconstruction survey and as agreed to in consultation with CDFG.

Verification: At least 60 days prior to start of any project-related ground disturbance activities (and/or pre-construction surveys), the project owner shall provide the CPM and CDFG with the final version of the Burrowing Owl Monitoring and Mitigation Plan that has been reviewed and approved by the CPM in consultation with CDFG. An addendum to the plan, which includes the pre-construction survey results (e.g., number of owls identified onsite) and the CDFG-approved amount of compensatory mitigation, shall be submitted within 10 days of completing the burrowing owl pre-construction surveys. The CPM will determine the acceptability of the Plan and addendum within 15 days of their receipt. All modifications to the approved Plan may be made by the CPM after consultation with CDFG. The project owner shall notify the CPM no less than five working days before implementing any CPM-approved modifications to the Burrowing Owl Monitoring and Mitigation Plan.

AMERICAN BADGER AND DESERT KIT FOX IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-14 To avoid direct impacts to American badgers and desert kit fox, preconstruction surveys shall be conducted for these species concurrent with the desert tortoise surveys. Surveys shall be conducted as described below:

Biological Monitors shall perform pre-construction surveys for badger and kit fox dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads. If dens are detected, each den shall be classified as inactive, potentially active, or definitely active.

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.

Potentially and definitely active dens shall not be disturbed during the whelping/pupping season (February 1 – September 30). 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.

<u>**Verification:**</u> The project owner shall submit a report to the CPM and CDFG within 30 days of completion of badger and kit fox surveys. The report shall describe survey methods, results, mitigation measures implemented, and the results of the mitigation.

COMPENSATORY MITIGATION

BIO-15 To fully mitigate for habitat loss and incidental take of desert tortoise and Mohave ground squirrel, the project owner shall acquire, prior to ground-disturbing activities, in fee or in easement, no less than 118.2 acres of land suitable for these species and shall provide funding for the enhancement and long-term management of these compensation lands. This compensatory habitat shall be in addition to any acreage required to mitigate impacts to burrowing owl (refer to **BIO-13**). The responsibilities for 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. If habitat disturbance exceeds that described in this analysis, the project owner shall be responsible for acquisition and management of additional compensation lands and/or additional funds required to compensate for any additional habitat disturbances. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. Agreements to delegate land acquisition or management shall be implemented within 12 months of the Energy Commission's decision. The acquisition and management of compensation lands shall include, but is not limited to, the following elements:

1. Selection Criteria for Compensation Lands. The compensation lands selected for acquisition or title/easement transfer shall:

   A. have substantial capacity to support resident and dispersing desert tortoise and MGS;

   B. be a contiguous block of land (preferably) or located so that parcel(s) result in a contiguous block of protected habitat;

   C. not be encumbered by easements or uses that would preclude fencing of the site or preclude management of the site for the primary benefit of the species for which mitigation lands were secured; and

   D. include mineral/water rights or ensure that those rights may not be evoked in a manner to negate the value of the compensation lands.

2. Review and Approval of Compensation Lands Prior to Acquisition or Title/Easement Transfer. A minimum of three months prior to acquisition or transfer of the property title and/or easement, the project owner, or a third-party approved by the CPM, in consultation with CDFG and USFWS, shall submit a proposal to the CPM, CDFG, and USFWS describing the parcel(s) intended for purchase or title/easement transfer. This proposal shall discuss the suitability of the proposed parcel(s) as compensation lands for desert tortoise and MGS in relation to the criteria listed above. Approval from the CPM, in consultation with USFWS and CDFG, shall be required for acquisition of all parcels comprising no less than 118.2 acres in advance of purchase or title/easement transfer.

3. Review and Approval of Compensation Lands Management Plan. Within six months of the land or easement purchase or transfer, as determined by the date on the title, the project owner, or a third-party approved by the CPM, in consultation with CDFG and USFWS, shall submit a compensation lands management plan to the CPM, CDFG, and USFWS. The plan shall include, but not be limited to proposed measures to enhance habitat (e.g., removal of structures and other human attractants); maintenance procedures; general maintenance provisions (e.g., trash dumping, trespass, pesticide use avoidance, etc.).

4. Mitigation Security for Compensation Lands and Avoidance/Minimization Measures. The project owner shall provide financial assurances to the CPM, with copies of the document(s) to CDFG and USFWS, to guarantee

that an adequate level of funding is available to implement all biological avoidance, minimization, and compensation measures described in the conditions of certification**.** These funds shall be used solely for implementation of the measures associated with the project.

The project owner or an approved third party shall complete acquisition of the proposed compensation lands prior to initiating ground-disturbing project activities.

5. Conditions for Acquisition of Compensation Lands. The project owner shall comply with the following conditions relating to acquisition of compensation lands or transfer of the property's title and/or easement after the CPM, in consultation with CDFG and USFWS, has approved the proposed compensation lands as described above.

   A. Preliminary Report: The project owner, or approved third party, shall provide a recent preliminary title report (no more than six months old), hazardous materials survey report (i.e., Phase I ESA), biological analysis, and other necessary documents for the proposed 118.2 acres. All documents conveying or conserving compensation lands and all conditions of title/easement are subject to a field review and approval by the CPM, in consultation with CDFG and USFWS, California Department of General Services and, if applicable, the Fish and Game Commission and/or Wildlife Conservation Board.

   B. Title/Conveyance: The project owner shall transfer fee title/deed or a conservation easement for the 118.2 acres of compensation lands to CDFG under terms approved by CDFG. Alternatively, a CPM-approved, in consultation with CDFG and USFWS, non-profit organization qualified pursuant to California Government Code section 65965 may hold fee title or a conservation easement over the compensation lands. In the event an approved non-profit holds title, a conservation easement shall be recorded in favor of CDFG in a form approved by CDFG and USFWS; in the event an approved non-profit holds a conservation easement over the compensation lands, CDFG shall be named a third party beneficiary. USFWS shall be named a third party beneficiary regardless of who holds the easement. The project owner shall also provide a property assessment and warranty.

   C. Enhancement Fund. The project owner shall fund the initial protection and enhancement of the 118.2 acres by providing the enhancement fund to the CDFG. Alternatively, a CPM-approved, in consultation with CDFG and USFWS, non-profit organization qualified pursuant to California Government Code section 65965 to manage the compensation lands may hold the enhancement funds. If CDFG takes fee title to the compensation lands, the enhancement fund must go to CDFG.

   D. Endowment Fund: Prior to ground-disturbing project activities, the project owner shall provide to CDFG a capital endowment in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis that will be conducted for the 118.2 acres of compensation lands. Alternatively, a CPM-approved, in consultation with CDFG and USFWS, non-profit organization qualified pursuant to California Government Code section 65965 may hold the endowment fees. If CDFG takes fee title to the compensation lands, the endowment must go to CDFG, where it will likely be held in the special deposit fund established pursuant to Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation will manage the endowment for CDFG and with CDFG guidance.

The project owner and the CPM shall ensure that an agreement is in place with the endowment holder/manager to ensure the following:

- Interest. Interest generated from the initial capital endowment 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 designed to protect or improve the habitat values of the compensation lands.
- Withdrawal of Principal. The endowment principal shall not be drawn upon unless such withdrawal is deemed necessary by the CDFG or the approved third-party endowment manager to ensure the continued viability of the species on the 118.2 acres. If CDFG takes fee title to the compensation lands, monies received by CDFG pursuant to this provision will likely be deposited in a special deposit fund established pursuant to Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation will manage the endowment for CDFG and with CDFG guidance.
- Pooling Endowment Funds. CDFG, or a CPM-approved, in consultation with CDFG and USFWS, non-profit organization qualified pursuant to California Government Code section 65965 to hold endowments may pool the endowment with other endowments for the operation, management, and protection of the 118.2 acres for local populations of desert tortoise and MGS. However, for reporting purposes, the endowment fund must be tracked and reported individually.

E. Security Deposit. The project owner may proceed with ground disturbing activities before fully performing its compensatory mitigation duties and obligations as set forth above only if the project owner secures its performance by providing funding to CDFG (Security Deposit), or if CDFG approves, administrative proof of funding, necessary to cover easement costs, fencing/cleanup costs, and as necessary, initial protection and enhancement of the compensation lands. If the Security is provided to allow the commencement of project disturbance prior to completion of compensation actions, the project owner, CDFG, or a third-party entity approved by the CPM, in consultation with CDFG and USFWS, may draw on the principle sum if it is determined that the project owner has failed to comply with the conditions of certification. The security will be returned to the project owner upon completion of the legal transfer of the compensation lands to CDFG or approved third-party entity, or upon completion of an implementation agreement with a third party mitigation banking entity acceptable to the CPM and CDFG, to acquire and/or manage the compensation lands.

The Security is calculated as follows:

- Costs of enhancing compensation lands are estimated at $250 per acre.
- Costs of establishing an endowment for long-term management of compensation lands are estimated at $1,350 per acre.

F. Reimbursement Fund. The project owner shall provide reimbursement to the CDFG or approved third party for reasonable expenses incurred during title, easement, and documentation review; expenses incurred from other state agency reviews; and overhead related to providing compensation lands.

The project owner is responsible for all compensation lands acquisition/easement costs, including but not limited to, title and document review costs, as well as expenses incurred from other state agency reviews and overhead related to providing compensation lands to the department or approved third party; escrow fees or costs; environmental contaminants clearance; and other site cleanup measures.

Verification: No less than 90 days prior to acquisition of the property, the project owner, or a third-party approved by the CPM, in consultation with CDFG and USFWS, shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcel(s) intended for purchase or title/easement transfer. At least 30 days prior to ground-disturbing, project-related activities (or as allowed under 5(e), above), 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(s). Within six months of 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, for the compensation lands and associated funds.

Within 90 days after completion of project construction, the project owner shall provide to the CPM verification that disturbance to desert tortoise and MGS habitat did not exceed 430 acres, and that construction activities did not result in impacts to desert tortoise and MGS habitat adjacent to work areas. If habitat disturbance exceeds that described in this analysis, the CPM shall notify the project owner of any additional funds required or lands that must be purchased to compensate for any additional habitat disturbances at the adjusted market value at the time of construction to acquire and manage habitat.

TAMARISK ERADICATION, MONITORING, AND REPORTING PROGRAM

BIO-16 The project owner shall ensure effective removal of tamarisk by designing and implementing a monitoring and reporting plan. The plan shall include proposed methods for tamarisk removal and treatment, monitoring and maintenance procedures/timeline, irrigation, success standards and contingency measures, and monitoring and maintenance objectives to prevent the re-invasion of undesirable weeds and/or invasive wildlife species for a minimum of five years. The plan shall include identification on a map of each location and size of non-native vegetation to be removed, and the methods proposed to remove and dispose of invasive wildlife species. Exotic, non-native, and invasive species removal shall be conducted throughout the monitoring and maintenance period.

For the CPM and CDFG to deem eradication successful:

- The site shall not contain more than 5% exotic plant species for the CPM and CDFG to deem the site successful.
- All plant species with rates of dispersal and establishment listed as “High” or “Moderate” on the California Invasive Plant Inventory shall have documented absence, or have been removed from the site for at least three years for the CPM and CDFG to deem the site successful.
- The site shall not contain invasive wildlife species for the CPM and CDFG to deem the site successful.

Monitoring and maintenance of the site shall be conducted for five years unless less monitoring can be justified. Following the first year of monitoring, if the project owner petitions to terminate the monitoring program, staff and CDFG will determine whether more years are of monitoring are needed.

<u>Verification:</u> At least 30 days prior to the site mobilization, the project owner shall submit to the CPM a copy of the Energy Commission staff- and CDFG-approved Tamarisk Eradication Monitoring and Reporting Plan, including success criteria.

The Designated Biologist shall submit annual reports to the CPM and CDFG describing the dates, durations and results of monitoring. The reports shall fully describe the status of the tamarisk at the eradication site, and shall describe any actions taken to remedy regrowth.

The CPM and CDFG shall 1) verify compliance with protective measures to ensure the accuracy of the project owner’s mitigation, monitoring and reporting efforts; and 2) review relevant documents maintained by the project owner, interview the project owner’s employees and agents, inspect the work site, and take other actions as necessary to assess compliance with or effectiveness of protective measures.

MONITORING IMPACTS OF SOLAR COLLECTION TECHNOLOGY ON BIRDS

BIO-17 The project owner shall prepare and implement a Bird Monitoring Study to monitor the death and injury of birds from collisions with facility features such as reflective mirror-like surfaces and from heat, and bright light from concentrating sunlight. The study design shall be approved by the CPM in consultation with CDFG and USFWS, and shall be incorporated into the project's BRMIMP and implemented. The Bird Monitoring Study shall include detailed specifications on data and carcass collection protocol and a rationale justifying the proposed schedule of carcass searches. The study shall also include seasonal trials to assess bias from carcass removal by scavengers as well as searcher bias.

Verification: No more than 30 days following the publication of the Energy Commission Decision, the project owner shall submit to the CPM, USFWS, and CDFG a draft Bird Monitoring Study. At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM with the final version of the Bird Monitoring Plan that has been reviewed and approved by the CPM, in consultation with CDFG and USFWS. All modifications to the Bird Monitoring Study shall be made only after approval from the CPM.

For at least two years following the beginning of operation the Designated Biologist shall submit quarterly reports to the CPM, CDFG, and USFWS describing the dates, durations and results of monitoring. The quarterly reports shall provide a detailed description of any Project-related bird or wildlife deaths or injuries detected during the monitoring study or at any other time.

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, 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 (e.g., development and/or implementation of bird deterrent technology) and/or adaptive management measures are necessary. After the Bird Monitoring Study is determined by the CPM to be complete, the project owner or contractor shall prepare a paper that describes the study design and monitoring results to be submitted to a peer-reviewed scientific journal. Proof of submittal shall be provided to the CPM within one year of concluding the monitoring study.

COMMON RAVEN MONITORING, MANAGEMENT, AND CONTROL

BIO-18 The project owner shall implement the following measures to manage their construction site and related facilities in a manner to control raven populations and to offset cumulative impacts associated with regional increases in raven numbers:

1. Common Raven Monitoring, Management, and Control Plan. The project owner shall design and implement a Common Raven Monitoring, Management, and Control Plan that is consistent with the most current USFWS-approved raven management guidelines and that meets the approval of USFWS, CDFG, and Energy Commission staff. 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. Address monitoring during construction and for the life of the project;

   E. And discuss reporting requirements.

2. USFWS Regional Raven Management. The project owner shall submit payment to a third-party account established by the USFWS to support a regional raven monitoring and management plan. The amount shall be agreed to by staff, USFWS, and the project owner.

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM, USFWS, and CDFG with the final version of the Raven Plan that has been reviewed and approved by USFWS and CDFG. The CPM shall determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Raven Plan must be made only after consultation with the Energy Commission staff, USFWS, and CDFG. The project owner shall notify the CPM no less than five working days before implementing any CPM-approved modifications to the Raven Plan.

Within 30 days after site mobilization, the project owner shall submit to the CPM verification of payment to a third-party account established by the USFWS to support a regional raven monitoring and management plan.

Within 30 days after completion of project construction, the project owner shall provide to the CPM for review and approval a 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.

EVAPORATION POND NETTING AND MONITORING

BIO-19 The Project 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 CDFG 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. Surveys shall be of sufficient duration and intensity 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 BSEP site shall also report finding any dead birds or other wildlife at the evaporation ponds to the Designated Biologist within one day of the detection of the carcass. The Designated Biologists shall report any bird or other wildlife deaths or entanglements within two days of the discovery to the CPM, CDFG, 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, CDFG, 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 by or reported to the Designated Biologist, monitoring can be reduced to quarterly visits.

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 CDFG, future surveys may be reduced to two surveys per year, during spring and fall migration.

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, CDFG, 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, CDFG, and USFWS no later than January 31st of every year for the life of the project.

HARPER DRY LAKE MARSH WATER DELIVERY

BIO-20 To ensure continuity of water delivery to the Harper Dry Lake ACEC the project owner shall not decommission the existing well on Mojave Solar, LLC-owned property that currently serves the Harper Dry Lake marsh (wetland well) until an alternate well is able to effectively convey a minimum of 75 acre feet per year to the Harper Dry Lake marsh.

This condition of certification does not transfer to Mojave Solar, LLC the obligation of Luz Solar Partners Ltd. to allow BLM to pump 75 acre feet of water per year to the marsh, under SEGS IX Condition of Certification **BIO-11.k**.

Verification: At least 15 days prior to decommissioning the wetland well, the project owner shall provide proof, to the satisfaction of the CPM, that the alternate well is completed and able to effectively convey a minimum of 75 acre feet per year to the Harper Dry Lake marsh. Proof shall include, but not be limited to, a description of the well parameters, as constructed.

USFWS BIOLOGICAL OPINION

BIO-21 The project owner shall provide a copy of the Biological Opinion per Section 7 of the federal Endangered Species Act written by the U. S. Fish and Wildlife Service in consultation with U.S. Department of Energy. The terms and conditions contained in the Biological Opinion shall be incorporated into the project's BRMIMP and implemented by the project owner.

Verification: For the Biological Opinion to effectively provide guidance on pre-construction actions for listed species (e.g., desert tortoise clearance surveys and translocation), the project owner shall submit to the CPM a copy of the USFWS's Biological Opinion at least 90 days prior to the start of any project-related ground disturbance activities. At this time the project owner shall also verify that the permit terms and conditions of the Biological Opinion are incorporated into the BRMIMP and will be implemented.

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_____ 2009d. Evaporation Pond Monitoring/Remediation Action Plan for the Mojave Solar Project. Submitted to the California Energy Commission on December 23, 2009.

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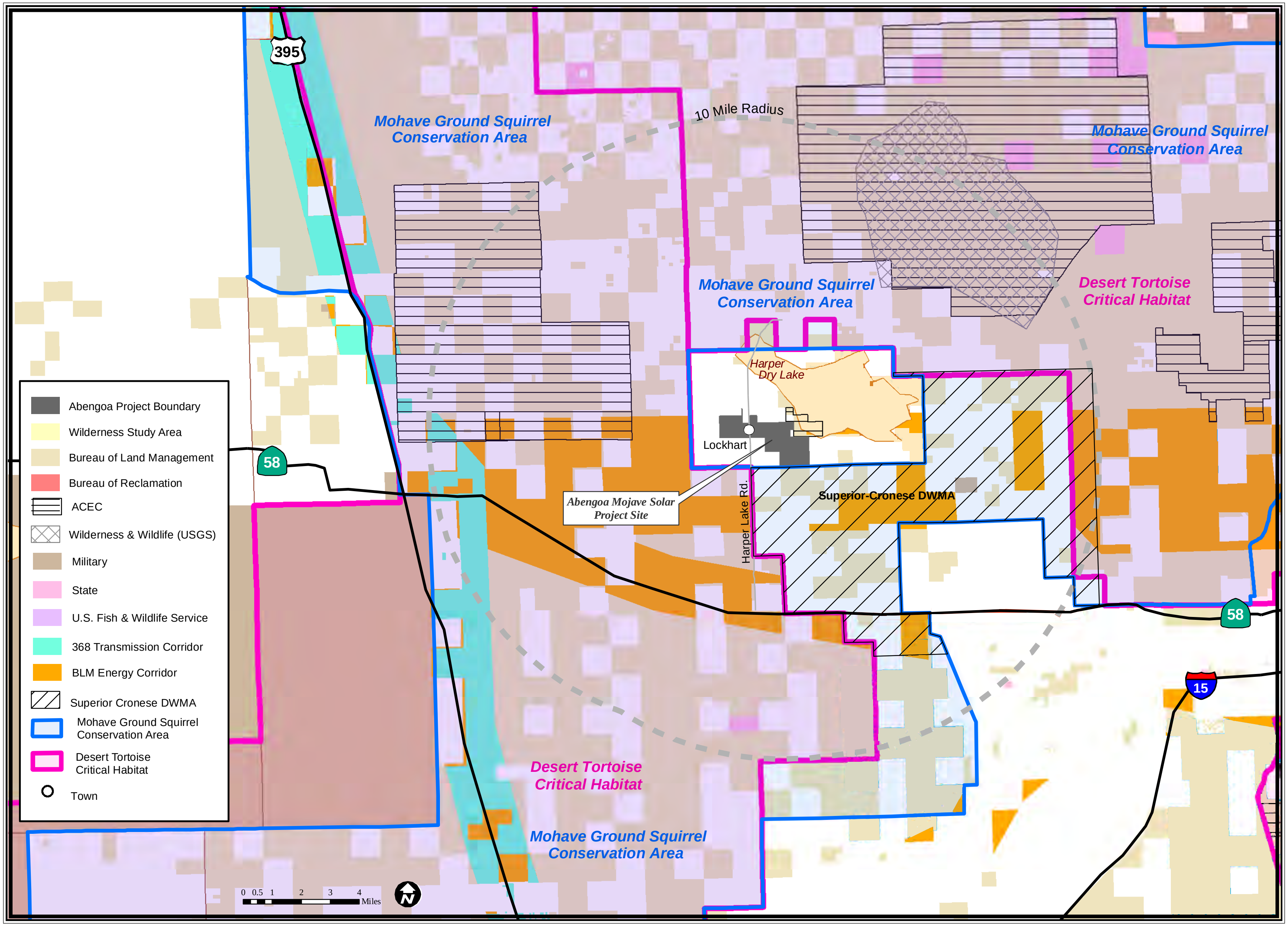
BIOLOGICAL RESOURCES - FIGURE 1

Abengoa Mojave Solar Project - Harper Dry Lake Land Management Areas and Project Vicinity

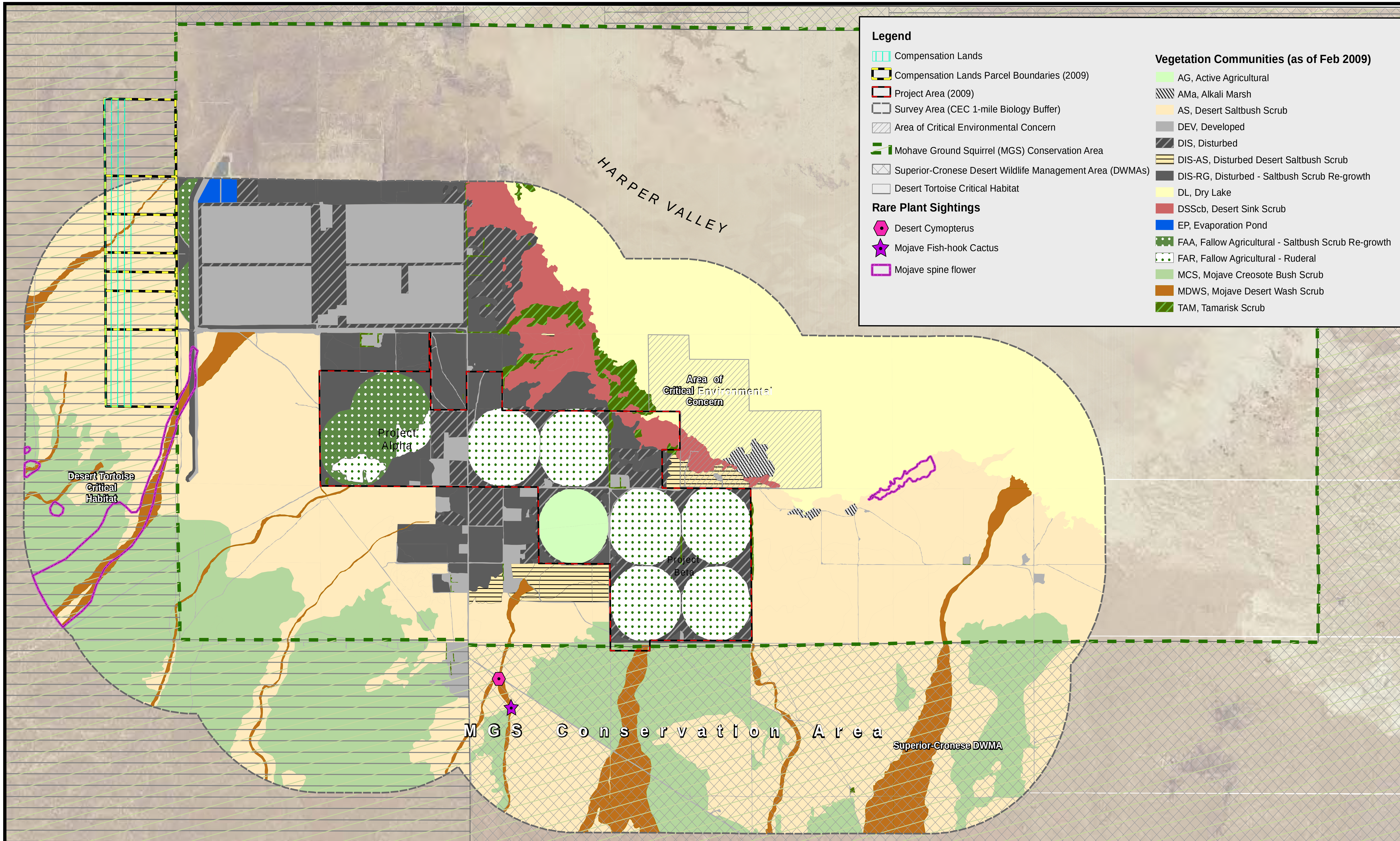


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: California Energy Commission, Bureau of Land Management

BIOLOGICAL RESOURCES - FIGURE 2

Abengoa Mojave Solar Project - Vegetation Communities, Compensation Lands and Project Vicinity



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

SOURCE: California Energy Commission, Bureau of Land Management

CULTURAL RESOURCES

Testimony of Kathleen A. Forrest

SUMMARY OF CONCLUSIONS

Staff concludes that the Abengoa Mojave Solar (AMS) project would have a significant direct impact on one historically significant historical archaeological site, referred to herein as “P-36-006553.” The adoption and implementation of Condition of Certification **CUL-8** would reduce the potential impacts of the proposed project on this historical resource to less than significant.

Staff recommends that the Commission adopt the following cultural resources Conditions of Certification, **CUL-1** through **CUL-8**. These measures are intended to facilitate the identification and assessment of inadvertent discoveries of archaeological resources during construction and to mitigate any significant impacts from the project on these resources should they be determined significant. To accomplish this, the conditions provide for the hiring of a Cultural Resources Specialist and archaeological monitors, for cultural resources awareness training for construction workers, for the archaeological and Native American monitoring of ground-disturbing activities, for the recovery of data from significant discovered archaeological deposits, for the writing of a technical archaeological report on all archaeological activities and findings, and for the curation of recovered artifacts and other data. When properly implemented and enforced, staff believes that these conditions of certification would reduce to less than significant any impacts to inadvertent discoveries during construction or operation that are determined to be significant archaeological resources. Additionally, with the adoption and implementation of these conditions, the AMS would be in conformity with all applicable laws, ordinances, regulations, and standards (LORS).

INTRODUCTION

This cultural resources assessment provides an assessment of the potential impacts of the AMS to cultural resources. Cultural resources are defined under state law as buildings, sites, structures, objects, and historic districts. Three kinds of cultural resources are considered in this assessment: prehistoric, historic, and ethnographic.

Prehistoric archaeological resources are those materials relating to prehistoric human occupation and use of an area. 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 California.

Historic-period resources are those materials, archaeological and architectural, usually 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. Under federal and state requirements, historical cultural resources must be greater than fifty years old to be considered of potential historic importance. A resource less than fifty years of age may be historically important if the resource is of exceptional importance.

Ethnographic resources are those materials important to the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, or Asian immigrants. They may include traditional resource collecting areas, ceremonial sites, topographic features, cemeteries, shrines, or ethnic neighborhoods and structures.

For the AMS project, staff provides an overview of the environmental setting and history of the project area, an inventory of the cultural resources identified in the project vicinity, and an analysis of the potential impacts from the proposed project using criteria from the CEQA.

If cultural resources are identified, staff determines which are significant and whether there could be an AMS project-related significant impact to those. If significant project impacts to significant cultural resources cannot be avoided, staff recommends mitigation measures to reduce impacts to significant cultural resources to below the level of significance.

Staff's primary concern is to ensure that all potentially significant historical resources are identified, that all potential impacts are identified, and that conditions are set forth that ensure that all significant impacts are mitigated to a less-than-significant level.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Projects licensed by the Energy Commission are reviewed to ensure compliance with all applicable laws. For this project, which has no federal involvement, the applicable laws are primarily state laws, in particular, the California Environmental Quality Act (CEQA). Although the Energy Commission has pre-emptive authority over local laws, it typically ensures compliance with local laws, ordinances, regulations, standards, plans, and policies.

Cultural Resources Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
State	
Public Resources Code, section 21083.2 (CEQA)	The lead agency may require reasonable steps to preserve a unique archaeological resource in place. Otherwise, the project applicant is required to fund mitigation measures to the extent prescribed in this section. This section also allows a lead agency to make provisions for archaeological resources unexpectedly encountered during construction, which may require the project applicant to fund mitigation and delay construction in the area of the find.
Health and Safety Code, section 7050.5	Makes it a misdemeanor to disturb or remove human remains found outside a cemetery; also requires a project owner to halt construction if human remains are discovered and to contact the county coroner.
Public Resources Code 5097.98 (b) and (e)	Requires a landowner on whose property Native American human remains are found to limit further development activity in the vicinity until he/she confers with the Native American Heritage Commission's(NAHC)-identified Most Likely Descendents (MLDs) to consider treatment options. In the absence of MLDs or of a treatment acceptable to all parties, the landowner is required to reinter the remains elsewhere on the property in a location not subject to further disturbance.
Local	
San Bernardino County General Plan, Section V.4-Conservation Element	Provides that the County will preserve and promote its historic and prehistoric cultural heritage.

SETTING

REGIONAL SETTING

The proposed Abengoa Mojave Solar project (AMS) would be located near Harper Dry Lake in San Bernardino County, in the western Mojave Desert. The project site is located approximately 15 miles northwest of Barstow and nine miles northwest of Hinkley in an unincorporated area of San Bernardino County. The proposed project would be located southwest of Harper Dry Lake, and the site has a relatively flat topography with elevations ranging from approximately 2,100 feet at the southwest corner of the site and descending to approximately 2,030 feet at the northwest corner.

PROJECT, SITE, AND VICINITY DESCRIPTION

The proposed AMS project is a solar thermal electric generating facility to be located on approximately 1,765 acres. The proposed project site is located approximately nine miles northwest of the Town of Hinkley in unincorporated San Bernardino County, approximately halfway between the City of Barstow and Kramer Junction (US Highway 395/State Route 58 junction). Project site access is provided by Harper Lake Road, which is located approximately twenty miles west of Barstow along the State Route 58 corridor. The project site is approximately six miles north of where Harper Lake Road intersects with State Route 58. Existing Solar Electric Generating Stations VIII and IX facilities, now owned by NextEra™ Energy Resources, are located adjacent to the project site.

The project site is comprised of private property that was historically used as the Lockhart Ranch complex. The property has served as an agricultural and cattle center for over sixty years and, in that capacity, has utilized water from ground wells. Farming activities have included flood irrigation and the pivot system of irrigation of quarter section areas. Currently there are no ranching or residential activities on the property, and there is only one active pivot irrigation field in production on the site. The structures associated with the Lockhart Ranch and the town of Lockhart are abandoned or have been demolished.

Harper Dry Lake, located northeast of the proposed project site, was a Pleistocene-era pluvial lake and is now a dry playa. Evidence suggests that the lake once served as the terminal lake of the Mojave River, until the river's course was shifted southward. The Mojave River is now located approximately 12 miles from the proposed project site. The last wet sections of the lake dried up in the 1990s (AS 2009a, p. 5.4-13).

The project will have a combined nominal electrical output of 250 MW from twin 125-MW parabolic trough power blocks. Solar thermal technology will provide 100% of the power generated by the plant. No supplementary energy source, such as natural gas to generate electricity at night, is proposed to be used for electricity generation. Each power block will have an auxiliary boiler fueled by natural gas to reduce startup time and for heat transfer fluid freeze protection. Each power block will also have a diesel powered firewater pump for fire protection and a diesel powered backup generator for power plant essentials.

The power blocks will connect to the Southern California Edison (SCE) Kramer Coolwater 230-kV transmission line to form one full-output transmission interconnection. The interconnection is located at the southern border of the project site. The on-ground improvements associated with the interconnection were permitted in an outside process led by SCE. All project-related transmission facilities are located within the project site boundaries.

Natural gas for the project's auxiliary purposes will be supplied by a SoCal Gas-owned pipeline that runs to the project boundary. No additional offsite project facilities are proposed as part of the AMS (EDAW 2009a, p 5-6).

Environmental Setting

Identifying the kinds and distribution of resources necessary to sustain human life in an environment, and the changes in that environment over time, is central to understanding whether and how an area was used during prehistory and history. During the time that humans have lived in California, the region in which the proposed AMS is located, the Mojave Desert, has undergone several climatic shifts. These shifts have resulted in variable availability of vital resources, and that variability has influenced the scope and scale of human use of the vicinity of the project site. Consequently, it is important to consider the historical character of local climate change, or the paleoclimate, and the effects of the paleoclimate on the physical development of the area and its ecology.

Paleoclimate

The climate in the Mojave Desert has fluctuated between the dry climate familiar today and a wetter climate in the past. The late Pleistocene data shows that the Laurentide ice sheet forced a moisture-laden jet stream directly over the Mojave region, and the Eastern Pacific Ocean received consistent El Nino-like weather patterns during full glacial climate regimes. The high albedo (reflective) rates of Laurentide ice sheet allowed for a continued southerly jet stream even in summer. The combination of the above factors allowed California to received moisture-laden air annually. In the Mojave, data indicates that during the late Pleistocene epoch pinyon-juniper woodlands occurred at elevations as low as 1000 meters, indicating a significantly wetter environment (SWCA 2009c, p. 3-4).

The Pleistocene-Holocene transition was one of extreme climate change and massive deglaciation, including the collapse of the Laurentide ice sheet. The effect on the Mojave was change from pinyon-juniper woodland to more familiar modern desert scrub. The Middle Holocene saw increased rainfall leading to the enlargement of lakes. The Late Holocene brought a reduction in precipitation leading to drought conditions (SWCA 2009c, p. 3-4).

Early research in the area indicated a paleolake likely existed in the Harper Basin. This was confirmed in later research, which also determined the highest paleoshoreline was located near 2,150-2,160 feet above mean sea level (amsl). The likely source for lake was the Mojave River, which probably flowed or terminated into the Harper Basin until it was diverted away as a result of tectonic forces (SWCA 2009c, p. 3-4).

Geology

The project site is located in the western region of the Mojave Desert Geomorphic Province. It is bounded by the Transverse Ranges to the northwest; the Colorado Desert to the southwest; the Colorado River to the east; and the Sierra Nevada and Basin and Range provinces to the north. The Mojave is an elevated alluvial plain on a wedge-shaped fault, bounded by the San Andreas and Garlock fault zones. The project area is “underlain by Quaternary alluvial and lake bed deposits ranging from Pleistocene (1.8 million years old [Ma] to 10,000 BP) to Holocene (10,000 BP to Recent) in age” (SWCA 2009c, p. 5). The surface of the project area is mapped to a large extent as “made land,” or artificial fill resulting from extensive agricultural disturbance (SWCA 2009c, p. 4-5).

Geomorphology

Geomorphology is the study of landforms and the forces that shape them (Waters 1996, p. 3-4). The AMS project site is located in the western portion of the Mojave Desert Geomorphic Province. It is a large depressional, wedge-shaped block bounded by faults. There are numerous parallel strike-slip faults within the block, which has resulted in the formation of a series of isolated and contorted ridges and basins. Harper Lake is a basin formed by the Lockhart fault to the north and the Harper fault to the northeast. The basin received a thick sequence of sediments in the form of coalescing alluvial fans during the Pliocene, Pleistocene and Holocene epochs. The base of the depression formed a lake in cool climates, fed by the Mojave River until it was diverted in the late Pleistocene epoch. After the river was diverted the lake levels dropped and fluctuated over time (SWCA 2009c, p. 8).

Prehistoric Setting

The prehistory of the western Mojave Desert is the narrative of how human populations have adapted to marked fluctuations in the local environment over the course of at least the last 12,000 years. The archaeological remains of the region's prehistory are relatively scarce. Sparse scatters of stone tools and chipped stone tool manufacturing debris, and isolated artifacts, resources that typically yield information of marginal value, account for 40-60% of the archaeological remains found in the Mojave and Colorado deserts. A relative paucity of intact buried archaeological deposits contributes further to the dearth of information on the prehistory of the region (Lyneis and Macko 1986, p. 52). The availability of water and the location of high-value resource patches in otherwise unproductive habitats appear to influence the distribution of the archaeological sites that are on the desert landscape (Lyneis and Macko 1986, p. 57; Sutton, et al., 2007, p. 230). The broad trajectory of cultural development in the Mojave Desert appears to be a steady decline in residential mobility as local populations came to occupy increasingly larger valley or basin-bottom base camps, in a few preferred locations, over longer periods of time, rather than working out of temporary camps in particularly productive environmental zones (Bamforth 1990, p. 74).

Over the past seven decades, Mojave Desert archaeologists have developed and refined a broad sequence of approximately six artifact groups or assemblages, each with distinctive types of stone projectiles, that represent the material record of the peoples who once lived in the proposed project area (Bamforth 1990, p. 72; Campbell 1936; Lyneis 1982; Rogers 1939; Sutton, et al., 2007; Warren 1984; Warren and Crabtree 1986).

Terminal Pleistocene Period (Prior to 10,000 B.C.)

Evidence for a Paleo-Indian occupation in the western Mojave Desert has come in the form of fluted points, generally considered to represent the Clovis complex (Sutton, et al., 2007, pp. 233–234). It should be noted, however, that not every fluted point can necessarily be attributed to Clovis, and that the western Mojave Desert finds could be associated with later cultures using a similar technology. Work in the China Lake basin drainage, located in Indian Wells Valley to the north; and in the Lake Thompson basin drainage, located in the Antelope Valley to the south, have yielded these points. Glennan discovered an obsidian isolate on the slope of the El Paso Mountains, described as “a lanceolate-shaped point with a concave base.” He noted, however, that he considered the point to be “a Folsom-like type” (Glennan 1987; Rondeau, et al., 2007).

During this period, it has been suggested that highly mobile groups relied considerably upon lacustrine resources (Apple and Glenny 2008, p. 15). These patterns of subsistence and settlement have been collectively described as the Western Pluvial Lakes Tradition (WPLT) (Moratto 1984, pp. 90–103). This pattern has also been demonstrated throughout the western Great Basin, continuing briefly into the Early Holocene.

Early Holocene

The Lake Mojave complex is the pattern characteristic of this period, dating from approximately 8,000–6,000 cal (calibrated radiocarbon years) B.C. (Sutton, et al., 2007, p. 234). This complex is marked by projectile points of the Lake Mojave and Silver Lake types. The assemblages can also generally contain bifaces, steep-edged unifaces, and crescents in quantity, with some cobble-core tools and ground stone tools also represented.

During the Early Holocene, the pluvial lakes began to slowly recede, with groups adapting to the changing environment (Sutton, et al., 2007). Archaeological evidence indicates that lacustrine resources around these lake basins continued to be exploited, but evidence of groups obtaining other resources from beyond the lake basins, such as the procurement of lagomorphs, rodents, and certain reptiles, has also been reported from work at Fort Irwin (Sutton, et al., 2007; Basgall 1993; Douglas, et al., 1988).

Middle Holocene

For the Middle Holocene, the Pinto complex has become the widely accepted cultural complex for this region (Sutton, et al., 2007, p. 238). Archaeologists have generally accepted that the Pinto complex began just after the Lake Mojave complex and ended at approximately 3,000 cal B.C. Some, however, argue that the Lake Mojave and the Pinto complexes overlap, with the Pinto complex being introduced toward the end of the Early Holocene.

Artifacts identified with this complex include stemmed, indented-base Pinto series projectile points, probably used as thrusting spears rather than darts (Sutton, et al., 2007, p. 238). There is a dramatic increase in the presence of ground stone tools during this time period, with evidence of these implements in almost every Pinto site that has been identified. The procurement of faunal resources appears to be much the same in the Middle Holocene as in the Early Holocene, with a slight increase in small fauna, and with artiodactyls (deer and mountain sheep) decreasing (Sutton, et al., 2007, p. 238). Pinto complex sites have been found in varying topographic and environmental zones, including pluvial lake basins, springs/seeps, streams, and within upland areas (Sutton, et al., 2007, p. 238). The dramatic increase in ground stone implements suggests that access to plant foodstuffs was probably of high importance for the selection of habitation.

The scarcity of sites in the western Mojave Desert representing the period ca. 3,000–2,000 cal B.C. indicates that there may have been “an occupational hiatus” at this time (Sutton, et al., 2007, p. 241), or that population density in the region was low. This may have been due to the climate being much hotter and drier towards the end of the Middle Holocene.

Late Holocene

The Gypsum complex appeared during the earliest part of this period, from 2,000 cal B.C.–cal A.D. 200 (Sutton, et al., 2007, p. 241). During this time, the climate became wetter and cooler than during the previous period. Artifacts from the Gypsum complex are represented by Elko series corner-notched points; Humboldt series, concave base points; and well-shouldered, contracting-stemmed, Gypsum series points (Sutton, et al., 2007, p. 241).

The Rose Spring complex followed the Gypsum complex, appearing in the period cal A.D. 200–1100, the time during which the bow and arrow were introduced. Archaeological evidence from this complex suggests demonstrates a drastic change in artifact assemblages and suggests a dramatic increase in the population, evidenced by more substantial middens (Sutton, et al., 2007, p. 241). Artifacts from this complex include Eastgate and Rose Spring series projectile points, drills, bone awls, milling implements, marine shell and other ornaments, and evidence the heavy exploitation of obsidian during this period. The Medieval Climatic Anomaly (MCA) occurred sometime within the middle of the Rose Spring complex (Sutton, et al., 2007, p. 242). Lakes began to desiccate, with settlement patterns changing, as a result.

The Late Prehistoric began in 1000 A.D. and ended at European contact. During this period, populations decreased; however, new technologies were developing and several new cultural complexes appeared, most likely developing into the ethnographic groups of the region (Sutton, et al., 2007, p. 242). The marker artifacts of this period include Desert series projectile points (Desert Side-notched and Cottonwood points), ceramics, shell beads, and mortars and pestles (Warren and Crabtree, 1986; Apple and Glenny 2008, p. 17; Sutton 1991, p. 19). The prolific use of obsidian, seen during the Rose Spring complex, declined in this period (Sutton, et al., 2007, p. 242).

Ethnographic Setting

Ethnographic evidence suggests that the Vanyume, a subgroup of the Serrano Indians, occupied the region in prehistoric times. Several small Vanyume villages were encountered by Father Francisco Garces as early as 1776 along the Mojave River and further west. This portion of the Mojave Desert was also visited by several other native groups, including the Serrano, the Kitanemuk and the Desert Kawaiisu. The Central Mojave Desert was exploited by a variety of groups as well, including the Chemehuevi/Southern Paiute, the Mojave and possibly the Desert Kawaiisu (EDAW 2009a, p. 21-22).

The Vanyume-speaking people, also known as the Desert Serrano, were extensively disrupted by Spanish missionaries, and subsequently very little is known of them. The Serrano occupied the area in and around the San Bernardino Mountains, their territory extending north past Victorville; south to the Yucaipa Valley; east to Twentynine Palms;

and west to Cajon Pass. This area was a trade nexus between inland tribes and coastal tribes, and the Serrano controlled significant travel corridors in the area (SWCA 2009c, p. 14).

The Vanyume spoke either a dialect of Serrano or a closely related language. The Serrano language “is part of the Serran division of a branch of the Takic family of Uto-Aztecan linguistic stock,” and closely related to the Kitanemuk language (SWCA 2009c, p. 14). The Serrano practiced a subsistence economy consisting of hunting and collecting plant goods. Faunal resources also included mountain sheep, deer, antelope, rabbits, small rodents, fish and various birds. They also collected seeds, acorns, pinon, bulbs, tubers, shoots, blooms and roots of a variety of plants. Intervillage trade supplemented the diet and communal food procurement events facilitated the distribution of resources (SWCA 2009c, p. 15).

Funerary rituals involved cremation of the dead and distribution of their possessions, and a week-long ceremony that included burning an effigy depicting the deceased (SWCA 2009c, p. 15)

Historic Setting

Spanish Period (1769 to 1821)

The Spanish focused their efforts in Alta California on building missions and presidios, and assimilating the Native American population into Christianity. Early Spanish explorations of inland Alta California did not begin until the late 18^{th} century. Pedro Fages passed through the area near the Cajon Pass as early as 1772, but Father Francisco Garces was the first to enter what would become San Bernardino County. Using an ancient trade route known as the Mojave Trail, Fr. Garces traveled from the Colorado River to the Pacific Coast in 1776 (SWCA 2009c, p. 16-17). The San Bernardino Valley was named by Francisco Dumetz in 1810 who, in observance of the Feast of St. Bernadine of Siena, led a party from the San Gabriel Mission into the valley (SWCA 2009c, p. 17).

Mexican Period (1821 to 1848)

New Spain won independence from Spain in 1821 and ended the Spanish isolationist policies, opening the California ports to foreign merchants. American trappers and explorers came west during this time (SWCA 2009c, p. 17). Jedediah Smith was the first American known to cross the Mojave while it was still under the Mexican flag in 1826, via the Mojave River (Swanson 1988, p. 3).

As the influence of the missions diminished through the 1830s, their land holdings were privatized. The mission lands were initially intended to be redistributed to the Native Americans who helped build the missions, however as part of the Secularization Act of 1833 the lands were distributed to private ranchers. The resulting ranchos, which primarily focused on cattle grazing, were important social and economic centers. Twenty ranchos were granted in northwestern Riverside and southwestern San Bernardino counties, covering almost 500,000 acres. The rancho industries, including cattle grazing and hides, helped spur a population influx to California (SWCA 2009c, p. 17).

American Period (1848 to the present)

California became part of the United States in 1848, with the end of the Mexican-American War and the Treaty of Guadalupe Hidalgo. It became a state in 1850, along with Utah, New Mexico and present-day Arizona. San Bernardino County was established in 1853 from parts of Los Angeles and San Diego counties and, despite parts of it being used to help create Riverside County in 1893, remains the largest county in the United States (SWCA 2009c, p. 18).

The southeastern desert region of California has always been a heavily traveled transportation corridor in and out of the state. Thousands of people traveled west through the Colorado and Mojave deserts during the Gold Rush on their way to the gold fields via Los Angeles or San Diego. The Mojave River Trail, also known as the Old Spanish Trail, began in Santa Fe, New Mexico and traveled through Utah and Arizona, crossing the Mojave finally reaching the Mission San Gabriel Arcangel and Pueblo de Los Angeles. The Gold Rush changed the nature of the rancho cattle industry, placing more emphasis on the use of cattle for meat and other goods, rather than their hides. The influx of people created a cattle boom in the state, which lasted until the operation of the ranchos became increasingly difficult and neighbor states drove cattle to California at reduced prices (SWCA 2009c., p. 18).

A transcontinental route through the southern United States was considered in the 1850s, with land purchased and surveys performed. The start of the Civil War in 1861 halted work on this route. There were many wagon routes and regional railroads in southern California constructed across the Colorado and Mojave deserts from the 1840s through the 1870s, connecting the California coast with the rest of the country, carrying mail, people, supplies, livestock, and other necessities (SWCA 2009c, p. 18). The route to and from Los Angeles went through Barstow, a link that was reinforced when Southern Pacific tracks reached Barstow in 1882. Route 66 also came through Barstow, continuing to bring visitors through the region via automobile as the railroads declined (EDAW 2009a, p. 22).

These trails became integrated into permanent roadways with the introduction of the automobile in the twentieth century. The first highways across the Mojave Desert followed the Cajon Pass-Barstow-Needles route, and the Ocean-to-Ocean Highway was established in 1912 following the Mojave River Trail through Needles and Barstow to San Bernardino. Route 66, established in 1926, followed the Ocean-to-Ocean Highway through Barstow (SWCA 2009c, p. 19).

Agriculture has always played a major role in California, and large-scale agriculture has had greatest impact, both on the landscape and the economy. The Gold Rush brought a wave of entrepreneurial settlers. The subdivision of the Mexican-era ranchos was facilitated by both the end of the Mexican-American War in 1849 and the Homestead Act of 1862, which spurred increased land ownership. Those that took part in this program became known as “homesteaders.” As development spread into more arid regions, mass irrigation was necessary to sustain the crops required to be planted by the Homestead Act. The Wright Act was passed in 1887, prompting the establishment of irrigation districts in the Central Valley and Southern California. Gravity fed systems however, were more common in the San Bernardino County area. Dry conditions and geographic isolation made commercial agriculture in Southern California more challenging than in places such as the Central Valley, but the arrival of the railroad and discovery of agricultural potential of citrus in Los Angeles and Orange counties allowed the region to thrive. Agriculture was particularly challenging in the Mojave Desert, as the climate and geomorphology limited access to water. The region became a primary alfalfa producer regardless of these limitations (EDAW 2009a, p. 22-24).

The Harper Lake area has been well-documented in Mark T. Swanson's *History of the Harper Lake Community* (1988), and other studies by Greenwood and Associates. San Bernardino County surveyors measured section lines of rectangular grid system for Harper Lake area in 1856, shortly after California attained statehood. United States Army engineers had also surveyed the area looking for the best transcontinental railroad routes, and one of the recommended routes passed 10 miles south of Harper Dry Lake. This route was ultimately used by the Santa Fe Railroad (Swanson 1988, p. 3)

The 1856 survey did not record any land improvements in the Harper Lake area. The first cattle ranch was established east of Harper Lake by C.S. Black in 1872. The Black Ranch became a frequent stop on the San Bernardino-Panamint Road, which was established following the discovery of borate deposits at Searles Lake and the Panamint Valley, north of Harper Dry Lake. The San Bernardino-Panamint Road became less traveled following the discovery of larger borate deposits in Death Valley (Swanson 1988, p. 4).

The first settlers on the west side of Harper Lake, in the project area, were Henry and Emma Spenker, who arrived in 1911. The Spenkers came to the area hoping to create an irrigation-based farming community, and built irrigation ditches and a reservoir to grow alfalfa, raise chickens and turkeys, and plant orchards (EDAW 2009a, p. 24).

Eleven more land patents were issued for the Harper Lake area by the Bureau of Land Management (BLM) between 1921 and 1929. The first was issued to James M. Maclachlan, the original homesteader on the Lockhart Ranch property. Underground water was more accessible at lower elevations near the lake bed, and each homestead had to install its own well and construct irrigation ditches. Many homestead claims were not year-round inhabitants, but weekenders who lived in urban areas. The Harper Lake residents were officially listed as living in Hinkley, approximately 10 miles southeast, but full-time residents considered themselves a separate community (Swanson 1988, p. 9-11).

The only Desert Land Entry (DLE) permit issued in the Harper Dry Lake area was to Victor York and L.M. Lockhart in 1925, for land which became the York Ranch. York and Lockhart were wealthy business partners with the York-Smullin Oil Company, and invested in the ranch as a side venture. The ranch grew a variety of crops, including alfalfa and cashews, demanding an enormous quantity of water that necessitated the drilling of special deep wells. Hugh Evans, who's alfalfa farm was south of the project area, also installed deep wells with diesel-powered pumps in the 1930s. The deep wells on the Evans and York properties contributed to a significant drop in the water table, below the reach of the initial wells, which limited the production of alfalfa to only Evans and York. The limited accessibility to water combined with the Great Depression spelled the end for the original homesteads. Many of the remaining local residents went to work for York and Lockhart. The population had dropped so low by 1937 that the schoolhouse was closed, and Lockhart had become the sole owner of both the York and Evans ranches by the end of the decade (Swanson 1988, p. 11-13).

California Electric constructed a substation and introduced electricity to the valley in 1947. This brought new residents, many of whom also ended up working for the Lockhart Ranch, which was dedicated to raising high-quality beef and farming alfalfa to feed ranch cattle. The ranch eventually became one of the largest farming concerns in the Mojave Desert (Hampson and Swanson 1990, p. 14-15). Forrest Most and his family arrived in the area in 1946 and purchased 480 acres of what was the York Ranch, and would become the second largest landholders in the area (Swanson 1988, p. 13-14).

Lockhart began to invest a substantial amount of money into the ranch and to develop a community in the 1950s, building a grocery store, butcher, a gas station, café and 16 employee houses (Swanson 1988, p. 14-15). Originally conceived of as a small general store, the General Merchandise Store was one of the largest structures in the area. It was constructed at a cost of $365,000 and opened in 1953. It carried all manner of provisions and also housed a post office. People came from all over the area to buy Lockhart Ranch meat, which was considered the best in the Mojave Desert. The Lockhart community at that time numbered approximately 200 people, most of whom were Lockhart Ranch employees and their families (Hampson and Swanson 1990, p. 22).

The Most Ranch was also becoming profitable at this time, concentrating on sheep, corn, oats and wheat rather than alfalfa. By the late 1950s both ranches had incorporated a new pivot irrigation system that entailed a giant arm making a circular sweep of a quarter section, which proved much more efficient than the standing pipe method as it was largely automatic and required less manpower (Swanson 1988, p. 14-15). The Mosts sold their ranch back to Lockhart in 1955 (Hampson and Swanson 1990, p. 14).

The implementation of the pivot irrigation system may have contributed to the decline of the community of Lockhart, as it took significantly less manpower to operate. Additionally, Lockhart suffered a series of financial losses in the mid-1950s, and the ranch was a secondary interest. These losses may have caused him to reevaluate his financial priorities, and the ranch had not been a profitable investment (Hampson and Swanson 1990, p. 23). People began to leave the town of Lockhart around 1959, and the grocery store and gas station were converted into a mechanic shop. The post office was closed in 1958 (Swanson 1988, p. 14-15),and the ranch changed hands several times until it was finally sold to Orita Land and Cattle Company around 1962 (Hampson and Swanson 1990, p. 24).

Milton Most, the son of Forrest Most, was the ranch manager for Orita. Most demolished many of the ranch buildings constructed by Lockhart. In 1977 Orita sold the ranch to Al Cotton, who went bankrupt within two years. The southern half of the ranch, south of Hoffman Road, was purchased in 1979 by Milton Most. The Luz Development and Finance Corporation bought the ranch from Milton Most in 1988, and immediately leased the land back to him until the early 1990s (Hampson and Swanson 1990,

p. 24-27). Luz installed solar energy panels within Sections 19 and 24 of the former ranch, and Abengoa Solar, Inc. purchased the remainder of the ranch in 2008 (EDAW 2009a, p. 26).

The town of Lockhart was recorded as part of a cultural resources survey in 1990, at which time there were 41 standing buildings and structures associated with the complex. Since then, the majority of the buildings have been demolished (AS 2009a, p. 5.4-27).

Cultural Resources Inventory

A project-specific cultural resources inventory is a necessary step in staff's effort to determine whether the proposed project may cause significant impacts to CRHR-eligible cultural resources and would therefore, under CEQA, have an adverse effect on the environment.

The development of a cultural resources inventory entails working through a sequence of investigatory phases. The first step is to establish an appropriate area of analysis for the inventory. Generally the research process 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 the proposed project, assessing the results of any geotechnical studies or environmental assessments completed for the proposed project site, and compiling determinations of historical significance for any cultural resources that are identified.

This subsection describes the research procedures used by the applicant 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), Native American consultation, and field investigations. Staff provides a description of each identified cultural resource, its historical significance, and the basis for its significance evaluation. Assessments of the project's impacts on significant cultural resources, potential impacts on previously unidentified, buried archaeological resources, and proposed mitigation measures for all significant impacts are presented in a separate subsection below.

Project Area of Analysis

The inventorying of cultural resources within what staff defines as the appropriate area for the analysis of a project's potential impacts is the first step in the assessment of whether the proposed project may cause a significant impact to a CRHR-eligible cultural resource and therefore have an adverse effect on the environment. The area that staff considers when identifying and assessing impacts to historical resources, called the "area of analysis" for the project, is usually defined as the area within and surrounding the project site and associated linear facility corridors. The area varies in extent depending on whether the cultural resource is archaeological, ethnographic, or built-environment:

- For archaeological resources, the area of analysis is minimally defined as the project site footprint, plus a buffer of 200 feet, and the project linear facilities routes, plus 50 feet to either side of the routes.

- For ethnographic resources, the area of analysis is expanded to take into account traditional use areas and traditional cultural properties which may be far-ranging, including views that contribute to the significance of the property. These resources are often identified in consultation with Native Americans and other ethnic groups, and issues that are raised by these groups may define the area of analysis.
- For built-environment resources, the area of analysis is confined to one parcel deep from the project site footprint in urban areas, but in rural areas is expanded to include a half-mile buffer from the project site and above-ground linear facilities to encompass resources whose setting could be adversely affected by industrial development. For this project, the area is established at that minimum.
- For a historic district or a cultural landscape, staff defines the area of analysis based on the particulars of each siting case.

For the purposes of this analysis, the project area of analysis consists of the project site, the 200-foot archaeological buffer, and the one-half mile built environment buffer. There are no linear facilities associated with the project.

Background Inventory Research

CHRIS Record Search

EDAW requested a records search at the San Bernardino County Archaeological Information Center on August 15, 2006 to identify any previous cultural resources studies and recorded historical resources within a 1-mile radius around the project area, and an additional 5-mile radius for the focus of the project's regional historic context. Within the records search area there were 15 previous studies, 30 known cultural resources and 121 isolated archaeological finds within 1-mile of the project vicinity. An updated records search was requested on April 27, 2009. New records or reports for the area had not been received since the 2006 records search (EDAW 2009a, p. 29-32).

Three previously recorded archaeological resources fall within the project area of analysis: a historic refuse scatter, cement slab and wood and cement-lined well (P-36-006553); and two small historic refuse scatters (P-36-007429 and P-36-007430) (EDAW 2009a, p. 29-32).

The records search also identified eleven previously recorded architectural resources, five of which have been demolished (4) or were unable to be relocated (1). The six remaining previously recorded sites are listed in the table below.

Cultural Resources Table 2
Previously Recorded Architectural Resources in the Project Area of Analysis

Resource Designation	Resource Type	Resource Age
P-36-001025/P-36-002084-99H	Farming and residential complex and adobe structure	Historic
P-36-006555	Farming and residential complex	Historic
P-36-006556	Farming and residential complex	Historic
P-36-006557	Farming and residential complex	Historic
P-36-006558	Ranching, farming, commercial and residential complex (Town of Lockhart)	Historic
P-36-006882	Residential buildings	Historic

Local Records Search

EDAW reviewed maps, literature and historical collections related to the project area. They also sent letters to historical societies and other potentially interested parties on June 1, 2009 to request any pertinent information regarding historic or cultural resources within the records search boundary, including the San Bernardino County Museum, the Mojave River Valley Museum, the Mojave Desert Heritage and Cultural Association, and the City of San Bernardino Historical and Pioneer Society. Responses were not provided to EDAW. EDAW also visited the Upper Mojave Historical Society in May 2009. A reference library was not available (EDAW 2009a, p. 34).

Native American Coordination

EDAW initiated contact with local Native American groups and interested parties. A letter requesting information on sacred lands, traditional cultural properties, and a list of Native American individuals and organizations affiliated with the project area was sent to the Native American Heritage Commission on June 1, 2009. The Sacred Lands File search did not reveal any specific site information for the project area or 1-mile buffer. Letters were sent to 13 Native American representatives on July 14, 2009. The letters were followed up with phone calls on July 22, 27 and 28. The Historic Preservation Officer for the Kern Valley Indian Council expressed concern that the project area and project buffer were not large enough to determine the effect the project would have on the area. The representative affiliated with the Tebatulabal, Kawaiisu, Koso and Yokut tribes was contacted and stated he had no comment at the time. Responses were not received from the eleven remaining groups (EDAW 2009a, p. 33-34).

Field Inventory Investigations

Geoarchaeological Research

In its ongoing effort to improve its methods for identifying cultural resources in project impact areas, to stay aware of the evolving practice of cultural resources management, and to provide a more factual basis for considering the potential presence of buried prehistoric archaeological deposits on the proposed project site, Energy Commission staff requested in Data Request 1B, numbers 18-20, that Abengoa Solar, Inc., provide geoarchaeological information about the project site.

Geoarchaeology is a subfield of archaeology that uses the concepts and methods of the earth sciences to conduct archaeological research. The broader goal of geoarchaeology is to firmly establish the most basic elements of archaeological interpretation, which are the physical contexts of archaeological sites and the human material residues that are a part of them. Geoarchaeology provides information on the structure, the origin, and the development of archaeological deposits. Geoarchaeological research typically draws on a suite of concepts and methods from geomorphology (the study of landform development and history), stratigraphy (the study of the character and age of sequences of geologic deposits), pedology (the study of soils and soil development), and sedimentology (the study of the composition, character, and age of geologic sediments). Geoarchaeological research is essential to the analysis of the potential impacts of a proposed project on buried archaeological deposits, where a proposed project involves deep (greater than one meter) ground disturbance, because it provides a factual assessment of the likelihood that such deposits may be present in a project area and establishes the likely character of any such deposits.

Staff felt that the AMS's pedestrian archaeological survey was not adequate for assessing the potential for subsurface archaeological deposits for two reasons. First, the site was previously used for agricultural purposes, making it unlikely that intact buried archaeological deposits would be found in the uppermost three feet of sediments; second, the proposed mass grading and excavation of the site has the potential to inadvertently impact previously unknown subsurface resources during construction; and third, prehistoric archaeological deposits that lie more than approximately one meter below the surface often do not produce visible surface evidence. A geoarchaeological study can address the above limitations of a pedestrian survey.

The Energy Commission's Data Request Set 1B, numbers 18 -20 asked the applicant to provide Quaternary science information pertinent to the project area from published sources, if such were available, and to conduct a geoarchaeology field study of the development of the landforms and their depositional regimes since the Late Pleistocene epoch. The Energy Commission recommended that the field study consist of:

- A map or series of maps of the present landforms in the project area;
- A sampling strategy to document the stratigraphy of the portions of the landforms in the project areas where construction would involve disturbance at depths greater than three feet;

- Data collection necessary for determinations of the physical character, the ages, and the depositional rates of the various sedimentary deposits and paleosols that may be beneath the surface of the project area to the proposed maximum depth of ground disturbance, including:
    - A measured profile drawing and profile photograph;
    - Screening of a small sample of sediment from the major sedimentary deposits in each profile through ¼-inch hardware cloth; and
    - Collection and assaying of enough soil humate samples to reliably radiocarbon date a master stratigraphic column for each sampled landform; and
- Analysis of the collected field data and an assessment, based on the collected data, of the likelihood of the presence of buried archaeological deposits in the project area, and, to the extent possible, the likely age and character of such deposits.

SWCA reviewed the available literature relating to the project site, including the geology, geomorphology and soils of San Bernardino County and the Mojave Desert region, and previous geoarchaeological studies. The goal of this review was to understand “the natural and anthropogenic formation processes affecting the sediments located within the proposed project area” (SWCA 2009c, p. 19).

Following staff’s review of a field research design, SWCA also conducted geoarchaeological field investigations on the proposed 1,765 acre project site to assess the potential for buried archaeological deposits within the project footprint, focusing in areas where disturbance is expected to go deeper than one meter. Twenty trenches were excavated using a backhoe and examined to identify characteristics of the depositional environment. Samples of the sediments were also screened (SWCA 2009c, p. 20-21).

There had not been any previous subsurface archaeological research in the project area (SWCA 2009c, p. 28).The testing determined that the project site is covered by a “consistent and rather thick veneer of agriculturally disturbed sediments underlain by thick Holocene and Pleistocene age alluvial fan sediments with interdigitations of lacustrine sediments” (SWCA 2009c, p. 24). The area is overlain by predominantly Cajon soils that have been extensively disturbed by agricultural activities; these soils overlie deep alluvial fan sediments dating to the Pleistocene and Holocene (SWCA 2009c, p. 28).

The geoarchaeological fieldwork did not recover any evidence of buried cultural deposits or artifacts. It did record, however, a sequence of buried lacustrine deposits indicative of a previously high lake stand, possible extending to 2,050 feet in elevation. These lacustrine deposits, found in the northeast portion of the site and which would be impacted by construction, imply that the potential for buried archaeological deposits is high between 2,050 and 2,025 feet in elevation (SWCA 2009c, p. 29).

Thus the consultant recommended that, due to the high potential for buried archaeological deposits, that the project retain an archaeologist meeting the Secretary of the Interior's Professional Qualification Standards to serve as a full-time monitor for all ground-disturbing activity below the elevation of 2,050 feet in the northeast portion of the site (SWCA 2009c, p. 29).

Archaeological survey

A pedestrian survey of the project area was conducted by EDAW between May 27 and June 22, 2009. The project area and 200-foot buffer was surveyed by walking 15-to-20 meter transects. Archaeological sites were flagged and the locations documented using handheld GPS units and sites and isolates were recorded on the appropriate California State Parks DPR 523 series forms. Resource boundaries, features and artifacts were recorded with handheld GPS units. Previously recorded sites were updated on DPR 523 Continuation Sheets (EDAW 2009a, p. 36).

Twenty four new sites were identified in the course of the survey and are listed in the table below. Twenty three of the sites are historical archaeological sites, twenty one of which are refuse scatters. Two historical archaeological sites contain the remains of built structures. One prehistoric lithic scatter was identified.

Cultural Resources Table 3
Newly Recorded Archaeological Resources in the Project Area of Analysis

Resource Designation	Resource Type	Resource Age
MS-H-001	Historic/modern refuse scatter	Historic
MS-H-004	Historic refuse scatter with modern materials	Historic
MS-H-005	Two historic/modern refuse piles and sparse scatter	Historic
MS-H-011	Historic/modern refuse scatter	Historic
MS-H-013	Historic/modern refuse scatter	Historic
MS-H-017	Refuse pile and adjacent historic scatter	Historic
MS-H-023	Historic/modern refuse scatter	Historic
MS-H-024	Historic/modern refuse scatter	Historic
MS-H-025	Historic/modern refuse scatter	Historic
MS-H-026	Historic/modern refuse scatter	Historic
MS-H-207	Cement lined reservoir, well, pump, three cement foundations, five cement stand pipes	Historic
MS-H-210	Historic/modern refuse scatter	Historic
MS-H-211	Historic/modern refuse scatter	Historic
MS-H-214	Historic/modern refuse scatter	Historic
MS-H-216	Historic/modern refuse scatter	Historic
MS-H-217	Historic/modern refuse scatter	Historic
MS-H-218	Historic/modern refuse scatter	Historic
MS-H-221	Historic/modern refuse scatter	Historic
MS-M-225	Multi-component site: Historic/modern refuse scatter and single prehistoric obsidian flake	Prehistoric/Historic
MS-H-238	Historic/modern refuse scatter	Historic
MS-H-245	Historic/modern refuse scatter	Historic
MS-H-246	Historic refuse scatter, possible remnants of adjacent structure and corral	Historic
MS-P-250	Prehistoric lithic scatter	Prehistoric
MS-H-252	Historic/modern refuse scatter	Historic

Built Environment Survey

EDAW also conducted the built environment survey between May 27 and June 22, 2009 within the project area and a 0.5 mile buffer area. Previously recorded and newly identified resources were recorded on the appropriate DPR forms (EDAW 2009a, p. 36).

Because of changes to the setting of the town of Lockhart (P-36-006557) due to the demolition of many of the structures recorded in 1990, and the proposed demolition of the Hays Farm (P-06-006556), staff requested additional information in Data Requests 1 and 2 of Data Request Set 1B in order to further evaluate the significance of those resources within their historic contexts and provide a justification for their significance under CRHR criteria (ESH 2009b, Attachments 1 and 2).

Eight newly recorded resources were identified in the course of the survey and are listed in the table below. Seven of the sites are modest residential sites and one is the extensive irrigation system associated with the farming activities in the project area.

Cultural Resources Table 4
Newly Recorded Architectural Resources in the Project Area of Analysis

Resource Designation	Resource Type	Resource Age
MS-B-1001	Residence	Historic
MS-B-1002	Residence	Historic
MS-B-1003	Irrigation system	Historic
MS-B-1004	Residence	Historic
MS-B-1005	Residence	Historic
MS-B-1006	Residence	Historic
MS-B-1007	Residence	Historic
MS-B-1008	Residence	Historic

In total, 41 resources have been identified in the project area of analysis—27 archaeological sites and 14 built environment resources. One of the archaeological resources was prehistoric and the remaining 26 were from the historic period.

Determining the Historical Significance of Cultural Resources

CEQA requires the Energy Commission, as a lead agency, to 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 eligible for listing in the CRHR, and such a cultural resource is referred to as a “historical resource,” which 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)). The term, "historical resource," therefore, indicates a cultural resource that is historically significant and eligible for the CRHR.

Consequently, under the CEQA Guidelines, to be historically significant, 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,[1] a resource must meet at least one (and may meet more than 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;
- 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.

In addition, historical resources must also possess integrity of location, design, setting, materials, workmanship, feeling, and association (Cal. Code Regs., tit. 14, § 4852(c)).

Additionally, cultural resources listed in or formally determined eligible for the National Register of Historical 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)). 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 (Pub. Resources Code, § 21084.1).

The assessment of potentially significant impacts to historical resources and the mitigation that may be required of a proposed project to ameliorate any such impacts depend on CRHR-eligibility evaluations.

CRHR Evaluations

Under CEQA, only CRHR-eligible cultural resources that the proposed project could potentially impact need be considered in staff's recommendations for mitigation measures for project impacts. 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

[1] 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.

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.

Sixteen resources were identified within the project site that could be impacted by the project. These resources, nine archaeological sites and seven built environment resources are summarized in the table below and followed by formal staff recommendations on their eligibility for listing in the CRHR.

Cultural Resources Table 5
Cultural Resources Subject to Project Effects

Resource Designation	Resource Type	Staff Recommendation on CRHR eligibility
MS-P-250	Prehistoric lithic scatter	CRHR-ineligible
MS-H-026	Historic/modern refuse scatter	CRHR-ineligible
MS-H-246	Historic refuse scatter, possible remnants of adjacent structure and corral	CRHR-ineligible
P-36-006553	Historic refuse scatter, cement slab and wood and cement-lined well	CRHR-eligible
P-36-007429	Historic refuse scatter	CRHR-ineligible
MS-H-017	Refuse pile and adjacent historic scatter	CRHR-ineligible
MS-H-207	Cement lined reservoir, well, pump, three cement foundations, five cement stand pipes	CRHR-ineligible
MS-H-221	Historic/modern refuse scatter	CRHR-ineligible
MS-H-252	Historic/modern refuse scatter	CRHR-ineligible
P-36-006556	Farming and residential complex	CRHR-ineligible
P-36-006558	Ranching, farming, commercial and residential complex (Town of Lockhart)	CRHR-ineligible
P-36-006557	Farming and residential complex	CRHR-ineligible
MS-B-1002	Residence	CRHR-ineligible
MS-B-1004	Residence	CRHR-ineligible

Archaeological Resource Evaluations

Three of the identified archaeological sites (MS-P-250, MS-H-026, and MS-H-246) are on the project site and were proposed by EDAW as potentially significant. Staff requested that a field investigation be designed to determine if subsurface deposits were present and, if so, to acquire sufficient data to make recommendations of eligibility for these sites and to provide the appropriate DPR forms (CEC 2009n, p.5). The Phase II research design included reexamination of the surface of the site, excavation of shovel test pits (STPs) at each of the sites and, depending on the results of the STPs, the excavation of 1-meter by 1-meter pits at the sites. All of the excavated material was screened through 1/8 inch mesh hardware cloth. Fieldwork was conducted in December of 2009 to determine if intact deposits were present and, if so, to determine the extent, age, affiliation, and eligibility of those deposits (ESH 2010a, p. 1).

MS-P-250

MS-P-250 is a sparse prehistoric lithic scatter consisting of four cryptocrystalline silicate flakes adjacent to the dry lake shoreline in the northeast corner of the project site, north of the Alpha Solar Field (East). The surrounding vegetation consists of marsh grasses and adjacent salt brush. Three of the pieces are complete flakes and one is a flake fragment. Two of the flakes appeared to originate from rodent burrow backdirt piles which could be indicative of a subsurface deposit (EDAW 2009a, p. 63). Potential for a subsurface deposit was assumed based on the location of the scatter, adjacent to the dry lake bed.

The Phase II investigation placed four STPs throughout the site and reexamined the surface of the site. STPs were excavated to a depth of 80 centimeters below the present surface, the deepest extent possible. Soils were noted to be non-organic, sandy, silty alluvium. None of the STPs revealed any cultural materials, and further testing was not pursued (ESH 2010a, p. 3-4). Additionally the geoarchaeology study also excavated test trenches in the northeastern corner of the project site, to an average depth of 1.7 meters. The results of the geoarchaeology testing, discussed fully in the “Field Inventory Investigation” subsection above, noted that, while the geoarchaeological testing did not record any cultural deposits, the presence of lacustrine deposits in this area of the project site have the potential to contain subsurface archaeological deposits (SWCA 2009c, p. 29).

The site does not qualify under CRHR Criteria 1, 2 or 3. Based on the results of the Phase II archaeological testing, staff recommends that MS-P-250 does not meet the criteria for listing on the CRHR under Criteria 4, as there is no evidence of a subsurface deposit and the site does not have the potential to yield information important to history or prehistory.

MS-H-026

MS-H-026 is a cluster of extensive historic and modern refuse dumps and an associated scatter, situated along the southern side of Lockhart Road and western side of Lockhart Ranch Road, and the southwestern boundary of the Alpha Solar Field (West), within the project buffer. MS-H-026 is located directly across Lockhart Road from a historic farmstead site, and may be associated with it. Seven concentrations were noted in the site, with a less dense scatter surrounding them. Due to the large amount of material present, during the initial field investigation a one-meter-by-one-meter area of each concentration was inventoried to obtain a representative sample of the contents of the site. The majority of items inventoried were cans and bottles, including those associated with food, beverage, condensed milk, coffee, fuel, cleansers and soap. Also present were building and construction materials and automotive items. Items noted outside of the sample areas included butchered animal bones, kitchen ware, a motorcycle seat, furniture parts and other domestic items. The survey notes that a comparatively larger proportion of the materials located in this site are modern than in other nearby refuse sites. Also noted was that some of the concentrations show evidence of burning, which is indicative of purposeful dumping and trash elimination. The possibility of significant quantities of older materials warranted further investigation (EDAW 2009a, p. 54-55).

As part of the Phase II investigation, four STPs at 10 meter intervals were excavated to a depth of 30 centimeters. Soils were noted to be non-organic, sandy, silty alluvium. None of the STPs revealed any cultural materials, and further testing was not pursued (ESH 2010a, p. 6-7). The site was initially assumed to extend into the project site; however, the Phase II testing took place within the project site and did not discover any subsurface cultural materials north of Lockhart Road or east of Lockhart Ranch Road. Should cultural materials be discovered within the project site, they would not contribute to the significance of the site, if it were ever determined to be significant. The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

MS-H-246

The initial site record described MS-H-246 as a dense historic refuse dump and the remnants of a possible adjacent wooden structure and corral located at the northeast section of the project site, adjacent to the dry lake shoreline and north of the Alpha Solar Field (East). The site contains several in-situ posts and milled wooden structural debris. The refuse dump may have begun as a pit, and shows evidence of burning. Historic materials in the dump include domestic refuse such as beverage cans; sanitary food and condensed milk cans; crockery shards; and a variety of bottles and jars including soda, liquor, ketchup and bleach. The deposit does not contain any clearly modern materials, suggesting it was not in use after the 1950s. The posts may represent the remains of a livestock coral, and the posts and milled wooden debris on the west side appear to be the remains of a shed or small residence. The refuse dump has been disturbed by bottle hunters, erosion, past farming activity, and use for target practice (EDAW 2009a, p. 61).

As part of the Phase II investigation, four STPs were placed within the area of the possible structure, ranging from 35 to 80 centimeters in depth, and the surface of the site was further examined. The STPs did not indicate the presence of subsurface features such as walls or a foundation. Four additional STPs were placed within the refuse area ranging in depth from 30 to 50 centimeters, and did not indicate the presence of subsurface deposits extending horizontally beyond the visible surface extent (ESH 2010j, p. 36).

Additionally, a one-meter-by-one-meter test pit was excavated into the dump deposit. The pit revealed a dense deposit of refuse extending to a depth of approximately 40 centimeters. The majority of items recovered were building materials and consumer goods, including a variety of tin cans (fragments), glass bottles (fragments), crockery shards, automotive parts, domesticated animal bone and pieces of iron. The site may also have been used as a butchering site for domesticated animals, as evidenced by the bone found on site, and the in situ posts may indicate a holding pen or chute used for the animals (ESH 2010j, p. 39-40).

The Phase II investigation concluded that the site was likely a discrete dump site for household and commercial goods, used by a small number of people over a prolonged period of time, rather than a communal dump site. The site may have also been used as a butchering site for cattle or other animals as evidenced by the butchered bone on the site, and the structural remains may represent a holding pen or chute. The maker's marks of the bottles found were analyzed to provide information on the potential dates of use, and it appears likely that the dump was in use between the 1940s and the 1960s (ESH 2010j, p. 57-58).

The entire site showed evidence of significant disturbance, including several pits created by looters (ESH 2010a, p. 7-8). The site does not qualify for the CRHR under Criteria 1, 2 or 3. Based on the archival information, Phase II investigation that did not reveal an association for the site, and the extensive disturbance of the site, the site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

P-36-006553

P-36-006553 was also identified as a resource potentially subject to project impacts. It is a sparse historic refuse scatter that was re-visited as part of the project survey. It is on the northeastern portion of the project site along the northern boundary of the Beta Solar Field, partially located in the project site and extending approximately 150 feet north towards the dry lakebed. In addition to the sparse historic refuse scatter, the site consists of a large cement slab and a contiguous wood and cement-lined well. An additional concrete foundation is located at the north end of the site, beyond the project boundary. The refuse scatter consists of sanitary food cans, church key-opened beverage cans, white ware crockery shards, a ceramic coffee cup fragment, aqua glass shards, and red brick fragments. The research notes that this site could be associated with habitation on the site between 1922 and 1939, and the potential for significant information to be acquired from the site, both archival and archaeological, exists (EDAW 2009z, p. 45-47).

The applicant was requested in Data Request 1B, Data Requests 8-13, to more accurately locate the site in relation to the project site, to identify any impacts, and, if impacts could not be avoided, provide a plan for a field investigation of the site to determine the presence of subsurface deposits and acquire enough information to make a recommendation of eligibility for the CRHR (CEC 2009n, p. 2-4). The site was determined to extend 13 meters into the project site. The applicant requested additional time to complete the research in their letter of November 18, 2009, indicating that it would be included in the Phase II investigation (ESH 2009b, p.1). The applicant has not yet had the opportunity to complete the investigation. As a result, staff is making an assumption that the resource is eligible for listing in the CRHR under Criterion 4 and will carry this assumption through the balance of the analysis. Condition **CUL-8** mitigates the direct physical impact to the site.

P-36-007429

P-36-007429 is a previously recorded sparse historic refuse scatter on the project site in the southwestern corner of the proposed Beta Solar Field. It consists of twelve refuse items. Historic refuse items include sun-colored amethyst glass shards; aqua glass shards; hole-in-cap cans; and knife-opened cans. Modern materials include a metal round bar; milled wood; pieces of wooden crate(s); concrete block; and a metal band. The site has been disturbed by farming activities and has likely been used for target practice (EDAW 2009a, p. 47). Staff recommends, due to the disturbance of the site and the lack of association that the site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

MS-H-017

MS-H-017 is a small refuse pile located in the proposed 50-foot wide drainage area at the northeastern corner of the Alpha Solar Field (West), west of Harper Lake Road. All items in the refuse pile are church-key opened beverage cans. The site has been disturbed by farming activities and has likely been used for target practice (EDAW 2009a, p. 51). The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

MS-H-207

MS-H-207 is a cement-lined reservoir and attendant facility structures located at the northwestern corner of Alpha Solar Field (East). Extending north from the project site, it consists of a well, pump, three cement slabs/foundations and five cement stand pipes. The eastern wall of the reservoir has been removed and two large piles of rubble are south of the reservoir, possible the remains of the eastern wall and former structures. The associated refuse scatter consists of crockery, nails, metal and concrete pieces, glass vessel shards, sanitary food and beverage cans, bottles and jars (EDAW 2009a, p. 56). The demolition of the east wall of the reservoir and associated structures has compromised the integrity of the site. The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

MS-H-221

MS-H-221 is located on the western boundary of the Beta Solar Field, south of Lockhart Road. Two concentrations of historic refuse scatter were identified, consisting of church-key opened beverage cans, sanitary food cans, condensed milk cans, and crockery fragments. Also present are sheet metal, butchered bone, round wire, cut nails, coffee cans, milled lumber fragments, window glass, combustion engine parts, and various other items of unknown age. The site has been extensively disturbed by agricultural activities and has also likely been used for target practice (EDAW 2009a, p. 59). The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

MS-H-252

MS-H-252 is located on the southern edge of Beta Solar Field and continues south of the project site. It is a historic refuse scatter consisting of sanitary food cans, pocket tobacco tins, lard buckets, and a baking powder can lid. Items of unknown age include pieces of an alarm clock, wooden crates, sheet metal, a galvanized bucket and a metal thermos casing. The site has been extensively disturbed by agricultural activities and has also likely been used for target practice (EDAW 2009a, p. 63). The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

Built-Environment Resources Evaluations

Five built environment resources were identified within the project site that would be impacted by the project.

Hays Farm (P-36-006556)

The Hays Farm, P-36-006556, was initially identified by EDAW as potentially eligible for the CRHR under Criteria 1 and 4. Located on the project site at the eastern side of the Alpha Solar Field (East), the site was previously recorded as a homestead complex, and consists of a ca. 1950s one-story residence; a two-story unfinished garage; two outbuildings; animal pens; a large reservoir; and the remains of an irrigation system. It is the site of the Spenker homestead, the first homestead in the west Harper Lake area (EDAW 2009a, p. 69-70).

Following the initial eligibility recommendation, staff requested in Data Request Set 1B, Data Requests 1, 3, 4, 5, and 6, that additional information be provided clarifying how the resource was or was not eligible and also that the site be investigated for its historical archaeological potential (CEC 2009n, p. 2-4). The additional investigation concluded that while the site retained significance for its association with the Spenkers, none of the buildings original to that period survive and therefore the site does not retain sufficient integrity to be eligible. The historical archaeological investigation, which consisted of a review of archival information including the previous surveys, historic maps and photographic collections, as well as the current field survey, concluded that there was a low potential for historic archaeological deposits (ESH 2009d, Attachment 3, p. 2). The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

Lockhart General Merchandise Store

The Lockhart General Merchandise Store, a component of the community of Lockhart (P-36-006558), was also initially identified by EDAW as eligible for the CRHR under Criteria 1. There were originally 41 buildings and structures recorded on the Lockhart site, which was described as the central complex of the Lockhart and Most ranches. Those buildings included residential buildings, a water tower, reservoirs, hay sheds, the General Merchandise Store, miscellaneous farm buildings, garages and an airplane hangar. Largely intact when it was recorded in 1990, the site encompassed four broad historical periods: the Davis/Weatherill homesteads c. 1922-1930; the Evans Ranch c.1930-1940; the Lockhart Ranch c. 1940-1962; and the Orita Land and Cattle/Most Ranch c. 1962-1990. The site was one of the earliest locations of permanent occupancy within the Harper Valley study area, and the Davis house was still standing in 1990. When the site was recorded, the town of Lockhart retained architectural integrity and spanned the period of 1919 through the early 1950s, representing the development of the Harper Valley community and the origin of the town of Lockhart (EDAW 2009a, p. 72).

The majority of the structures standing in 1990 have since been demolished, with only the concrete foundations remaining. The General Merchandise store is the only remaining building that appears to represent an association with the period. Following the initial consultant eligibility recommendation, staff requested in Data Request Set 1B, Data Requests 2-6, that additional information be provided clarifying how the resource was or was not eligible and also that the site be investigated for its historic archaeological potential (CEC 2009n, p. 2-4).

The archaeological investigation, which consisted of a review of archival information including the previous surveys, historic maps and photographic collections, as well as the current field survey, concluded that there was a low potential for historic archaeological deposits.

Upon further evaluation, the Lockhart General Merchandise Store was described as having been

> *"The iconic building was once the center of a vibrant desert community and it remains one of the largest buildings in the valley…During the 1950s, movies were projected onto the west wall, and the building served as a centerpiece for the community. Attracting visitors from the region and beyond, it has historically been a major landmark in the desert and for the desert community…"* (ESA 2009d, Attachment 2, p. 4)

However, it is noted in a discussion of the social life of the community in the 1990 Cultural Resources survey that while the General Merchandise Store put the town of Lockhart on the map,

> *"At the end of the day, however, the community reverted back to a small settlement of some 200 people, most of whom were Lockhart employees and their families. It was at that time that the general store became just another big building. Throughout the 1950s, it never replaced the cook shack as the nerve center of the community…people sometimes watched outdoor movies projected onto the west wall of the general store—in the 1950s, there were no back additions to the building as there are today"* (Hampton and Swanson, 1990, p. 22).

The cook shack was a frame structure that had an industrial gas grill, a walk-in refrigerator and three long wooden tables with benches, and also served as the commissary until the General Merchandise Store opened. It remained operational for several years after the opening of the General Merchandise Store, although it eventually closed and collapsed sometime in the 1960s. The remains were carted off-site (Hampton and Swanson, 1990, p. 21). This account, based on interviews with some of the remaining residents at the time, diminishes the importance of the General Merchandise Store to the community of Lockhart, and also notes that the rear of the building—where movies were shown—has been altered.

Additionally, the majority of the architectural remains of the community of Lockhart are no longer extant, having been demolished since the site was originally recorded in 1990 (EDAW 2009a, p. 73). The building is noted as being the centerpiece of the community, however the community—both people and buildings—are gone. As a result, the integrity of setting, feeling and association of the site has been has been significantly compromised. Staff recommends that the General Merchandise Store is not eligible for the CRHR, due to the loss of integrity to the setting, feeling and association as a result of the demolition of the majority of structures on the site.

P-36-006557

When recorded in 1990 P-36-006557 was an intact homestead site with several structures, including a residence, two outbuildings, a fountain/pool, a well, and the remains of an irrigation system. The site is located in the southwestern corner of the Alpha Solar Field. The property was established by James M. Maclachlan in ca. 1918, one of the first homesteaders in the area. The property eventually became part of the Most ranch. The current survey documented the buildings in ruins (EDAW 2009a, p. 71). The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

MS-B-1002

MS-B-1002 is located on Lockhart Road at the northwestern corner of the Beta Solar Field, immediately south of the Alpha Solar Field (East). The site includes two residential buildings, a storage structure, well and large standpipe. The residential structures were originally mirror images of each other, but have been altered over time. The construction date of the buildings is unknown, however they are likely associated with the Lockhart/Most ranch and may have housed employees. While associated with the Lockhart ranch and the Harper Lake community, the site does not retain a significant level of association with an event or historical figure. Although they do exhibit Minimal Traditional-style characteristics, the buildings are not distinctive examples of a type or period (EDAW 2009a, p. 77-80). The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

MS-B-1004

MS-B-1004 is a concrete block structure located at the southern edge of the Beta Solar Field, adjacent to a transmission line. The building does not retain a roof, doors, windows or finished walls. It may have been associated with the Lockhart Ranch, but does not retain sufficient integrity to convey any association or significance (EDAW 2009a, p. 82). The site does not appear to be significant under any of the CRHR criteria, and therefore staff recommends that the resource is not eligible for listing on the CRHR.

Two sites included in the architectural survey area were noted as being potentially eligible under CRHR Criterion 4, MS-B-1005 and MS-B-1008. They are outside the archaeological survey area. Both are presumed to be occupied ranches containing multiple buildings, and both are early homestead sites. The structures on both sites are heavily modified or are not 45 years old, and neither was determined eligible under Criterions 1-3. The project would not impact any potential subsurface archaeological deposits on the sites. They are outside of the project boundary and would not be impacted by construction.

Summary of CRHR-Eligible Resources Subject to Potential Project Impacts

There is one significant archaeological resource within the area of analysis that could potentially be impacted by the AMS, P-36-006553. This is the only historical resource that needs to be taken into account when considering impacts from the project.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE OF IMPACTS TO HISTORICAL 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). Thus, staff analyzes whether a proposed project would cause a substantial adverse change in the significance, that is, the CRHR eligibility, of all historical resources identified in the Cultural Resources Inventory as CRHR eligible. The degree of significance of an impact depends on:

- The cultural resource impacted;
- The nature of the resource's historical significance;
- How the resource's historical significance is manifested physically and perceptually;
- Appraisals of those aspects of the resource's integrity that figure importantly in the manifestation of the resource's historical significance; and
- How much the impact will change those integrity appraisals.

DIRECT/INDIRECT IMPACTS AND MITIGATION

In the abstract, direct impacts to cultural resources are those associated with project development, construction, and 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 standing structures when those structures must be removed to make way for new structures or when the vibrations of construction impair the stability of historic structures nearby. New structures can have direct impacts on historic structures when the new structures are stylistically incompatible with their neighbors and the setting, and when the new structures produce something harmful to the materials or structural integrity of the historic 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 structures can suffer indirect impacts when project construction creates improved accessibility and vandalism or greater weather exposure becomes possible.

Ground disturbance accompanying construction at a proposed plant site, along proposed linear facilities, and at proposed laydown areas has the potential to directly impact archaeological resources, unidentified at this time. 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 plant into this particular setting could have a direct impact on the integrity of association, setting, and feeling of nearby standing historic structures.

Construction Impacts and Mitigation

The assessment of the potential direct impacts of the construction of the proposed project on historical resources is presented below. Mitigation proposals for significant effects to such resources, those effects that staff determines would cause a substantial adverse change in their significance, follow.

Identification and Assessment of Direct Impacts on Archaeological Resources and Recommended Mitigation

Staff finds that the construction of the proposed project would directly affect one known historical resource. That resource, historical archaeological site P-36-006553, would be wholly or partly destroyed as a result of grading and earth-moving operations that are integral components of the construction of the project. Staff further finds that such destruction to P-36-006553 would cause a substantial adverse change in the significance of the resource and would therefore be a significant effect on the environment. Staff proposes **CUL-8**, a program of phased investigation to recover a representative sample of the information for which the resource is presently assumed to be significant.

The construction of the proposed project would also entail subsurface ground disturbance to a depth greater than one meter below the present surface across different portions of the project site. Ground disturbance at depth can affect buried archaeological deposits that are not apparent on the surface and which may be significant under CRHR Criterion 4 (“likely to yield information important in history or prehistory”). More specifically, ground disturbance accompanying grading and construction at the proposed AMS plant site has the potential to directly impact unknown archaeological resources. The risk of potential direct, physical impacts from the proposed AMS construction on unidentified archaeological resources is commensurate with the extent of ground disturbance entailed in the particular mode of construction. This varies with each component of the proposed project. The proposed AMS construction activities which involve ground disturbance entail grading of the site and excavation for foundations of proposed equipment, and trenching for drainage channels. The greatest excavation depths into native soils anticipated for the AMS are up to 10 feet for the foundations for the plant equipment and 26 feet for the drainage canals. Site grading would result in an overall elevation of approximately 2,065 feet amsl; the current site elevation ranges from 2,020 feet amsl to 2,105 feet amsl. Preliminary cut and fill volume is estimated at 4.2 million cubic yards (AMS 2009a, p. 5.17-37).

Staff, in consideration of the available evidence on prehistoric and historic fluctuations in the level of Lake Harper, concludes that the potential for the discovery of buried archaeological deposits is moderate to high across the whole of the project site. The results of the geoarchaeology study for the project site found evidence in the northeastern portion of the project site that indicates a prehistoric high lake stand that may have extended as high as 2,050 feet amsl. The geoarchaeologist for the applicant concluded, on that basis, that the potential for buried archaeological deposits in that portion of the project site is high between 2,050 and 2,025 amsl (SWCA 2009c, p. 29). The applicant also notes high stands for Harper Lake as high as 2,160 amsl in the historic period (AMS 2009a, p. 5.17-18). The sedimentological evidence from the geoarchaeology study and the historic archival evidence, taken together, appear to demonstrate that former shorelines of Harper Lake have traversed the entire breadth of the project site through time. Staff concludes that the prehistoric human use of Harper Lake natural resources and the material remains of that behavior along those multiple former shorelines are plausible across the entire project site.

Because of the possibility that buried prehistoric archaeological deposits could be encountered during construction, CEQA advises a lead agency to provide for such a contingency, and the 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 proposes that procedures for identifying, evaluating, and possibly mitigating impacts to newly discovered archaeological resources be put in place in conditions of certification to reduce those impacts to a less-than-significant level.

To that end as well, the applicant has suggested a number of measures intended to mitigate potential impacts to archaeological resources that could be discovered during the construction of the proposed AMS project (AS 2009a, p. 5.4-42 – 5.4-43). The applicant's suggested mitigation measures include the following:

<u>Evaluation and Documentation</u>. In the event that a resource cannot be avoided during construction, the applicant would retain a qualified Cultural Resources Specialist to prepare and implement an evaluation program to assess the significance of the resource and prepare a treatment plan for significant resources. The Cultural Resources Specialist would meet the qualifications for a Principal Investigator per the Secretary of the Interior's Guidelines.

<u>Mitigation for Resource</u>. Should a resource be discovered that is determined to be, in consultation with the Energy Commission, significant, a mitigation plan would be developed and carried out in accordance with State and Federal Guidelines. The appropriate DPR forms would be completed and a technical report prepared.

Crew Education. Training would be given to construction personnel by the monitoring archaeologists on procedures for the handling of discovered archaeological resources, including the need to stop work until a qualified archaeologist has assessed the significance of the find and implemented appropriate mitigation measures.

Collection and Curation: Cultural materials, field notes and other pertinent materials collected as part of an assessment or data recovery mitigation would be curated at a qualified curation facility.

Human Remains: Should human remains be encountered during excavation, work shall be stopped, the Cultural Resources Specialist would notify the Principal Investigator and the Energy Commission would be contacted. All applicable State and Federal laws, including NAGPRA, would be followed and the remains treated with respect.

Although staff concurs with many of the applicant's suggested mitigation measures, staff has added additional proposals or expanded upon the applicant's suggestions to ensure that all impacts to cultural resources are mitigated to below the level of significance. The applicant's suggested mitigation measures and staff's additional proposals are incorporated into the proposed Conditions of Certification **CUL-1** through **CUL-8**, below, intended to provide for the contingency of discovering archaeological resources during AMS construction and related activities. Staff's proposed **CUL-1** requires a Cultural Resources Specialist (CRS) to be retained and available during the AMS's construction-related excavations to evaluate any discovered buried resources and, if necessary, to conduct data recovery as mitigation for the project's unavoidable impacts on them. **CUL-2** would require the applicant to provide the CRS with all relevant cultural resources information and maps. **CUL-3** would require the CRS to write and submit to the Energy Commission Compliance Project Manager (CPM) a Cultural Resources Monitoring and Mitigation Plan (CRMMP). **CUL-4** would require the CRS to write and submit to the CPM a final report on all AMS cultural resources monitoring and mitigation activities. **CUL-5** would require the project owner to train workers to recognize cultural resources and instruct them to halt construction if cultural resources are discovered. **CUL-6** proposes archaeological monitoring, by an archaeologist and, possibly, by a Native American, intended to identify buried prehistoric archaeological deposits. **CUL-7** would require the applicant to halt ground-disturbing activities in the area of an archaeological discovery and to fund data recovery, if the discovery is evaluated as CRHR-eligible. **CUL-8** provides for the conclusion of efforts to evaluate the historical significance of P-36-006553 and the recovery of a representative sample of the information that makes the site eligible for listing in the CRHR.

Staff's proposed mitigation measures for concluding the evaluation and recovering significant information from historical archaeological site P-36-006553, and for identifying, evaluating, and possibly mitigating impacts to previously unknown archaeological resources discovered during construction ensure that impacts to significant archaeological discoveries would be mitigated to a less than significant level.

Identification and Assessment of Direct Impacts on Ethnographic Resources and Recommended Mitigation

No ethnographic resources, either previously recorded or newly disclosed in the communications with Native American groups conducted by the applicant for the proposed project or by staff, were identified in the vicinity of the project. The proposed project would, therefore, have no significant impact on ethnographic resources, and no mitigation for impacts to this class of cultural resources would be necessary.

Identification and Assessment of Direct Impacts on Historic Standing Structures and Recommended Mitigation

No built-environment resources that qualify as historical resources under CEQA are now known or likely to be found in the project area of analysis. The proposed project would, therefore, have no significant impact on built-environment resources, and no mitigation for impacts to this class of cultural resources would be necessary.

Identification and Assessment of Indirect Impacts and Recommended Mitigation

Neither the applicant nor staff identified any indirect impacts to any identified cultural resources in the impact areas of the proposed AMS project, and so no mitigation measures for indirect impacts would be necessary for any class of cultural resources.

Operation Impacts and Mitigation

During operation of the proposed AMS project, if a leak should develop in the gas or water pipelines supplying any part of the plant, repair of the buried utility could require the excavation of a large hole. Such repairs could impact previously unknown subsurface archaeological resources in areas unaffected by the original excavation. The measures proposed above and below to mitigate impacts to previously unknown archaeological resources found during the construction of the proposed project would also serve to mitigate impacts that occur due to repairs that are made during the operation of the plant.

Cumulative Impacts and Mitigation

A cumulative impact refers to a proposed project's incremental effects considered over time and together with those of other, nearby, past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project (Pub. Resources Code sec. 21083; Cal. Code Regs., tit. 14, secs. 15064(h), 15065(a)(3), 15130, and 15355). Cumulative impacts to cultural resources in the AMS project vicinity could occur if any other existing or proposed projects, in conjunction with the proposed AMS, had or would have impacts on cultural resources that, considered together, would be significant. The previous ground disturbance from prior projects and the ground disturbance related to the future construction of the AMS and other proposed projects in the vicinity could have a cumulatively considerable effect on subsurface archaeological deposits, both prehistoric and historic. The alteration of the setting which could be caused by the construction and operation of the proposed AMS and other proposed projects in the vicinity could be cumulatively considerable, but may or may not be a significant impact to cultural resources.

The applicant has reviewed the San Bernardino County Planning Department website and spoken to planning staff, and there are not currently any open applications for development projects within a 6-mile radius of the project. As of the date of the application submission, the nearest energy-related project is 43 miles away. The applicant therefore concluded that the AMS was not expected to result in significant cumulative impacts to cultural resources. (AS 2009a, p. 5.4-41 – 5.4-42).

Staff has proposed conditions of certification that would mitigate AMS's impacts to known CRHR-eligible cultural resources to below the level of significance. Staff has also proposed conditions of certification for the AMS project providing for identification, evaluation, and avoidance or mitigation of impacts to previously unknown CRHR-eligible archaeological resources discovered during the construction of the project.

Proponents of any other future projects in the AMS area could mitigate impacts to unanticipated subsurface archaeological sites to less than significant levels by requiring construction monitoring, evaluation of resources discovered during monitoring, and avoidance or data recovery for resources evaluated as CRHR-eligible. Impacts to human remains can be mitigated by following the protocols established by state law in Public Resources Code, section 5097.98. Since the impacts from the proposed AMS project would be mitigated to a less than significant level by the project's compliance with staff's proposed Conditions of Certification **CUL-1** through **CUL-8**, and since similar protocols can be applied to other projects in the area, staff does not expect any incremental effects on cultural resources of the proposed AMS project to be cumulatively considerable when viewed in conjunction with other projects.

COMPLIANCE WITH LORS

If staff's proposed conditions of certification (below) are properly implemented, the proposed AMS project would result in a less than significant impact on known and newly found cultural resources. The proposed AMS project would therefore be in compliance with applicable state laws, ordinances, regulations, and standards listed in Cultural Resources Table 1.

The County of San Bernardino's General Plan has language promoting the general county-wide preservation of cultural resources, outlining five policies specific to cultural resources. The conditions of certification require specific actions not just to promote but to effect historic preservation and mitigate impacts to all cultural resources in order to ensure CEQA compliance. Consequently, if AMS implements these conditions, its actions would be consistent with the general historic preservation goals of the County of San Bernardino.

CONCLUSIONS AND RECOMMENDATIONS

Staff's cultural resources analysis has determined that the proposed AMS project would have a significant direct impact on P-36-006553, a historical archaeological site assumed to be a historical resource for the purpose of this analysis, and has further determined that the project has a moderate to high potential to have significant direct impacts on unknown buried prehistoric archaeological deposits.

Staff recommends that the Commission adopt the following cultural resources Conditions of Certification, **CUL-1** through **CUL-8,** to reduce the known and potential impacts of the proposed project to a less than significant level. The subject conditions are variously intended to mitigate for the whole or partial loss of P-36-006553, to facilitate the identification and assessment of unanticipated discoveries of historical resources encountered during construction, and to mitigate any significant impacts from the project on these latter resources if they should be found to be significant. To facilitate the identification and mitigations, the conditions provide for the hiring of a Cultural Resources Specialist and archaeological monitors, for cultural resources awareness training for construction workers, for the archaeological monitoring of ground-disturbing activities, for the recovery of data from significant discovered archaeological deposits, for the writing of a technical archaeological report on all archaeological activities and findings, and for the curation of recovered artifacts and other data. When properly implemented and enforced, staff believes that these conditions of certification would reduce to less than significant known impacts to historical resources and any impacts to unanticipated discoveries of historical resources encountered during construction or operation. Additionally, with the adoption and implementation of these conditions, the proposed AMS project would be in conformity with all applicable laws, ordinances, regulations, and standards.

PROPOSED CONDITIONS OF CERTIFICATION

CUL-1 Prior to the start of ground disturbance (includes “preconstruction site mobilization”; “construction ground disturbance”; and “construction 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 required in accordance with the Conditions of Certification (Conditions). The CRS may elect to obtain the services of Cultural Resources Monitors (CRMs) and other technical specialists, if needed, to assist in monitoring, mitigation, and curation activities. The project owner shall 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 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 non-compliance on this or other projects.

CULTURAL RESOURCES SPECIALIST

The resumes 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 (36 C.F.R., part 61). In addition, the CRS shall have the following qualifications:

1. The CRS's qualifications shall be appropriate to the needs of the project and shall include a background in anthropology, archaeology, history, architectural history, or a related field;

2. At least three years of archaeological or historical, as appropriate, resource mitigation and field experience in California; and

3. At least one year of experience in a decision-making capacity on cultural resources projects in California and the appropriate training and experience to knowledgably make recommendations regarding the significance of cultural resources.

The resumes of the CRS and alternate CRS shall include the names and telephone numbers of contacts familiar with the work of the CRS/alternate CRS on referenced projects and demonstrate to the satisfaction of the CPM that the CRS/alternate CRS has the appropriate training and experience to implement effectively the Conditions.

CULTURAL RESOURCES MONITORS

CRMs 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 AS or AA 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.

CULTURAL RESOURCES TECHNICAL SPECIALISTS

The resume(s) of any additional technical specialist(s), e.g., historical archaeologist, historian, architectural historian, and/or physical anthropologist, shall be submitted to the CPM for approval.

<u>Verification:</u>

1. At least 45 days prior to the start of ground disturbance, the project owner shall submit the resume for the CRS, and alternate(s) if desired, to the CPM for review and approval.

2. 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 resume 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 there is no alternate CRS in place to conduct the duties of the CRS, a previously approved monitor may serve in place of a CRS so that construction may continue up to a maximum of three days without a CRS. If cultural resources are discovered then construction will remain halted until there is a CRS or alternate CRS to make a recommendation regarding significance.

3. At least 20 days prior to ground disturbance, the CRS shall provide a letter naming anticipated CRMs for the project and stating that the identified CRMs meet the minimum qualifications for cultural resource monitoring required by this Condition. If additional CRMs are obtained during the project, the CRS shall provide additional letters to the CPM identifying the CRMs and attesting to the qualifications of the CRMs, at least five days prior to the CRMs beginning on-site duties.

4. At least 10 days prior to any technical specialists beginning tasks, the resume(s) of the specialists shall be provided to the CPM for review and approval.

5. At least 10 days prior to the start of ground disturbance, the project owner shall confirm in writing to the CPM that the approved CRS will be available for onsite work and is prepared to implement the cultural resources conditions.

CUL-2 Prior to the start of ground disturbance, if the CRS has not previously worked on the project, the project owner shall provide the CRS with copies of the AFC, data responses, and confidential cultural resources reports for the project. The project owner shall also provide the CRS and the CPM with maps and drawings showing the footprints of the power plant, all linear facilities, all access roads, and all laydown areas. Maps shall include the appropriate USGS quadrangles and a map at an appropriate scale (e.g., 1:2000 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 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 submitted prior to the start of each phase. Written notification identifying the proposed schedule of each project phase shall be provided to the CRS and CPM.

At a minimum, the CRS shall consult weekly with the project construction manager to confirm area(s) to be worked during the next week, until ground disturbance is completed.

The project owner shall notify the CRS and CPM of any changes to the scheduling of the construction phases.

<u>**Verification:**</u>

1. At least 40 days prior to the start of ground disturbance, the project owner shall provide the AFC, data responses, and confidential cultural resources documents to

the CRS, if needed, and the subject maps and drawings to the CRS and CPM. The CPM will review submittals in consultation with the CRS and approve maps and drawings suitable for cultural resources planning activities.

2. If there are changes to any project-related footprint, revised maps and drawings shall be provided at least 15 days prior to start of ground disturbance for those changes.

3. If project construction is phased, if not previously provided, the project owner shall submit the subject maps and drawings 15 days prior to each phase.

4. On a weekly basis 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 identifying changes, the project owner shall provide written notice of any changes to scheduling of construction phase.

CUL-3 Prior to the start of ground disturbance, the project owner shall submit the Cultural Resources Monitoring and Mitigation Plan (CRMMP), as prepared by or under the direction of the CRS, to the CPM for review and approval. The CRMMP shall be provided in the Archaeological Resource Management Report (ARMR) format, and, per ARMR guidelines, the author's name shall appear on the title page of the CRMMP. The CRMMP shall identify general and specific measures to minimize potential impacts to sensitive cultural resources. 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, 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.

The CRMMP shall include, but not be limited to, the following elements and measures:

1. A proposed general research design that includes a discussion of archaeological research questions and testable hypotheses specifically applicable to the project area, and a discussion of artifact collection, retention/disposal, and curation policies as related to the research questions formulated in the research design. A prescriptive treatment plan may be included in the CRMMP for limited resource types. A refined research design will be prepared for any resource where data recovery is required.

2. The following statement 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."

3. Specification of the implementation sequence and the estimated time frames needed to accomplish all project-related tasks during the ground disturbance, construction, and post-construction analysis phases of the project.

4. Identification of the 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.

5. A description of the manner in which Native American observers or monitors will be included, the procedures to be used to select them, and their role and responsibilities.

6. A description of 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 construction and/or operation, and identification of areas where these measures are to be implemented. The description shall address how these measures would be implemented prior to the start of construction and how long they would be needed to protect the resources from project-related effects.

7. A statement that all cultural resources encountered shall be recorded on Department of Parks and Recreation (DPR) 523 forms and mapped and photographed. In addition, all archaeological materials retained as a result of the archaeological investigations (survey, testing, data recovery) shall be curated 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.

8. A statement that the project owner will pay all curation fees for artifacts recovered and for related documentation produced during cultural resources investigations conducted for the project. The project owner shall identify three possible curation facilities that could accept cultural resources materials resulting from project activities.

9. A statement that the CRS has access to equipment and supplies necessary for site mapping, photography, and recovery of any cultural resource materials that are encountered during ground disturbance and cannot be treated prescriptively.

10. A description of the contents and format of the Cultural Resource Report (CRR), which shall be prepared according to ARMR guidelines.

<u>Verification:</u>

1. At least 30 days prior to the start of ground disturbance, the project owner shall submit the subject CRMMP to the CPM for review and approval.

2. At least 30 days prior to the start of ground disturbance, a letter shall be provided to the CPM indicating that the project owner agrees to pay curation fees for any materials collected as a result of the archaeological investigations (survey, testing, data recovery).

CUL-4 The project owner shall submit the Cultural Resources Report (CRR) to the CPM for approval. The CRR shall be written by or under the direction of the CRS and shall be provided in the ARMR format. The CRR shall report on all field activities including dates, times and locations, findings, samplings, and analyses. All survey reports, DPR 523 forms, and 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 an appendix to the CRR.

If the project owner requests a suspension of 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 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 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 90 days after completion of ground disturbance (including landscaping), the project owner shall submit the CRR to the CPM for review and approval. 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.

2. Within 90 days after completion of ground disturbance (including landscaping), the project owner shall provide to the CPM a copy of an agreement with, or other written commitment from, a curation facility that meets the standards stated in the California State Historical Resources Commission's *Guidelines for the Curation of Archaeological Collections*, to accept cultural materials, if any, from this project. Any agreements concerning curation will be retained and available for audit for the life of the project.

3. Within 10 days after CPM approval, the project owner shall provide documentation to the CPM confirming that copies of the CRR have been provided to the SHPO, the CHRIS, and the curating institution, if archaeological materials were collected.

4. 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.

CUL-5 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, laydown area, and along the linear facilities routes. 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. Instruction that the CRS, alternate CRS, and CRMs have the authority to halt construction 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;
4. 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;
5. An informational brochure that identifies reporting procedures in the event of a discovery;
6. An acknowledgement form signed by each worker indicating that they have received the training; and
7. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

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 beginning 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, and the CPM will provide to the project owner a WEAP Training Acknowledgement form for each WEAP-trained worker to sign.
2. On a monthly basis, until ground disturbance is completed, the project owner shall provide in the Monthly Compliance Report (MCR) the WEAP Training Acknowledgement forms of workers at the project site and on the linear facilities who have completed the training in the prior month and a running total of all persons who have completed training to date.

CUL-6 The project owner shall ensure that the CRS, alternate CRS, or CRMs monitor full time all ground disturbance at the project site, and ground disturbance at laydown areas, roads, and other ancillary areas, to ensure there are no impacts to undiscovered resources and to ensure that known resources are not impacted in an unanticipated manner.

Full-time archaeological monitoring for this project shall be the archaeological monitoring of all project-related ground disturbance in the project area for as long as the activities are ongoing. Where excavation equipment is actively removing dirt and hauling the excavated material farther than fifty 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 further than fifty feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.

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 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. 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 cultural resources-related activities at the construction site, unless reducing or ending daily reporting is requested by the CRS and approved by the CPM.

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 (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.

A Native American monitor shall be obtained to monitor ground disturbance in areas where Native American artifacts are discovered. Informational [contact] lists of concerned 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.

<u>Verification:</u>

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. 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.

2. 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 acceptable to the CPM. If the CRS concludes that daily reporting is no longer necessary, a letter or e-mail providing a detailed justification for the decision to reduce or end daily reporting shall be provided to the CPM for review and approval at least 24 hours prior to reducing or ending daily reporting.

3. At least 24 hours prior to implementing a proposed change in monitoring level, documentation justifying the change shall be submitted to the CPM for review and approval.

4. 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 Chairperson 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 and any comments or information provided in response by the Native Americans.

CUL-7 The project owner shall grant authority to halt construction to the CRS, alternate CRS, 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 cultural resources over 50 years of age or, if younger, considered exceptionally significant are found, or impacts to such resources 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 **CUL-6** shall continue during all ground-disturbing activities wherever project construction is not halted. The halting or redirection of construction 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 eligibility, and recommendations for mitigation of any cultural resources discoveries, whether or not a determination of significance has been made.

2. The CRS has completed field notes, measurements, and photography for a DPR 523 “Primary” form. The “Description” entry of the DPR 523 “Primary” form shall include a recommendation on the significance of the find. The project owner shall submit completed forms to the CPM.

3. 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, 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, and CRMs have the authority to halt construction activities 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. Completed DPR 523 forms for resources newly discovered during construction 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-8 Prior to site mobilization or construction-related ground disturbance 30 meters within the boundary and inclusive of historical archaeological site P-36-006553, the project owner shall submit, for CPM approval a Cultural Resources Treatment Plan (CRTP), completed by or under the direction of the CRS. The submitted CRTP shall include the proposed personnel, methods, and research framework to conclude the evaluation of the historical significance of P-36-006553 and to recover a representative sample of the information for which Energy Commission staff may determine the site to be eligible for listing in the CRHR. The CRTP should further include discussions on artifact retention and disposal protocols, and curation provisions, as related to the research questions formulated in the research framework.

The project owner shall ensure that all tasks under the CRTP are undertaken by or under the direction of the CRS, who shall employ persons for these tasks having the minimum qualifications of a CRM.

The project owner shall ensure that the requisite updates to the DPR 523 Primary and detail forms, as shall be specified in the approved CRTP, are completed and shall provide for CPM approval a technical report, in ARMR format, on activities carried out under the CRTP, with requisite DPR 523 series forms included as an appendix.

No ground disturbance shall occur 30 meters within the boundary and inclusive of historical archaeological site P-36-006553 prior to completion of the tasks identified in the CRTP, or additionally required by the CPM, and prior to CPM approval of the submitted final technical report on all activities carried out under the CRTP, unless specifically approved by the CPM.

Verification:

1. At least 135 days prior to the start of construction-related ground disturbance 30 meters within the boundary and inclusive of historical archaeological site P-36-006553, the project owner shall submit the CRTP for CPM approval.

2. At least 75 days prior to ground disturbance 30 meters within the boundary and inclusive of historical archaeological site P-36-006553, the project owner shall submit for CPM approval a written recommendation on the CRHR eligibility of P-36-006553 that is supported by the preliminary results of the archival and field research done under the CRTP for the purpose of concluding the evaluation of the historical significance of the subject resource, in addition to the results of prior investigations on the resource.

3. At least 30 days prior to ground disturbance 30 meters within the boundary and inclusive of historical archaeological site P-36-006553, the project owner shall submit for CPM approval a final technical report (in ARMR format) that provides personnel, methods, findings, and completed DPR 523 forms for all cultural resources activities completed pursuant to the CRTP.

CULTURAL RESOURCES ACRONYM GLOSSARY

AFC	Application for Certification
AMS	Abengoa Mojave Solar
ARMR	Archaeological Resource Management Report
BCE	Before Common Era
CE	Common Era
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System

Conditions	Conditions of Certification
CRHR	California Register of Historical Resources
CRM	Cultural Resources Monitor
CRMMP	Cultural Resources Monitoring and Mitigation Plan
CRR	Cultural Resource Report
CRS	Cultural Resources Specialist
DPR 523	Department of Parks and Recreation cultural resource inventory form
FSA	Final Staff Assessment
LORS	Laws, ordinances, regulations, and standards
MCR	Monthly Compliance Report
MLD	Most Likely Descendent
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
OHP	Office of Historic Preservation
PSA	Preliminary Staff Assessment
SHPO	State Historic Preservation Officer
Staff	Energy Commission cultural resources technical staff
WEAP	Worker Environmental Awareness Program

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HAZARDOUS MATERIALS MANAGEMENT

Testimony of Alvin Greenberg, Ph.D.

SUMMARY OF CONCLUSIONS

Staff's evaluation of the proposed Abengoa Mojave Solar (AMS) project, along with staff's proposed mitigation measures as described in seven proposed Conditions of Certification, indicates that hazardous materials use at the site would not present a significant impact to the public. With adoption of the proposed conditions of certification, the proposed project will comply with all applicable laws, ordinances, regulations, and standards. Energy Commission staff proposes conditions of certification to address safe handling of hazardous materials, use of heat transfer fluid (HTF), transportation of hazardous materials, and site security.

INTRODUCTION

The purpose of this hazardous materials management analysis is to determine if the proposed AMS has the potential to cause significant impacts on the public as a result of the use, handling, storage, or transportation of hazardous materials at the proposed site. If significant adverse impacts on the public are identified, Energy Commission 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.

For 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 is 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 migration of a spill off site to the extent that there won't be significant off-site impacts. These measures look at potential direct contact from runoff of spills, air-borne plume concentrations, and the potential for spills to mix with runoff water and be carried offsite. Generally, staff seeks to confirm that the applicant has proposed secondary containment basins for containing liquids, and that volatile chemicals would have a restricted exposure to the atmosphere after capture.

Various hazardous materials including mineral and lubricating oils, cleaning detergents, water treatment chemicals, heat transfer fluid (HTF), and welding gasses will be present at the proposed AMS project. Although the AMS project will not use natural gas for energy production, natural gas would be supplied to the site for the auxiliary boiler and domestic uses such as space heating. The project would connect to an existing natural gas pipeline supplied by the Southwest Gas Corporation which reaches the project boundary (AS 2009a, Section 2.5). The AMS project would also require the transportation of hazardous materials to the facility. This document addresses all potential impacts associated with the use and handling of 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 Law	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 Law	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	
2007 California Fire Code Title 24, Part 9	Adopts the California Fire Code, 2007 Edition, into San Bernardino County regulations.

The Certified Unified Program Agency (CUPA) with the responsibility to review Hazardous Materials Business Plans (HMBPs) is the San Bernardino County Fire Department (SBCFD). With regard to seismic safety issues, the site is located in a California Earthquake Fault Zone. Construction and design of buildings and vessels storing hazardous materials will meet the appropriate seismic requirements of the 2007 California Building Code as determined by a site-specific probabilistic seismic hazard analysis (AS 2009a, Section 5.6.3.6 & Appendix B Section 6.4).

SETTING

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 (5.2.1.3) and Appendix C.2 of the Application for Certification (AS 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 essentially flat (about 2,070 feet above sea level) consisting of open desert and agricultural land adjacent to the Harper Dry Lake depression. Elevated terrain surrounds the project site from all directions and can be found within one to three miles of the site (AS 2009a, Section 5.2.1.1).

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. Sensitive receptors in the project vicinity are listed in Section 5.6.2.1 of the AFC. There are no sensitive receptors within a 3-mile radius of the project site. The nearest sensitive receptor is the Hinkley Elementary School located about 10 miles southeast of the project site. The nearest residence is approximately 60 feet south of the southern boundary and several additional residences are located within 0.6 miles of the project boundaries (AS 2009a, Section 5.6.2.1 and Table C.4-4).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

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. In order to accomplish this goal, staff utilized the most current public health exposure levels (both acute and chronic) that are established to protect the public from the effects of an accidental chemical release.

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 applicant 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 applicant plans to store the materials on site.

Staff reviewed the applicant'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 the rules and procedures that workers at the facility must follow that will help to prevent accidents or to keep them small if they do occur. Both engineering and administrative controls can act as methods of prevention or as methods of response and minimization. In both cases, the goal is to prevent a spill from moving off site and causing harm to the public.

Staff reviewed and evaluated the applicant's proposed use of hazardous materials as described by the applicant (AS 2009a, 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 AFC and in Tables 7-9 of Data Responses Set 1 (ESH 2009c) 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 applicant 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 applicant 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 applicant. When mitigation methods proposed by the applicant 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.

DIRECT/INDIRECT IMPACTS AND 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 paint, solvents, gasoline, diesel fuel, motor oil, lubricants, and welding gases. See Tables 7 and 8 of Data Response Item 76 for a complete list of hazardous materials to be used and stored on site during construction (ESH 2009c).

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, fertilizers, pesticides, and other various chemicals (see **HAZARDOUS MATERIALS APPENDIX A** for a list of all chemicals proposed to be used and stored at AMS 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 project will be limited to using, storing, and transporting only those hazardous materials listed in Appendix A of this section as per staff's proposed condition **HAZ-1**.

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: natural gas and Therminol VP-1™, the proposed heat transfer fluid (HTF).

Large Quantity Hazardous Materials

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% in concentration. Methane is flammable when mixed in air at concentrations of 5-14%, 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 (Lees 1998), 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 recent natural gas detonation in Belgium in July 2004).

Natural gas at the proposed facility will only be used to fuel the auxiliary boilers and for domestic uses (such as space heating). It will not be stored on-site but delivered via an existing Southwest Gas Corporation pipeline that reaches the project's boundary (AS 2009a, Section 5.6.3.5). Approximately two miles of pipeline would be installed within the site boundaries to deliver natural gas to both power blocks (AS 2009a, Section 2.5). Approximately 140 pounds of natural gas would be contained in on-site equipment and piping (ESH 2009c, Table 8). 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. The safety management plan proposed by the applicant 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.

Therminol VP-1

Therminol VP1 is the heat transfer fluid (HTF) that will be used in the solar panels to collect solar heat and transfer it in order to generate steam to run the steam turbines. Therminol is a mixture of 73.5% diphenyl ether and 26.5% biphenyl, and is a solid at temperatures below ~54 °F. Therminol can therefore be expected to remain liquid if a spill occurs. While the risk of off-site migration is minimal, Therminol is highly flammable and fires have occurred at other solar generating stations that use it. Approximately 2,292,000 gallons of HTF will be stored at the AMS contained in the pipes and heat exchanger. Isolation valves would be placed throughout the HTF piping system designed to automatically block off sections of the piping in which a loss of pressure is detected (AS 2009a, Section 5.6.3.3).

Staff has assessed the properties of Therminol, and reviewed the record of its use at Solar Electric Generating Stations 8 and 9 at Harper Lake, California. Past leaks, spills, and fires involving this HTF were examined and discussed. It appears that the placement of additional isolation valves in the HTF pipe loops throughout the solar array would add significantly to the safety and operational integrity of the entire system by allowing a loop to be closed if a leak develops in a ball joint, flex-hose, or pipe, instead of closing off the entire HTF system and shutting down the plant. In order to ensure that HTF leaks do not pose a significant risk, staff proposes Condition of Certification **HAZ-4,** which would require the project owner to install a sufficient number of isolation valves that are automatically, manually, and remotely activated.

The AFC indicates that the Alpha site will be bisected by Harper Lake Road and that the west side of the Alpha solar field will be disconnected from the power block by this road. Since the control room and power block will be located on the east parcel of the Alpha site, pipes carrying heat transfer fluid (HTF), all command and control systems, and the fire water loop will be required to cross Harper Lake Road either above or beneath the road. Staff has discussed this with the applicant and the applicant has stated that all HTF and command and control lines will be placed underground when crossing Harper Lake Road. The lines would be installed in a protective structure underneath the road and the HTF pipes would have expansion loops aboveground on either side of the road. In order to ensure that all HTF pipes and command and control system cross existing roads underground, staff proposes Condition of Certification **HAZ-7**.

Mitigation

Staff believes that this project’s use of hazardous materials poses no significant risk only if mitigation measures are used. These mitigation measures are discussed in this section. The potential for accidents resulting in the release of hazardous materials is greatly reduced by the implementation of a Safety Management Program, which 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 applicant for use at the AMS project include:

- Storage of small quantity hazardous materials in original, properly labeled containers;
- Construction of secondary containment areas surrounding each of the bulk hazardous materials storage areas 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;
- Installation of a fire protection system for hazardous materials storage areas; and
- Continuous monitoring of HTF piping system by plant staff and by automatic pressure sensors designed to trigger isolation valves if a leak is detected.

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 applicant 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.

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.

Staff’s proposed Condition of Certification **HAZ-1** ensures that no hazardous material would be used at the facility except as listed in Tables 7-10 of Data Response Item 76 (ESH 2009c), which have been reviewed by staff to determined the need and appropriateness of their use. **HAZ-1** also requires changes to the allowed list of hazardous materials and their maximum amounts to be approved by the Compliance Project Manager. 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 Conditions of Certification **HAZ-2** (preparation of a Hazardous Materials Business Plan, a Process Safety Management Plan, and a Spill Prevention, Control, and Countermeasure Plan) and **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 Spill Prevention, Control, and Countermeasure (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. However, there are no known waters of the State or of the United States and thus staff's position is that no SPCC Plan is required by 40 CFR 112. However, pursuant to California HSC Sections 25270 through 25270.13, the AMS will 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 Certified Unified Program Authority (CUPA).

Plant personnel would 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 San Bernardino County Fire Department (SBCFD) which has a hazmat response unit capable of handling any incident at the proposed AMS. The SBCFD Hazmat unit is located at Station #322 in Adelanto, about 50 miles away, and would respond in about 45 minutes (AS 2009a, Sections 5.6.2.1 and 5.6.4.2 and SBCFD 2010).

Transportation of Hazardous Materials

Various containerized and bulk hazardous materials would be transported to the facility via truck. While many types of hazardous materials will be transported to the site, staff believes that transport of HTF poses the predominant risk associated with hazardous materials transport. It should be noted that previous modeling of spills involving much larger quantities of more toxic materials such as aqueous and anhydrous ammonia (two hazardous materials that *would not* be used, stored, or transported to the proposed AMS) has demonstrated that minimal airborne concentrations would occur at short distances from the spill.

Staff reviewed the applicant's proposed transportation routes for hazardous materials delivery. Trucks would travel on SR-58 to Harper Lake Road to the project site via an access road (AS 2009a, Section 5.6.3.3). About 2,292,000 gallons of HTF would be transported to the project site during the last nine months of construction, which would require an estimated 374 deliveries during that period (about 10 trucks per week) each delivering approximately 6,130 gallons (ESH 2009c, Data Response Item 77).

Liquid hazardous materials can be released during a transportation accident, and the extent of their impact in the event of a release would depend on the location of the accident and the rate of vapor dispersion from the surface of the spilled pool. The likelihood of an accidental release during transport is dependent upon three factors:

- The skill of the tanker truck driver;

- The type of vehicle used for transport; and
- Accident rates.

To address this concern, staff evaluated the risk of an accidental transportation release in the project area. Staff's analysis focused on the project area after the delivery vehicle leaves the main highway (SR-58). 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. See AFC section 5.13 for additional information on regulations governing the transport of hazardous materials.

To address the issue of tanker truck safety, HTF would be delivered to the site in standard petroleum semi-tractor and tanker trailers (ESH 2009c, Data Response Item 77). To address the issue of accident rates, staff reviewed the technical and scientific literature on hazardous materials transportation (including tanker trucks) accident rates in the United States and California. Staff relied on six references and three federal government databases to assess the risk of a hazardous materials transportation accident.

Staff used the data from the Davies and Lees (1992) article, which references both the 1990 Harwood et al. and 1993 Harwood studies, to determine that the frequency of release for the transportation of hazardous materials in the U.S. is between 0.06 and 0.19 releases per 1,000,000 miles traveled on well-designed roads and highways. The applicant estimated that over a course of nine months, 374 evenly distributed deliveries of HTF would be made from the rail yard in Barstow to the project site. Each delivery will travel approximately six miles from SR-58 along Harper Lake Road to the facility.

This would result in about 2,244 miles of delivery tanker truck travel in the project area (with a full load) during the construction period. Only minimal additional HTF deliveries are expected during operations, however the applicant did not quantify these deliveries. Staff believes that the risk over this distance is insignificant. Data from the U.S. DOT show that the actual risk of a fatality over the past five years from all modes of hazardous material transportation (rail, air, boat, and truck) is approximately 0.1 in 1,000,000 miles traveled.

In addition, staff used a transportation risk assessment model (developed by staff) in order to calculate the probability of an accident resulting in a release of HTF during delivery from SR-58 to the facility via Harper Lake Road. Results show a total risk of 240 in 1,000,000 for 374 deliveries. This risk was calculated using accident rates on various types of roads (in this case, rural two-lane) with distances traveled on each type of road computed separately. Although it is an extremely conservative model in that it includes risk of accidental release from all modes of hazardous materials transportation and does not distinguish between a high-integrity steel tanker truck and other less secure modes, the results still show that the risk of a transportation accident is insignificant.

Staff therefore believes that the risk of exposure to significant concentrations of HTF during transportation to the facility is insignificant because of the remote possibility that an accidental release of a sufficient quantity could be dangerous to the public. The transportation of similar volumes of hazardous materials on the nation's highways is neither unique nor infrequent. Staff's analysis of the transportation of HTF to the proposed facility (along with data from the U.S. DOT) demonstrates that the risk of accident and exposure is less than significant.

Based on the environmental mobility, toxicity, the quantities at the site, and frequency of delivery, it is staff's opinion that HTF poses the predominate risk associated with both use and hazardous materials transportation. Staff concludes that the risk associated with the transportation of other hazardous materials to the proposed project does not significantly increase the risk of HTF transportation.

Seismic Issues

It is possible that an earthquake could cause the failure of hazardous materials storage tanks and/or solar field piping. 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 that may cause fires or impact the environment. The applicant stated that the piping in the solar array will be constructed to be flexible and allow movement due to thermal expansion. The piping will be attached with ball joints and won't be fixed to a rigid structure; therefore failure of the piping during an earthquake is unlikely (AS 2009a, Section 5.6.3.6).

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 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 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. Referring to the sections on **GEOLOGIC HAZARDS AND RESOURCES** and **FACILITY SAFETY DESIGN** in the AFC, staff notes that the proposed facility will be designed and constructed to the appropriate standards of the 2007 California Building Code determined by a site-specific probabilistic seismic hazard analysis (AS 2009a, Section 5.6.3.6 & Appendix B Section 6.4). Therefore, on the basis of what occurred in Northridge with older tanks and the lack of failures during the Nisqually earthquake (with newer tanks), staff determined that tank failures during seismic events are not probable and do not represent a significant risk to the public.

Site Security

AMS proposes to use hazardous materials in sufficient quantities that special site security measures should be developed and implemented to prevent unauthorized access. The North American Electric Reliability Corporation (NERC) published *Security*

Guidelines for the Electricity Sector in 2002 (NERC 2002) 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. On April 9, 2007, the U.S Department of Homeland Security published, in the Federal Register (6 CFR Part 27), an Interim Final Rule 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. Although the proposed AMS facility would not be subject to this regulation, staff believes that all power plants under the jurisdiction of the Energy Commission shall 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 proposed conditions of certification **HAZ-5** and **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 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, the Energy Commission 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 determined that the AMS 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 supplying hazardous materials strictly adhere to the U.S. DOT requirements that hazardous materials vendors prepare and implement security plans per 49 CFR 172.800 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 applicant.

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 Regulation, Title 14, section 15130).

GEOGRAPHIC EXTENT

The geographic area considered for cumulative impacts on Hazardous Materials Management is only within the project boundaries.

EXISTING CUMULATIVE CONDITIONS

For this analysis, there are no projects or developments in the area or region that use, store, and/or transport hazardous materials that staff has found to have an impact on the region. The use of hazardous materials is neither frequent nor concentrated in this area.

Staff analyzed the potential for hazardous materials cumulative impacts at many other power plant projects. 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. The only nearby existing facilities that handle hazardous materials are the SEGS VIII and IX solar projects which use the same HTF proposed for AMS. While the potential exists for on-site impacts of a release of HTF, the potential for off-site impacts is less than significant. 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.

FUTURE FORESEEABLE PROJECTS

Foreseeable Projects in the Project Area

Hazardous Materials Management at the proposed project is not expected to be affected by any reasonably foreseeable future projects, including the proposed solar and wind projects (see **Cumulative Impacts Table 3** and **Figure 2**). The reasons for staff's position are described above.

The construction and operation of the AMS is not expected to result in short or long term adverse impacts related to hazardous materials use. The applicant will develop and implement a hazardous materials handling program for the AMS independent of any other projects considered for potential cumulative impacts. Staff believes that the facility, as proposed by the applicant 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.

Foreseeable Renewable Projects in the Western Mojave Desert

As noted above, cumulative impacts in the area of Hazardous Materials Management can only occur in the immediate vicinity of the project and therefore impacts to the greater region are not feasible.

FACILITY CLOSURE

The AMS project would be designed for an operating life of between 30 years to 40 years. Depending on maintenance factors, at an appropriate point beyond the designed operating life, the project would cease operation and close down. At that time, it would be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts.

Although the setting for this project does not appear to present any special or unusual closure problems, it is impossible to foresee what the situation would be in 30 years or more when the project ceases operation. Therefore, provisions must be made which provide the flexibility to deal with the specific situation and project setting at the time of closure. Facility closure would be consistent with laws, ordinances, regulations and standards in effect at the time of closure.

OVERALL CONCLUSION

The potential for off-site impacts resulting from the use, storage, and transportation of hazardous materials at the AMS is insignificant 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 one 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.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments have been received.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Staff concludes that construction and operation of the AMS 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.

CONCLUSIONS

Staff's evaluation of the proposed project (with proposed 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 conditions of certification, the proposed project 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 conditions of certification presented below to ensure that the project 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 applicant and by staff are implemented, the use, storage, and transportation of hazardous materials would not present a 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 conditions of certification which are mentioned in the text (above) and listed below. **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. **HAZ-2** ensures that local emergency response services are notified of the amounts and locations of hazardous materials at the facility, **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. **HAZ-4** addresses the use of HTF in the solar array. Site security during both the construction and operation phases is addressed in **HAZ-5** and **HAZ-6** and any pipes or command and control communication lines crossing existing roads shall cross underground as per **HAZ-7**.

PROPOSED CONDITIONS OF CERTIFICATION

HAZ-1 The project owner shall not use any hazardous materials not listed in Appendix A, below, or in greater quantities or strengths than those identified by chemical name in Appendix A, below, unless approved in advance by the Compliance Project Manager (CPM).

Verification: 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 provide a Hazardous Materials Business Plan (HMBP), a Spill Prevention, Control, and Countermeasure Plan (SPCC), and a Process Safety Management Plan (PSMP) to the San Bernardino County Fire Department and the CPM for review. After receiving comments from the San Bernardino County Fire Department and the CPM, the project owner shall reflect all recommendations in the final documents. Copies of the final HMBP, SPCC, and PSMP shall then be provided to the San Bernardino County Fire Department for information and to the CPM for approval.

Verification: At least 60 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 Countermeasure Plan, and a 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 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 sixty (60) days prior to the delivery of any liquid 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. These valves shall be actuated automatically, manually, and remotely. 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 construction.

Verification: At least sixty (60) days prior to the commencement of solar array construction, the project owner shall provide the design drawings as described above 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 thirty (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 security plan for the commissioning and operational phases that will be 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;

   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;

6. Site access controls for employees, contractors, vendors, and visitors;

7. A statement(s) (refer to sample, **ATTACHMENT C**), signed by the owners or authorized representative of 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;

8. 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 and the front gate; and

9. Additional measures to ensure adequate perimeter security consisting of either:

   A. Security guard(s) present 24 hours per day, 7 days per week; **<u>or</u>**

   B. Power plant personnel on site 24 hours per day, 7 days per week,

   <u>and</u>

   the CCTV able to view 100% of the entire solar array fenceline perimeter

   <u>or</u> breach detectors **<u>or</u>** on-site motion detectors along the entire solar array fenceline.

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—transformers, gas lines, and compressors—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 applicant.

Verification: At least thirty (30) days prior to the initial receipt of hazardous materials on site, 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.

HAZ-7 The project owner shall ensure that all pipes carrying heat transfer fluid (HTF), all command and control systems, and the fire water loop that are required to cross Harper Lake Road or Lockhart Road will be placed underground for the crossing. The pipes and lines shall be installed in a protective structure underneath the road and the HTF pipes shall have expansion loops aboveground on either side of the road. The engineering design plans shall be provided to the CPM for review and approval prior to the commencement of the solar array construction.

Verification: At least sixty (60) days prior to the commencement of solar array construction, the project owner shall provide the design drawings as described above to the CPM for review and approval.

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.

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HAZARDOUS MATERIALS
APPENDIX A

Hazardous Materials Proposed for Use at AMS During Operations

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Hazardous Materials Appendix A
Hazardous Materials Proposed for Use at AMS During Operations

Material	CAS No.	Application	Hazardous Characteristics	Maximum Quantity On Site	CERCLA SARA RQ[a]
Acetylene	74-86-2	Welding gas	Health: hazardous if inhaled Physical: combustible, flammable	1,600 cubic feet	N/A
Air Conditioning Fluids	None			40 pounds	N/A
Argon	7440-37-1	Welding gas	Health: low toxicity Physical: non reactive	1,600 cubic feet	N/A
Bathroom Supplies – Liquid Soap	None			25 gallons	N/A
Chem Treat, Inc. BL-1260 or similar Carbohydrazide	497-18-7		Health: moderate toxicity	Totes, 4 x 300 gallons	N/A
ChemTreat, Inc. BL-1558 or similar 3-Methoxyproplyamine Cyclohexlyamine Diethydroxylamine	 5332-73-0 108-91-8 3710-84-7		Health: high toxicity Physical: corrosive, combustible	Totes, 4 x 300 gallons	 N/A 10,000 pounds N/A
ChemTreat, Inc. BL-180 or similar Nitrous Acid, Sodium Salt Sodium Tetraborate Pentahydrate	 7632-00-0 12179-04-3		Health: moderate toxicity	Totes, 2 x 300 gallons	 100 pounds N/A
ChemTreat, Inc. CL-1432 or similar Potassium Phosphate, Tribasic 1-Hydroxyethylidene-1, 1-Diphosphonic Acid, Tetrapotassium Salt Tetrapotassium Pyrophosphate Potassium Hydroxide Tolytriazole, Sodium Salt	 7778-53-2 14860-53-8 7320-34-5 1310-58-3 64665-57-2		Health: high toxicity Physical: corrosive	Totes, 2 x 1,000 gallons	 N/A N/A N/A 1,000 pounds N/A

Material	CAS No.	Application	Hazardous Characteristics	Maximum Quantity On Site	CERCLA SARA RQ[a]
ChemTreat, Inc. BL-124 or similar Sodium Bisulfite	7631-90-5		Health: low toxicity, irritant	Totes, 2 x 300 gallons	5,000 pounds
ChemTreat, Inc. BL-1794 or similar Trisodium Phosphate	7601-54-9		Health: high toxicity Physical: corrosive	Plastic Totes, 2 x 300 gallons	N/A
Cleaning Chemicals (Janitorial Supplies)	None	Periodic cleaning of combustion turbine	Health: various Physical: various	20 gallons	NA
Diesel Fuel			Health: low toxicity Physical: combustible	14,200 gallons	N/A
Fertilizer (Bioremediation) Urea	57-13-6 1317-25-5		Health: low toxicity	300 pounds	N/A
Fertilizer (Bioremediation) Monopotassium Phosphate	7778-77-0		Health: low toxicity Physical: combustible	2,000 pounds	N/A
Gasoline	86290-81-5			1,000 – 2,000 gallons	N/A
Heat Transfer Fluid: Diphenyl Ether (73.5%) Biphenyl (26.5%)	101-84-8 92-52-4	Heat transfer from solar array to steam generator	Health: moderately toxic, skin irritant Physical: combustible	2,292,000 gallons	100 pounds
Herbicide Roundup® or equivalent (Glyphosate, Isopropylamine Salt)	38641-94-0		Health: low toxicity, irritant	No onsite storage, brought on site by licensed contractor, used immediately	N/A
Herbicides and Pesticides	None			5 gallons	N/A
Lab Gases	None			150 cubic feet	N/A
Lab Reagents	None			10 gallons	N/A
Lube Oil	64742-55-8	Lubricate rotating equipment	Health: hazardous if ingested Physical: may be flammable/combustible	5,00 gallons in equipment and piping, additional maintenance inventory of up to 550 gallons in 55-gallon steel drums	N/A

Material	CAS No.	Application	Hazardous Characteristics	Maximum Quantity On Site	CERCLA SARA RQ[a]
Mineral Insulating Oil	64742-53-6 68037-01-4	Transformers/switchyard	Health: hazardous if ingested Physical: may be flammable/combustible	64,000 gallons	N/A
Natural Gas (Methane)	74-82-8	Auxiliary boiler and domestic use (space heating)	Health: low toxicity Physical: flammable	No on-site storage, natural gas in equipment and piping; pressurized carbon steel pipeline for delivery to site	N/A
Nitrogen	7727-37-9			37,200 gallons	N/A
Office Supplies (Batteries, etc)	None			1 cubic foot	N/A
Oxygen	7782-44-7	Welding gas	Health: low toxicity, skin irritant Physical: flammable	3,200 cubic feet	NA
Paint and Paint Thinners	Various	Touchup of painted surfaces	Health: various Physical: various	50 gallons	NA
Propane	74-98-6	Torch gas	Health: low toxicity, causes frostbites Physical: flammable, oxidizing	5,000 gallons	NA
Sodium Hydroxide	1310-73-2	Water treatment	Health: high toxicity Physical: corrosive	2,000 gallons	1,000 pounds
Sodium Hypochlorite	7681-52-9 10022-70-5	Water treatment	Health: low toxicity Physical: corrosive, flammable	12,000 gallons	100 pounds
Soil Stabilizer Coherex or similar	64742-11-6		None	No onsite storage, supplied in 400-gallon totes, used immediately	N/A
Sulfuric Acid (29.5%)	7664-93-9 8014-95-7	Water treatment	Health: high toxicity Physical: corrosive and water reactive	2,000 gallons	1,000 pounds
Sulfuric Acid (93%)	7664-93-9 8014-95-7	Water treatment	Health: high toxicity Physical: corrosive and water	1,600 gallons	1,000 pounds

Material	CAS No.	Application	Hazardous Characteristics	Maximum Quantity On Site	CERCLA SARA RQ[a]
			reactive		
Water Treatment Chemical ChemTreat, Inc. CT-9004 or similar 1-Hydroxyethylidene-1, 1-Diphosphonic Acid	2809-21-4			Totes, 2 x 300 gallons	N/A
Water Treatment Chemical ChemTreat, Inc. P-813 E or similar Petroleum Distillate Hydrotreated Light	64742-47-8		None	Totes, 2 x 275 gallons	N/A
Water Treatment Chemical ChemTreat, Inc. CL-2156 or similar 5-Chloro-2-Methyl-4-Isothiazolin-3-One 2-Methyl-4-Isothiazolin-3-One Magnesium Nitrate Magnesium Chloride	 26172-55-4 2682-20-4 10377-60-3 7786-30-3		Physical: corrosive	Totes, 2 x 300 gallons	 N/A N/A N/A N/A
Welding Rods	7439-89-6			100 pounds	N/A

Source: ESH 2009c Tables 9 and 10 and AS 2009a Table 5.6-3
a. Reportable quantities for a pure chemical, per the Comprehensive Environmental Response, Compensation, and Liability Act.

LAND USE

Testimony of Negar Vahidi and Susanne Huerta

SUMMARY OF CONCLUSIONS

The Energy Commission staff (referred to as "staff") have reviewed the proposed Abengoa Mojave Solar (AMS or "proposed project") project in accordance with the requirements of the California Environmental Quality Act (CEQA). This section addresses land use issues related to agriculture, compatibility with existing land uses and consistency with the applicable laws, ordinances, regulations, and standards (LORS). With implementation of the recommended conditions of certification, the proposed project would not result in adverse impacts to agricultural lands and would be consistent with the applicable LORS. Staff is proposing Conditions of Certification **LAND-1** to ensure that the proposed project mitigates the permanent loss of 1,588.5 acres of agricultural lands; **LAND-2** to ensure that the proposed project complies with San Bernardino County's (county) suggested project decommissioning/closure requirements; and **LAND-3** to ensure the proposed project is in compliance with the Subdivision Map Act.

The proposed project would contribute to the conversion of a total of approximately half a million acres of land that are proposed for solar and wind energy development in the western Mojave Desert area. Cumulative impacts to approximately half a million acres of land would all combine to result in adverse effects on agricultural lands, and the cumulative conversion of these lands would preclude numerous existing land uses including open space and rural residences. However, with implementation of Condition of Certification **LAND-1**, the proposed project's contribution to the overall conversion of land in the western Mojave Desert area would not be cumulatively considerable.

INTRODUCTION

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

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Land use LORS directly applicable to the proposed project and the surrounding area include San Bernardino County's General Plan and Land Use Ordinance. **Land Use Table 1** provides a general description of land use LORS applicable to the proposed project and surrounding lands. The project's consistency with these LORS is discussed in **Land Use Table 2**.

Land Use Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	None
State	
Subdivision Map Act (Public Resources Code Section 66410-66499.58)	This section of the California Public Resources Code provides procedures and requirements regulating land division (subdivisions) and parcel legality. Regulation and control of the design and improvement of subdivisions have been vested in the legislative bodies of local agencies.
Local	
County of San Bernardino 2007 General Plan (SBC 2007a)	The policies and programs of the County of San Bernardino General Plan, adopted March 13, 2007, are intended to serve as a blueprint for most land use decisions. Preparing, adopting, implementing, and maintaining a general plan serves to: identify the community's land use, transportation, environmental, economic, and social goals and policies as they relate to land use and development; form the basis for local government decision-making, including decisions on proposed development; provide residents with opportunities to participate in the planning and decision-making processes of their community; and inform residents, developers, decision makers, and other cities and counties of the ground rules that guide development within the community.
County of San Bernardino 2007 Development Code, Title 8 of the San Bernardino County Code (CSB 2007b; CSB 2010d)	The County's Development Code was adopted March 13, 2007, and amended August 20, 2009 and February 2010. The purpose of this Development Code is to implement the San Bernardino County General Plan by classifying and regulating the uses of land and structures within unincorporated San Bernardino County. In particular, the purposes of the Development Code are as follows: to provide standards and guidelines for continuing orderly growth and development; to conserve and protect the County's important agriculture, cultural, natural, open space and scenic resources; to create a comprehensive and stable pattern of land uses upon which to plan transportation, water supply, sewerage, energy, drainage/flood control and other public facilities and utilities; to encourage the most appropriate uses of land in order to prevent overcrowding of land and avoid undue concentration of population, and maintain and protect the value of property; and to ensure compatibility between different types of development and land use. The Development Code was most recently amended on February 9, 2010, to include Chapter 84.29 (Renewable Energy Generation Facilities) for the purpose of establishing "...standards and permit procedures for the establishment, maintenance and decommissioning of renewable energy generation facilities" (CSB 2010d).

SETTING

PROPOSED PROJECT

Proposed Project Site

The proposed AMS project is a solar electric generating facility to be located on approximately 1,765 acres approximately nine miles northwest of the Town of Hinkley in unincorporated San Bernardino County. Project site access is provided by Harper Lake Road, which is approximately twenty miles west of Barstow along the Highway 58 corridor, and approximately six miles north of where Harper Lake Road intersects with Highway 58. The existing Solar Electric Generating Stations (SEGS) VIII and IX facilities, now owned by NextEra™ Energy Resources, are located immediately northwest of the project site. See **Project Description Figures 1, 2,** and **3.**

The project site is comprised of private property that was historically used as the Lockhart Ranch complex. The property has served as an agricultural and cattle center for over sixty years and, in that capacity, has utilized water from ground wells; farming activities have included flood irrigation and ultimately the pivot system of irrigation of quarter section areas. Currently, there are no ranching or residential activities on the property, and there is only one active pivot irrigation field in production on the site. The property is designated Rural Living (RL) by the San Bernardino County General Plan, and is within the RL zone of the county's Development Code.

Project-Related Facilities

In addition to the proposed AMS site, other features and facilities associated with the proposed project would be located on the project site. The project would have a combined nominal electrical output of 250 megawatts (MW) from twin, independently-operable solar fields, each feeding a 125-MW power island. The plant sites, identified as Alpha (the northwest portion of the Project area) and Beta (the southeast portion of the Project area), would be 884 acres and 800 acres, respectively, and joined at an on-site transmission line interconnection substation to form one full-output transmission interconnection. The applicant proposes that an additional 81 acres shared between the plant sites would be utilized for receiving and discharging offsite drainage improvements.

Each power island would have its own warehouse and control/administrative building. Solar collector array assembly buildings would be installed in the northeast portion of the Alpha solar field, which would be later converted to warehouses. The total square footage of the various proposed project buildings and pre-engineered enclosures (e.g., control/administrative building, warehouse, electrical equipment enclosures, etc.) is approximately 185,000 square feet for the entire project.

The proposed onsite transmission line would be installed on approximately 23 new steel/concrete mono-poles from the Alpha site and approximately nine poles from the Beta site. The poles would be an average of 80 feet in height with a maximum pole height of 110 feet. The onsite transmission line would connect to a new substation that would be located on the southwest corner of the Beta solar field and referred to as "Hinkley." This proposed substation would then interconnect to Southern California

Edison's (SCE) Kramer-Cool Water 230-kV transmission line. The northern boundary of SCE's transmission line is adjacent to the southern boundary of the proposed project site. As such, all project-related transmission facilities would be within the proposed project site boundaries.

For a detailed description of the proposed project components and associated facilities, see the **PROJECT DESCRIPTION** section of the Staff Assessment.

SURROUNDING AREA

The majority of land surrounding the proposed AMS site is open space, rural residences and farms. Approximately ten rural residences and farms are located south of Lockhart Ranch Road and the proposed project site. Four are located west of Harper Lake Road within one mile of the project site. The proposed project would connect to an existing gas line located along Harper Lake Road. In addition, as noted above, the SEGS VIII and IX facilities are adjacent to the northwest boundary of the project site.

Other notable land uses in the surrounding area include Harper Dry Lake and viewing area, which are approximately 1,000 feet east of the project site. According to the U.S. Bureau of Land Management (BLM), water runoff from neighboring land uses has created a large marsh that, "...attracts resident wildlife and thousands of migratory waterfowl, shorebirds and wading birds, making this a prime bird watching spot" (BLM 2010).

AGRICULTURAL LANDS

Historically agricultural activities at the proposed project site and surrounding area included the production of alfalfa and cattle ranching. Currently, a crop circle of 128 acres is located in the northeast quarter of section 32, which is irrigated and producing alfalfa. The remainder of the site is largely non-irrigated former agricultural land that has been grazed by cattle, disturbed, or is now fallow. The proposed project would not be located on lands subject to Agricultural Land Conservation (i.e., Williamson Act) contracts (AS 2009a).

The Farm Land Mapping and Monitoring Program (FMMP) of the California Department of Conservation (DOC) provides statistics on the conversion of farmland to non-agricultural uses in San Bernardino County. Under the standard FMMP mapping criteria, the majority of the project site and surrounding area are designated as Grazing Land[1]. The FMMP map also shows a quarter section crop circle with Prime Farmland[2] (71 acres) and Farmland of Statewide Importance[3] (57 acres). The abandoned town of

[1] Grazing Land is "land on which the existing vegetation is suited to the grazing of livestock" (DOC 2007a).

[2] Prime Farmland includes lands with "the best combination of physical and chemical features able to sustain long-term agricultural production."

[3] Farmland of Statewide Importance is "similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date."

Lockhart, the other agricultural properties west of Harper Lake Road, and the SEGS VIII and IX facilities are all designated as Urban and Built-up Land[4].

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may also refer to the California Agricultural Land Evaluation and Site Assessment (LESA) Model, prepared by the DOC, which is an optional quantitative model to use in assessing impacts on agriculture and farmland (CCR 2006). LESA is a term used to define an approach for rating the relative quality of land resources based upon specific measurable features. The formulation of a California Agricultural LESA Model is the result of Senate Bill 850 (Stats. 1993, ch. 812, section 3), which charged the Resources Agency, in consultation with the Governor's Office of Planning and Research, with developing an amendment to Appendix G of the CEQA Guidelines concerning agricultural lands. As such the amendment is intended "to provide lead agencies with an optional methodology to ensure that significant effects on the environment of agricultural land conversions are quantitatively and consistently considered in the environmental review process" (Public Resources Code Section 21095).

The LESA Model is composed of six different factors. Two "Land Evaluation" (LE) factors are based upon measures of soil resource quality; and four "Site Assessment" (SA) factors provide measures of a given project's size, water resource availability, surrounding agricultural lands, and surrounding protected resource lands. For a given project, each of these factors is separately rated on a 100 point scale. The factors are then weighted relative to one another and combined, resulting in a single numeric score for a given project, with a maximum attainable score of 100 points. It is this project score that becomes the basis for making a determination of a project's potential significance, based upon a range of established scoring thresholds (DOC 1997).

The intent of the LESA Model is to provide land use analysts with a quantitative means of determining agricultural land and Important Farmland disturbance acreages; and quantitative thresholds to determine the level of severity of those land disturbance impacts. The results of the LESA Model are then used to determine the occurrence of significant impacts on agricultural lands and Important Farmlands based on the CEQA Guidelines Appendix G thresholds of significance. Note that Energy Commission staff use the LESA Model for assessment of impacts to agricultural lands for power generation facilities.

In order to conduct the model, staff obtains soil data from the Natural Resource Conservation Service's (NRCS) Web Soil Survey (WSS), which provides information on the designation of soils in areas with agricultural lands (NRCS 2010). Based on the soils found on the project site, the NRCS classifies approximately 50% of the project site as Farmland of Statewide Importance, approximately 40% of the site as Prime Farmland if Irrigated, and approximately 10% of the site as Not Prime Farmland (NRCS 2010).

[4] Urban and Built-Up Land is "land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial ... and other developed purposes."

GENERAL PLAN LAND USE AND ZONING DESIGNATIONS

Project Site

San Bernardino County has adopted a "one-map approach" for both the General Plan land use designations and zoning classifications to assure land use consistency between the county's General Plan and its zoning code. The land use and zoning designations for the Project site are RL (Rural Living), which allows the following uses: 1 unit per 2-1/2 acres with a 2-1/2 gross acre parcel size; 20% maximum building coverage; and a 35-foot height limit. In addition, RL is a zone that allows agricultural and open space uses (AS 2009a - page 5.7-8). Development of electrical power generation within the RL designation requires a Conditional Use Permit (CUP).

Surrounding Area

Lands under the Resource Conservation (RC) land use and zoning designation are northeast and southwest of the project site. The RC designation "...provides sites for open space and recreational activities, single-family homes on very large parcels and similar and compatible uses" (CSB 2007b).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Energy Commission staff has analyzed the information provided in the AFC and has acquired information from other sources to determine consistency of the proposed AMS project with applicable land use LORS and the proposed project's potential to have significant adverse land use-related impacts. In addition, conditions developed by staff to reduce any potential impacts to a less than significant level are provided, as well as a discussion of the feasibility and enforceability of the recommended conditions of approval.

METHOD AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

Significance criteria used in this document are based on Appendix G of the CEQA Guidelines (CCR 2006) and performance standards or thresholds identified by the 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
    - Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.
    - Conflict with existing zoning for agricultural use, or a Williamson Act contract.
    - Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural uses.
- Physical disruption or division of an established community.

- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction, or that would normally have jurisdiction, over the project. This includes, but is not limited to, a General Plan, redevelopment plan, or zoning ordinance.
- Individual environmental effects, which, when considered with other impacts from the same project or in conjunction with impacts from other closely related past, present, and reasonably foreseeable future projects, are considerable, compound, or increase other environmental impacts.

In general, a solar farm 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 restricts existing or future uses. Please see other sections of the Staff Assessment, as noted, for a detailed discussion of any additional potential project-related impacts and conditions of certification recommended to reduce those impacts.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Conversion of Farmland

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

- **California DOC:** Under the standard FMMP mapping criteria, the majority of the site is designated as Grazing Land, Prime Farmland (71 acres), Farmland of Statewide Importance (57 acres), and Urban and Built-up Land (AS 2009a). Refer to AFC **Figure 5.7-3**.
- **USDA NRCS:** According to the WSS, the NRCS designates the proposed project site as Farmland of Statewide Importance (approximately 50% of the project site or 882.5 acres), Prime Farmland if Irrigated (approximately 40% of the project site or 706 acres), and Not Prime Farmland (approximately 10% or 176.5 acres) (NRCS 2010). These classifications are obtained by manually drawing the project site boundaries into the WSS database, which immediately generates soil maps and data. This interactive mapping system for the WSS does not allow for exact boundaries; therefore, the percentage for each classification is approximate.
- **San Bernardino County:** The proposed project site is within the Rural Living residential land use zoning district, which "...provides sites for rural residential uses, incidental agricultural uses, and similar and compatible uses" (SBC 2007b)
- **Williamson Act**: The project site is not located in an area that is under a Williamson Act contract.

As acknowledged in the AFC, the impact to FMMP Important Farmland designations is considered a significant land use impact. The applicant has recommended implementation of Mitigation Measure LAND 3 in the AFC to mitigate this impact to a less than significant level (AS 2009a – pg. 5.7-22). The applicant's proposed Mitigation Measure LAND 3 would require the conservation of a minimum of 128 acres of Important Farmland or mitigation fees to allow for the protection of Important Farmlands, which would be placed into a "...permanent agriculture conservation easement at a ratio of one acre of agricultural conservation easement for every one acre of important agricultural land developed..." (AS 2009a – pg. 5.7-22). The 128 acres is based on the FMMP's mapping criteria which designates 71 acres as Prime Farmland and 57 acres as Farmland of Statewide Importance.

However, as discussed above, based on NRCS designations, the proposed project would convert approximately 882.5 acres of Farmland of Statewide Importance and approximately 706 acres of Prime Farmland if Irrigated to a non-agricultural use. In addition, the soil data used to obtain the NRCS designation is used to perform the LESA Model. The model was conducted for the proposed 1,765-acre project site in accordance with the detailed instructions provided in the LESA Model Instruction Manual (the completed LESA Model worksheets for the proposed project site are included within **APPENDIX LU-1** at the end of this section). The LESA score is based on a scale of 0 to 100, and the Final LESA score for the project site is 59.89. Note that both the LE and SA subscores for the proposed project site are over 20 points (see **APPENDIX LU-1**). Based on the California Agricultural LESA Thresholds[5], a score of 59.89 would result in a significant impact due to the permanent conversion of 1,765 acres of agricultural lands.

According to the thresholds for determining significance, the proposed project would result in a significant impact upon the conversion of Prime Farmland and Farmland of Statewide Importance as designated by the FMMP. Under this impact criterion, the applicant would be responsible for mitigation for the conversion of 128 acres of Important Farmland. However, based on the NRSC's designations the proposed project would convert approximately 882.5 acres Farmland of Statewide Importance and approximately 706 acres of Prime Farmland if Irrigated. As this NRCS designation and the finding of significance from the LESA Model are the results of multiple factors including soil quality, availability of water, and the size of the project site, these qualities unequivocally designate the project site as an area well-suited for agricultural development. Development of any other land use would permanently preclude the site from farmland activities and would result in the conversion of 1,588.5 acres of agriculturally viable land. Therefore, staff believes that the acreage for mitigation should be based on NRCS designation and the mitigation for this conversion should address the conversion of a total of 1,588.5 acres of Important Farmland.

Based on the information above and analysis conducted by staff, the site has high potential for agricultural production, and conversion of 1,588.5 acres of such lands to a non-agricultural use is considered a significant impact. As such, staff recommends Condition of Certification **LAND-1,** which requires the project owner to mitigate for the

[5] California LESA Model Scoring Thresholds (DOC 1997, Table 9):

- 0 to 39 Points Not Considered Significant
- 40 to 59 Points Considered Significant (only if LE and SA subscores are each greater than or equal to 20 points)
- 60 to 79 Points Considered Significant (unless either LE or SA subscore is less than 20 points)
- 80 to 100 Points Considered Significant.

conversion of 1,588.5 acres (based on NRCS designations) of agricultural land to non-agricultural use by requiring the project owner to purchase farmland and/or easements through a land conservancy at a level not to exceed a one-to-one ratio (consistent with the applicant's mitigation measure LAND 3 proposed in the AFC), which would help ensure that agricultural lands of the same or higher quality are conserved within the county. The components included in Condition of Certification **LAND-1** are based on similar conditions of certification used on other Energy Commission siting projects (e.g., Starwood, Panoche, and East Altamont) where agricultural land was converted to nonagricultural uses. The county suggested coordination with the Southern California Agricultural Land Foundation (SCALF) (CSB 2010a). However, based on staff's conversations with SCALF, their foundation does not deal with agricultural conservation easements (CEC 2010a). Upon further research staff identified and contacted the Mojave Desert Land Trust,(MDLT)which would not be a viable organization for the purposes of Condition of Certification **LAND-1**; however, MDLT staff referred Energy Commission staff to their acquisition consultant who has worked with the Transition Habitat Conservancy, which may be a viable organization for Condition of Certification **LAND-1** (CEC 2010b). The Transition Habitat Conservancy is scheduled to meet in February 2010 to discuss their ability to locate and operate conservation lands in the west Mojave area. Staff will continue to coordinate this issue with the Transition Habitat Conservancy to help ensure that the implementation of Condition of Certification **LAND-1** would reduce the proposed project's impacts of agricultural land conversion to less than significant levels.

The project site is not located in an area that is under a Williamson Act contract; therefore, the proposed project would not result in any conflict with Williamson Act contracts. In addition, the project would not involve other changes that would result in the conversion of Farmland to non-agricultural uses. However, according to the county's Development Code, agricultural land uses, including crop production and agricultural accessory structures, are permitted uses within the RL designation. Energy production, however, requires the issuance of a Conditional Use Permit (CUP). **Land Use Table 2** below discusses the project's consistency with all applicable LORS.

Physical Division of an Existing Community

The proposed AMS project is located in a rural area of unincorporated San Bernardino County. The power plant would be located entirely on private property, on a 1,765-acre site. Access to the site would be through the existing State Highway 58 and Harper Lake Road. No existing roadways or pathways would be removed from service due to the proposed AMS.

Ten scattered rural residences and farms are located within a one-mile radius of the proposed site. However, the residences are not located within any established residential communities or developments, and there would be no relocation of these residences as a result of the proposed project. In addition, no off-site linear facilities would be constructed as a result of the proposed project. The proposed onsite transmission line segment would connect to SCE's existing Kramer-Cool Water 230-kV transmission line adjacent to the southern border of project site, and therefore, no new right-of-way acquisition would be required. As such, implementation of the proposed project would not result in impacts associated with the physical division of an existing or established community.

Land Use Plan, Policy, or Regulation

As required by California Code of Regulations, Title 20, Section 1744, Energy Commission staff evaluates the information provided by the project owner in the AFC (and any amendments), project design, site location, and operational components to determine if elements of the proposed project would conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project, or that would normally have jurisdiction over the project except for the Energy Commission's exclusive authority. As part of the licensing process, the Energy Commission must determine whether a proposed facility complies with all applicable state, regional, and local LORS (Public Resources Code section 25523[d][1]). The Energy Commission must either find that a project conforms to all applicable LORS or make specific findings that a project's approval is justified even where the project is not in conformity with all applicable LORS (Public Resources Code section 25525). When determining LORS compliance, staff is permitted to rely on a local agency's assessment of whether a proposed project is consistent with that agency's zoning and general plan. On past projects, staff has requested that the local agency provide a discussion of the findings and conditions that the agency would make when determining whether a proposed project would comply with the agency's LORS, were they the permitting authority. Any conditions recommended by an agency are considered by Energy Commission staff for inclusion in the proposed conditions of certification for the project.

As stated above in the "Setting" subsection, the land use and zoning designations for the project site are both Rural Living (RL), which allows the following uses: 1 unit per 2-1/2 acres with a 2-1/2 gross acre parcel size; 20% maximum building coverage; and a 35-foot height limit (AS 2009a – pg. 5.7-8). The proposed project would have two independently-operable solar fields (i.e., plants) identified as Alpha and Beta, which would be 884 and 800 acres, respectively, and "…[e]ach plant site utilizes approximately 710 acres of the total land for solar thermal collector arrays" (AS 2009a – pg. 2.0-5). Therefore, these two plant sites exceed the 20% maximum building coverage for the RL zone. In addition, as stated in the AFC,

> "…[t]he entire length of the transmission gen-tie line is located on the Project site and will be installed on approximately 23 new steel/concrete mono-poles from the Alpha Plant site and approximately nine poles from the Beta Plant site. The poles are expected to average approximately 80 feet in height (maximum pole height of 110 feet)" (AS 2009a – pg. 2.0-32).

As a result, these tower heights would exceed the 35-foot height limit of the RL zone. On October 22, 2009, Energy Commission staff submitted data requests to the applicant. Land Use Data Request #78 addresses these issues, and asks that the applicant to provide information on how they plan to resolve conflicts with the height and building coverage requirements of the RL zone, and San Bernardino County's position on these zone inconsistencies, and a related schedule (CEC 2009m).

In addition to the standard data request, as part of staff's analysis of local LORS compliance and to determine the county's view of the project's consistency with its General Plan and Development Code, staff sent a letter to the county on November 10, 2009, detailing the potential LORS compliance issues associated with the proposed project, including the issues regarding the building coverage and height limit (CEC 2009o). In addition, the letter pointed out that "[e]lectric power generation is listed as a use that requires a conditional use permit (CUP) [San Bernardino County Development Code, Table 82-7], and a General Plan Amendment to apply the Energy Facilities (EN) Overlay." Staff requested that the county provide its position on the proposed project's consistency with its General Plan, Development Code, and other applicable LORS.

On November 10, 2009, the Deputy Director of the county's Land Use Services Department, James M. Squire, sent a letter to the Energy Commission acknowledging that "…since the proposed energy facility is subject to state regulation, the facility is exempt from the County's EN Overlay process. No General Plan Amendment is required" (CSB 2009a). In addition, Mr. Squire explained that the purpose of the EN Overlay,

> "...is to provide alternative standards for relating to height and setbacks for energy facilities. The intent was not to necessitate additional time delays by requiring a GPA for renewable energy producing facilities... [and] the County is currently reviewing alternative methods of providing increased height and reduced setbacks for such facilities. The results of this review will most likely lead to another amendment to our Code relative to the EN Overlay requirements and standards" (CSB 2009a).

On December 3, 2009, Energy Commission staff and the county's planning staff conducted a conference call to discuss these land use issues. County staff stated that on December 17th the County's Planning Commission would hear a motion to repeal the GPA requirement for the EN Overlay and adopt a new General Plan chapter on Renewable Energy Development and the associated Development Standards. Energy Commission staff requested that the county provide input as to what types of development standards (e.g., for height, lot coverage, landscaping etc.) and conditions they would want to see applied to the AMS project, since development of an energy generation facility in the RL zone would typically require a CUP. The county indicated that they did not have sufficient time to review the bulk of the AMS project information due to staff workloads; and therefore, were not yet ready to provide input regarding standards or conditions that they would normally apply as part of a CUP. However, the county did indicate that they would provide Energy Commission staff with a copy of the draft Development Standards for Renewable Projects, and that they would convene a meeting of applicable internal county departments to develop a list of conditions they would like applied to the project. The conditions would be provided to staff by mid January 2010 (CEC 2009u).

In a letter dated December 8, 2009, Principal Planner, Carrie Hyke, sent the draft standards for Chapter 84.29 (Renewable Energy Generation Facilities), which is proposed to be included in the County Development Code (CSB 2009b). Following that, in an email dated January 7, 2010, Ms. Hyke informed Energy Commission staff that the proposed renewable energy development standards would go to the County Board on

February 9th. With an approval by the Board, the new standards would repeal the EN Overlay and negate the need for a General Plan Amendment (GPA) for the proposed project. In addition, as noted above, development of the proposed project in the RL zone would ordinarily require a CUP; therefore, Ms. Hyke stated that the county would provide Energy Commission staff with their suggested conditions for approval of the proposed project by January 23rd (CSB 2010c).

On February 2, 2010, the county submitted their suggested Conditions of Approval for the AMS project (CSB 2010b). In general, the conditions include general performance standards required under the Development Code for issues such as lighting, air quality, fire hazards, noise, vibration, and waste disposal; as well as the requirements necessary for the issuance of grading and building permits including plans and reports such as grading and erosion control plans, and geotechnical and hydrogeologic reports.

On February 9, 2010, San Bernardino County Land Use Services Department staff (referred to as LUS staff) confirmed the County Board's approval of Chapter 84.29 (Renewable Energy Generation Facilities) of the Development Code, thereby repealing the EN Overlay and negating the need for a GPA (CSB 2010d).

Based on the information provided by the applicant and the county thus far, the proposed project still would be inconsistent with the 20% maximum building coverage and 35-foot height limit requirements. As such, on February 10, 2010, staff emailed LUS staff informing them of this inconsistency and requesting their further input. On February 11th, LUS staff indicated that the county would have to approve a "Major Variance" for the development standards of the RL zone under Development Code Chapter 85.17 (Variances), and that the county "…would grant a variance for this project because the technology used does not fit into the typical standards" (CSB 2010e). Based on staff's analysis of Chapter 85.17, the county's input and position regarding the AMS project, and the components necessary for development of the AMS, staff has made the findings necessary for the granting of a county Major Variance to confirm that with issuance of such a variance (but for the exclusive power plant licensing authority of the Energy Commission) the proposed project would comply with applicable county LORS. Staff's evaluation of the proposed project with respect to the four required elements associated with a county "Major Variance" can all be made in the affirmative, thereby allowing for the issuance of "Major Variance" for the proposed AMS (see **Land Use Table 2**).

Applicable LORS also include the applicant's compliance with the Subdivision Map Act. As stated in AFC Section 1.0 (Executive Summary), the applicant has established site control of the following parcels: APN 0490-121-42; APN 0490-131-06; APN 0490-131-07; APN 0490-131-08; APN 0490-131-11; APN 0490-131-12; APN 0490-131-15; APN 0490-131-16; APN 0490-161-08; APN 0490-161-09; APN 0490-161-10; APN 0490-161-11; APN 0490-161-12; APN 0490-161-13 (AS 2009a – pg. 1.0-3). In September 2009, staff submitted recommendations for data adequacy stating that there is no discussion of the method and timetable for merging or otherwise combining these parcels so that the proposed project will be located on a single legal parcel (CEC 2009e). In response, the applicant submitted a supplement to the data adequacy form stating that,

> "...the Project site currently contains 14 separate and contiguous parcels... wholly located within San Bernardino County. The property would be developed as a Solar Electrical Generating Plant which is exempt from the Map Act process (parcel map) under Section 66412(l) of the California Subdivision Map Act. Since all parcels are contiguous and will be under one ownership, the Applicant would file, and San Bernardino County would process a Lot Merger application per Section 66449.20.3/4 of the Map Act, as referenced in the San Bernardino County Code of Ordinances Chapter 87.04 Additional Subdivision Procedures" (AS 2009b).

However, according to the Subdivision Map Act, section 66412(l) refers to a "winderpowered electrical generation device," which does not apply to the proposed project (CGC 2010). As such, the proposed project is required to be consistent with the regulations under the Subdivision Map Act, and therefore, staff recommends implementation of Condition of Certification **LAND-3**, in order to ensure compliance with the Subdivision Map Act and site control.

Based on staff's independent review of San Bernardino County's applicable LORS documents and information provided by the county, the proposed project would be consistent with applicable land use LORS (see **Land Use Table 2**) upon implementation of staff's proposed Condition of Certification **LAND-2**, which would ensure that the project complies with the county's decommissioning standards set forth by newly approved Chapter 84.29 of the county Development Code. Implementation of Condition of Certification **LAND-3** also would verify the applicant's compliance with the Subdivision Map Act.

Land Use Table 2
Project Compliance with Adopted Land Use LORS

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
Federal	None		
State			
Subdivision Map Act (Public Resources Code Section 66410-66499.58)	Provides procedures and requirements regulating land division (subdivisions) and parcel legality. Regulation and control of the design and improvement of subdivisions have been vested in the legislative bodies of local agencies.	YES (With implementation of Condition of Certification **LAND-3**)	The proposed project site consists of 14 contiguous private parcels. As noted above, in a supplement to the data adequacy form, the applicant states that a Solar Electrical Generating Plant is exempt from the Map Act process (parcel map) under Section 66412(l) of the California Subdivision Map Act, and therefore, would process a Lot Merger application per Section 66449.20.3/4 of the Map Act, as referenced in the San Bernardino County Code of Ordinances Chapter 87.04 Additional Subdivision Procedures (AS 2009b). However, according to the Subdivision Map Act, Section 66412(l) applies to "a windpowered electrical generation device" (CGC 2010). As such, the proposed project is not exempt from the standards required by the Subdivision Map Act, and staff recommends implementation of Condition of Certification **LAND-3** in order to ensure that applicant develops the proposed project on one legal parcel, and is in compliance with the Subdivision Map Act.
Local			
San Bernardino County General Plan	**COUNTYWIDE GOALS AND POLICIES OF THE LAND USE ELEMENT** LU 1.2 The design and siting of new development will meet locational and development standards to ensure compatibility of the new development with adjacent land uses and community character. **DESERT REGION GOALS AND POLICIES OF THE LAND USE ELEMENT** D/LU 1.2 Limit future industrial	YES	As discussed above under the "**SETTING**" section, it should be noted that San Bernardino County has a "one-map approach" for both the General Plan land use designations and zoning classifications to assure land use consistency between the county's General Plan and its zoning code. Therefore, with the county's newly adopted Development Code Chapter 84.29 (Renewable Energy Generating Facilities), the county recognizes the need for renewable power generating facilities. Given the past and future projected solar projects in the area (refer to the "Cumulative Impacts Analysis" subsection), and the allowances for development of solar power in the RL zone in the county's newly adopted Development Code Chapter 84.29 (Renewable Energy Generating Facilities), and the existing large-scale solar farms (e.g., SEGS VIII and IX) adjacent to the AMS site, the proposed project would be compatible with these policies of the county General Plan.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	development to those uses which are compatible with the Community Industrial Land Use Zoning District or zone, are necessary to meet the service, employment and support needs of the region, do not have excessive water requirements, and do not adversely impact the desert environment. **DESERT REGION GOALS AND POLICIES OF THE CONSERVATION ELEMENT** D/CO 1.2 Require future land development practices to be compatible with the existing topography and scenic vistas, and protect the natural vegetation. **DESERT REGION GOALS AND POLICIES OF THE OPEN SPACE ELEMENT** D/OS 1.3 Maintain Rural Living (RL) and Resource Conservation (RC) Land Use Zoning Districts or zoning on steep slopes and remote areas to minimize hillside grading and to protect the rural and natural environment.		In addition, as noted in Section 2.2 (Project Objectives) of the AFC, approval of the proposed project would help achieve the state's renewable energy objectives and utility requirements (AMS 2009a – pg. 2.0-2), which will facilitate the power needs of the region.
	COUNTYWIDE GOALS AND POLICIES OF THE CONSERVATION ELEMENT CO 6.1 Protect prime agricultural lands from the adverse effects of urban encroachment, particularly increased erosion and sedimentation, trespass, and non-agricultural land development.	YES (With implementation of Condition of Certification **LAND-1**)	As discussed under the "Conversion of Farmland" subsection, the permanent conversion of 1,588.5 acres of agricultural land to a non-agricultural use is a significant impact. However, staff recommends Condition of Certification **LAND-1,** which requires the project owner to mitigate for the conversion of 1,588.5 acres of agricultural land to non-agricultural use. With the adoption and implementation of this condition, the impacts of farmland conversion would be reduced to a less than significant level, and the proposed project would be consistent with this policy.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	CO 8.3 Assist in efforts to develop alternative energy technologies that have minimum adverse effect on the environment, and explore and promote newer opportunities for the use of alternative energy sources.	YES	The proposed project is the development of a solar energy farm that would produce up to a nominal 250 MW net of power. The power generated by the proposed project would be conveyed into SCE's electric grid to provide electricity supply for the area's population. Because the proposed project makes use of a renewable resource (i.e., sun light), it is consistent with this goal of the General Plan. In addition, the county has consistently been very helpful in assisting staff with any information needed to complete this analysis.
	CO 10.2 The location of electric facilities should be consistent with the County's General Plan, and the General Plan should recognize and reflect the need for new and upgraded electric facilities.	YES	As discussed above for General Plan policies LU 1.2 and D/LU 1.2, the location of the proposed AMS is consistent with county's General Plan requirements regarding siting of new industrial development such as solar power generating facility. As discussed above under the "**SETTING**" section, it should be noted that San Bernardino County has a "one-map approach" for both the General Plan land use designations and zoning classifications to assure land use consistency between the county's General Plan and its zoning code. Therefore, with the county's newly adopted Development Code Chapter 84.29 (Renewable Energy Generating Facilities), the county recognizes the need for power generating facilities, and thus the proposed project would be consistent with this General Plan policy.
	DESERT REGION GOALS AND POLICIES OF THE CONSERVATION ELEMENT GOAL D/CO 2. Encourage utilization of renewable energy resources.	YES	The development of the proposed project represents the development of a large scale solar facility that would encourage the use of renewable energy resources consistent with this county goal
	D/CO 4.2 The conversion of agricultural land to non-agricultural uses shall be discouraged unless the proposed use can be demonstrated to be preferable in terms of economic development, and resource availability and resource conservation.	YES (With implementation of Condition of Certification **LAND-1**)	As discussed under the "Conversion of Farmland" subsection, the permanent conversion of 1,588.5 acres of agricultural land to a non-agricultural use is a significant impact. However, staff recommends Condition of Certification **LAND-1,** which requires the project owner to mitigate for the conversion of 1,588.5 acres of agricultural land to non-agricultural use. With the adoption and implementation of this condition, the impacts of farmland conversion would be reduced to less than significant levels. With implementation of Condition of Certification **LAND-1**, the proposed project would be consistent with the policies within the Conservation Element.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
San Bernardino County Code – Title 8 – Development Code	**82.02.020 General Requirements for Development and New Land Uses** (d) Legal parcel. The site of a proposed development or new land use shall be a parcel that was legally created in compliance with the Subdivision Map Act and Division 9 (Subdivisions).	YES (With implementation of Condition of Certification **LAND-3**)	The applicant intends to file a Lot Merger application per Section 66449.20.3/4 of the Map Act. In addition, staff recommends implementation of Condition of Certification **LAND-3**, in order to ensure that applicant develops the proposed project on a single legal parcel and is in compliance with the Subdivision Map Act. With implementation of Condition of Certification **LAND-3**, the proposed project would be in compliance with the Subdivision Map Act.
	CHAPTER 82.04 RESIDENTIAL LAND USE ZONING DISTRICTS **Excerpts from Table 82-7 – Allowed Land Uses and Permit Requirements for Residential Land Use Zoning Districts:** **<u>Rural Living</u>** **Land Use –** Electric power generation(2) **Permit Required by District –** CUP **Notes: (2) –** Requires a General Plan Amendment to apply the Energy Facilities (EN) Overlay	YES	As discussed above under the "**SETTING**" section, it should be noted that San Bernardino County has a "one-map approach" for both the General Plan land use designations and zoning classifications to assure land use consistency between the county's General Plan and its zoning code. In addition, the county's newly adopted Development Code Chapter 84.29 (Renewable Energy Generating Facilities) recognizes the need for renewable power generating facilities. As an electric power generation land use, the proposed project would require a Conditional Use Permit (CUP) by the county. Given the exclusive authority of the Energy Commission to license the project, staff requested that the county provide input as to what types of development standards (e.g., for height, lot coverage, landscaping etc.), and conditions they would want to see applied to the AMS project since development of an energy generation facility in the RL zone would typically require a CUP. On February 2, 2010, the county submitted their suggested Conditions of Approval for the AMS project (CSB 2010b). In general, the conditions include general performance standards required under the Development Code for issues such as lighting, air quality, fire hazards, noise, vibration, and waste disposal; as well as the requirements necessary for the issuance of grading and building permits including plans and reports such as grading and erosion control plans, and geotechnical and hydrogeologic reports. On February 11th, LUS staff indicated that the county would have to approve a "Major Variance" for the development standards of the RL zone under Development Code Chapter 85.17 (Variances), and that the county "…would grant a variance for this project because the technology used does not fit into the typical standards" (CSB 2010e). Based on staff's analysis of Chapter 85.17 (see discussion below), the county's input and position regarding the AMS project, and the components necessary for development of the AMS, staff has made the findings

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
			necessary for the granting of a county Major Variance to confirm that with issuance of such a variance (but for the exclusive power plant licensing authority of the Energy Commission) the proposed project would comply with applicable county LORS. Staff's evaluation of the proposed project with respect to the four required elements associated with a county "Major Variance" can all be made in the affirmative, thereby allowing for the issuance of "Major Variance" for the proposed AMS. With application of a "Major Variance" to the proposed project, issuance of a CUP would not be necessary. In addition, as discussed above, the EN Overlay was officially repealed by the county on February 9, 2010. As such, a GPA would not be required (CSB 2010d).
	Excerpts from Table 82-9C – Residential Land Use Zoning District Development Standards Desert Region: **<u>Rural Living</u>** **Density –** 1 unit per 2.5 acres **Setbacks –** **Front** - 25 ft **Side** - Street side: 25 ft **Side** - Interior (each): Lot 75 wide or less - 5 ft on one side, 10 ft on other; Other lots - 15 ft **Rear** - 15 ft **Lot Coverage –** Maximum Coverage - 20% **Height Limit** Maximum Height - 35 ft	YES	Onsite transmission line poles are expected to average approximately 80 feet in height with a maximum pole height of 110 feet (AS 2009a – pg 2.0-30). In addition, the lot coverage would exceed 20%, and according to AFC Figure 2-3(b) (Project Site map), the fence appears to be setback from Lockhart Road and consistent with the street side requirements; however, due to the scale of the map, it is difficult to definitively state that the fencing is 15 feet from the street ROW. According to county LUS staff, the components of the proposed project that do not adhere to these development standards would require a "Major Variance" if the county were the permitting agency. Although the county did not makes the specific findings required for the variance, county LUS staff believe that the county would approve a "Major Variance" considering that the project includes technology that does not fit into the typical standards of the RL zone (CSB 2010e). As such, Energy Commission staff evaluated the proposed project against the requirements for a "Major Variance" and made specific findings, recognizing that the county expressed support of the proposed project. See the detailed discussion under Chapter 85.17 below. Given that findings for a "Major Variance" can all be made in the affirmative, the proposed AMS would be consistent with this portion of the county Development Code.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	CHAPTER 84.29 RENEWABLE ENERGY GENERATION FACILITIES **84.29.020 Applicability and Land Use Zoning Districts** The Land Use Zoning Districts that allow renewable energy facilities are limited to the following: RC (Resource Conservation) AG (Agriculture) FW (Floodway) RL (Rural Living) Note: If a facility is proposed solely in the Rural Living land use zoning district, it must include a minimum of 20 acres in the development proposal. IR (Regional Industrial)	YES	This chapter of the county Development Code was recently adopted in February of 2010 in recognition of the State's need for Renewable Power Generating Facilities. The entire 1,765-acre project site is within the RL zone, and therefore, is consistent with this standard.
	84.29.040 Solar Energy Development Standards (a) Setbacks. Solar energy generating equipment and their mounting structures and devices shall be set back from the property line either pursuant to the standards in the Land Use Zoning District, or 130% of the mounted structure height, whichever is greater. **84.29.50 Special Fencing Standards** Special fencing standards may be applied without a variance in recognition of the capital costs of renewable energy facilities. Total fence heights allowed are inclusive of any height extension devices such as slanted razor-wire panels.	YES	According to AFC Figure 2-3(b) (Project Site map), the proposed project fence appears to be setback from Lockhart Road and consistent with the street side requirements; however, due to the scale of the map, it is difficult to definitively state that the fencing is 15 feet from the street ROW. As discussed in detail above and according to county LUS staff, the components of the proposed project that do not adhere to these development standards would require a "Major Variance" if the county were the permitting agency. Although the county did not makes the specific findings required for the variance, county LUS staff believe that the county would approve a "Major Variance" considering that the project includes technology that does not fit into the typical standards (CSB 2010e). As such, Energy Commission staff evaluated the proposed project against the requirements for a "Major Variance" and made specific findings, recognizing that the county expressed support of the proposed project. See the detailed discussion under Chapter 85.17 below. Given that findings for a "Major Variance" can all be made in the affirmative, the proposed AMS would be consistent with these portions of the county Development Code.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	(a) Fencing on street side. Chainlink fencing up to 8 feet in height may be installed no closer than 15 feet from the right-of-way on streetside boundaries. Security devices such as razor-wire height extensions may only be directed inward to the property, and may not extend beyond the property boundary to overhang the right-of-way. **(b) Fencing on interior boundaries.** Chainlink fencing up to 8 feet in height may be installed along the property line on interior (non-streetside) boundaries. Security devices such as razor-wire height extensions may only be directed inward to the property, and may not extend beyond the property boundary to overhang any other property. **(c) Electric Fencing.** Electric fencing is not allowed.		
	84.29.060 Decommissioning Requirements **(a) Closure Plan**. Following the operational life of [the project], the project owner shall perform site closure activities to meet federal, state and local requirements for the rehabilitation and revegetation of the project site after decommissioning. The Applicant shall prepare a Closure, Revegetation, and Rehabilitation Plan and submit to the Planning Division for review and approval prior to occupancy. Under this plan, all aboveground structures and facilities shall be removed to a depth of three feet below grade, and	YES (With implementation of Condition of Certification **LAND-2** and consistent with the requirements of **COMPLIANCE -11**)	According to Section 3.0 of the AFC, a decommissioning plan specifying the appropriate closure procedures would be developed and implemented, and Energy Commission and other responsible agencies would be notified of the decommissioning schedule and plans prior to commencing the permanent closure. In addition, the Energy Commission often requires a facility closure plan of all power plant licensing cases in the general conditions applied to each project. For the proposed AMS, Energy Commission Compliance staff has recommended Condition of Certification **COMPLIANCE-11** in the **GENERAL CONDITIONS** section of the Staff Assessment. In addition to **COMPLIANCE-11,** land use staff recommends implementation of Condition of Certification **LAND-2** to ensure compliance with the county's suggested decommissioning requirements in as much as these requirements do not conflict with **COMPLIANCE-11**, because at the point-in-time in the future when/if the proposed AMS is decommissioned or closed, the county may have decommissioning requirements different than the currently adopted Development Code

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	removed offsite for recycling or disposal. Concrete, piping, and other materials existing below three feet in depth may be left in place. Areas that had been graded shall be restored to original contours. Succulent plant species shall be salvaged prior to construction, transplanted into windrows, and maintained for later transplanting following decommissioning. Shrubs and other plant species shall be revegetated by the collection of seeds, and re-seeding following decommissioning. **(b) Compliance with other requirements.** Project decommissioning shall be performed in accordance with all other plans, permits and mitigation measures that would assure the project conforms with applicable requirements and would avoid significant adverse impacts.		standards. **COMPLIANCE-11** ensures 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.
	CHAPTER 85.17 VARIANCES **85.17.060 Findings and Decision** **(a) General findings. The review authority may approve a Variance (Major or Minor)** **only after first finding all of the following:** (1) The granting of the Variance will not be materially detrimental to other properties or land uses in the area and will not substantially interfere with the present or future ability to use solar energy systems;	YES	For a Minor Variance, a maximum variance of 30% is allowed for both the area and height requirements. As the lot coverage and height of the transmission line towers would exceed the maximum percentages for a minor variance, these standards would require a “Major Variance.” County LUS staff indicated the county likely would grant a variance for the proposed project since the technology used does not fit into the typical standards (CSB 2010e). However, the county did not provide specific findings for a variance. As such, the following are staff’s findings recognizing that the county has expressed support for the proposed project: 1. The SEGS VIII and IX are existing solar facilities adjacent to the northern boundary of the proposed project site. Otherwise, the surrounding area primarily consists of open space, along with rural

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	(2) There are exceptional or extraordinary circumstances or conditions applicable to the subject property or to the intended use that do not apply to other properties in the same vicinity and land use zoning district; (3) The strict application of the land use zoning district deprives the subject property of privileges enjoyed by other properties in the vicinity or in the same land use zoning district; and (4) The granting of the Variance is compatible with the maps, objectives, policies, programs, and general land uses specified in the General Plan and any applicable specific plan.		residences. Therefore, the granting of a Major Variance would not be materially detrimental to surrounding properties or land uses. In addition, the proposed project would not interfere with the ability to use solar energy systems; on the contrary, as a solar generating facility, the proposed project would contribute to achieving and supporting the state's electric utility requirements with the long term production of renewable electric energy. 2. As noted above, county LUS staff had indicated that the intended land use includes technology that does not fit into the typical standards. As such, the proposed use is an exceptional circumstance, and therefore, county LUS staff believes the county would grant a "Major Variance" (CSB 2010e). 3. The SEGS VIII and IX are existing solar facilities adjacent to the northern boundary of the proposed project site, which are also within the RL zone. As such, it is likely that these existing solar facilities have enjoyed privileges, such as variances from development standards required by the RL zone. It should be noted that these privileges were realized by these projects prior to the county's adoption of the Development Code Chapter on Renewable Energy Generation Facilities (Chapter 84.29). 4. The implementation of the proposed AMS would not require any changes to any applicable county LORS as discussed above. Therefore, the granting of a Variance for the proposed AMS would be compatible the maps, objectives, policies, programs, and general land uses specified in the General Plan and the Development Code.

Land Use Compatibility

This section addresses the proposed project's compatibility with other existing land uses in the same setting. Land use compatibility refers to the physical compatibility of planned and existing land uses. For example, nuisance producing land uses such as heavy industry is often physically incompatible with residential land uses. As discussed in detail above under the subsection entitled "**SETTING,"** the proposed project is within the RL zone and would be located in an area that primarily consists of open space and scattered rural residences and farms. In addition, the SEGS VIII and IX facilities are adjacent to the northwest boundaries of the proposed project site. The proposed project would require the removal of all abandoned buildings and farm-related facilities on the project site. Sensitive receptors such as residences are within a one-mile radius of the project site.

When a jurisdictional authority, such as the County of San Bernardino, establishes zoning designations to implement its general plan, it is that agency's responsibility to ensure the compatibility of adjacent zoning and permitted uses, and incorporate conditions and restrictions that ensure those uses would not result in a significant adverse impact ("minimum of detriment") to surrounding properties. It is therefore assumed that permitted electricity generating uses, or those deemed equivalent to a permitted use, sited on properties within the RL zone, are compatible with surrounding uses. Those uses operating under a valid use permit would also be considered compatible.

Administrative or conditional use permitting requirements and project reviews under CEQA are in place to evaluate the compatibility of projects that are not a permitted use or that have elements that may adversely impact public safety, the environment, or that could interfere with or unduly restrict existing and/or future permitted uses. As noted in the discussions above (see **Land Use Table 2**), under the San Bernardino County Development Code, electricity generation is an allowable conditional use that is subject to a land use permit in the RL zone, which requires specific development and use standards.

The existing SEGS VIII and IX facilities are adjacent to the project site, and multiple solar farm projects also are expected to be developed in the western Mojave area in the near future (see below under the subsection entitled **CUMULATIVE IMPACTS**). As a result, staff concludes that given the past and future projected solar projects in the area, and the allowances for development of solar power in the RL zone, the county would likely view such a land use type to be appropriately sited at the proposed location.

As stated in the AFC, the proposed project would be consistent with the San Bernardino County General Plan and Development Code with approval of a CUP. As such, the applicant included Mitigation Measure LAND-1 which requires the applicant to coordinate with the county and CEC "...to resolve any land use conflicts and comply with standard county requirements for similar facilities processed through a County CUP" (AS 2009a – pg. 5.7-20). As discussed in detail above under the "**SETTING**" section and the discussion in **Land Use Table 2**, a CUP would not be necessary for the proposed AMS with the approval of a "Major Variance," which the county has indicated it would approve considering that the "…project includes technology that does not fit into the typical [county Development Code] standards" (CSB 2010e). In addition, staff's evaluation of the proposed project with respect to the four required elements associated with a county “Major Variance” can all be made in the affirmative, thereby allowing for the issuance of “Major Variance” for the proposed AMS (see **Land Use Table 2**).

The **TRAFFIC AND TRANSPORTATION** section provides a discussion of vehicular access to the proposed project site.

Sensitive Receptors

A proposed siting location may be considered an incompatible use if a new source of pollution or hazard is located within close proximity to a sensitive receptor. From a land use perspective, sensitive receptor sites are those locations where people who would be more adversely affected by pollutants, toxins, noise, dust, or other project-related consequence or activity are likely to live or gather. Children, those who are ill or immune-compromised, and the elderly are generally considered more at risk from environmental pollutants. Therefore, schools, along with day-care facilities, hospitals, nursing homes, and residential areas, are considered to be sensitive receptor sites for the purposes of determining a potentially significant environmental impact. Depending on the applicable code, proximity is defined as “within 1,000 feet” of a school by the Health and Safety Code (California Health & Safety Code §§ 42301.6–9) or within one-fourth of a mile of a school under CEQA (Cal. Code Regs., tit. 14, § 21151.4). Proximity is not necessarily a determining factor for a potentially significant impact, but is the threshold generally used to require further evaluation.

As described above in the “**SETTING”** subsection, scattered rural residences and farms are within one mile of the proposed project site. However, given the existing and previous permitted uses in the project area, such as the existing SEGS VIII and IX facilities, once operational the proposed project would not be incompatible with surrounding sensitive receptors.

From a land use perspective, the siting of the AMS project at the proposed location would not be incompatible with surrounding sensitive receptors. The **AIR QUALITY, HAZARDOUS MATERIALS MANAGEMENT, NOISE, PUBLIC HEALTH, TRAFFIC AND TRANSPORTATION,** and **VISUAL RESOURCES** sections provide detailed analyses of the noise, dust, public health hazards or nuisance, and adverse traffic or visual impacts on surrounding sensitive receptors.

CUMULATIVE IMPACTS 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 (Cal. Code Regs., tit. 14, section 15130).

GEOGRAPHIC EXTENT

The geographic scope for the analysis of cumulative land use impacts related to this land use analysis includes the desert region of San Bernardino County. The county’s community plans map defines the desert region as the entire area north and northeast of the San Bernardino National Forest, which accounts for the majority of the county (CSB 2009a).

Cumulative impacts include the conversion of agricultural land. Projects related to agriculture consist of all construction activities, and residential, and industrial developments within the region. For the purpose of this analysis, in addition to the projects listed in **Cumulative Impacts Tables 2 and 3,** data obtained from the DOC and the BLM's online GIS maps were considered when identifying activities that could contribute to cumulative impacts.

As noted above in the "Setting," the lands surrounding the project site are designated as Grazing Land by the FMMP. In addition, according to DOC's Important Farmland maps of San Bernardino County, the majority of the desert region is outside of the survey boundaries. The areas that are surveyed include the southwestern portion of the desert region, which primarily consists of Grazing Land, with concentrations of Urban and Built-Up Land designations within the cities of Barstow, Victorville, and Hesperia.
The geographic scope for the analysis of cumulative land use impacts and LORS compliance are the local and regional communities and sensitive receptors. Cumulative impacts could result from the physical division of an established community or conflict with any applicable land use plan, policies, or regulation adopted for the purpose of avoiding or mitigating environmental impacts.

EXISTING CUMULATIVE CONDITIONS

As described in **Cumulative Impacts Table 2,** the only existing land uses similar to, and in the vicinity of, the proposed project site are the SEGS VIII and IX facilities. Otherwise, the surrounding area consists of undeveloped desert land and mountain terrain with small rural communities in the vicinity. The closest community is Hinkley, which is located approximately nine miles northeast of the project site. However, there are scattered rural residences and farms within a mile of the project site. Agricultural lands are not prevalent within the desert region of San Bernardino County. According to FMMP Important Farmland maps, within the west Mojave area much of the land has not been surveyed, so of the surveyed land the primary designation is Grazing Land with large concentrations of Urban and Built-Up Land and sporadic areas of Prime Farmland and Farmland of Statewide Importance (DOC 2008). As such, the existing development, described in **Cumulative Impacts Table 2**, has contributed to the conversion of existing rural land uses including rural residences, open space, and agricultural activities.

FUTURE FORESEEABLE PROJECTS

Foreseeable Projects in the Project Area

As described in **Cumulative Impacts Figure 2** and **Cumulative Impacts Table 3**, a 585 MW solar photovoltaic project is proposed for 5,033 acres of BLM land less than one mile northeast of the proposed project site, and a 10,105-acre wind energy project approximately seven miles south of the project site. Development of these projects would result in the conversion of approximately 15,000 acres of desert lands to industrial uses in the Harper Lake region. As such, future foreseeable development would contribute to the conversion of existing rural and open space land uses.

Foreseeable Renewable Projects in the Western Mojave Desert

As shown on **Cumulative Impacts Figure 1** and **Table 1** solar and wind applications for use of BLM and private land are proposed on approximately 553,000 acres of BLM land and 13,900 acres of non-federal land in the Western Mojave Planning Area. As such, future foreseeable development would contribute to the conversion of existing rural and open space land uses.

OVERALL CONCLUSION

Land uses other than agriculture and farm residences proposed near the project site include a 5,000-acre solar photovoltaic project and 10,105-acre wind generation project within 10 miles of the project site. This is in addition to the existing SEGS VIII and IX facilities. The cumulative implementation of renewable energy projects in the Harper Lake region would result in the conversion of thousands of acres of lands that are currently used for open space activities (which could include active or passive recreation), agricultural production, or rural residences. The conversion of these lands would represent a significant adverse cumulative land use impact, without considering the conversion of 1,588.5 acres resulting from the proposed projects.

Condition of Certification **LAND-1** is intended to mitigate the proposed project's contribution to the cumulative loss of agricultural land. In addition, Conditions of Certification **LAND-2** and **LAND-3** have been recommended to ensure the proposed project's consistency with applicable state and San Bernardino County LORS. Therefore, the proposed project's contribution to the already existing significant cumulative scenario would not be cumulatively considerable.

CONCLUSIONS AND RECOMMENDATIONS

- The proposed project would result in the permanent conversion of 1,588.5 acres of agricultural land to a non-agricultural use (i.e., a solar farm), which represents a significant impact. Therefore, staff recommends Condition of Certification **LAND-1**, which requires the project owner to mitigate for the conversion of 1,588.5 acres of agricultural land to a non-agricultural use at a level not to exceed a one-to-one ratio.
- The proposed project is consistent with the county's General Plan and Development Code. The county "…would grant a variance for this project because the technology used does not fit into the typical standards" (CSB 2010e). Staff made the findings necessary for the granting of a county Major Variance to confirm that with issuance of such a variance (but for the exclusive power plant licensing authority of the Energy Commission) would bring the proposed project into compliance with applicable county LORS. Staff's evaluation of the proposed project with respect to the four required elements associated with a county "Major Variance" can all be made in the affirmative, thereby allowing for the issuance of "Major Variance" for the proposed AMS.
- Staff is proposing Condition of Certification **LAND-2** to ensure that the proposed project complies with San Bernardino County's suggested project decommissioning/closure requirements.

- With implementation of staff's proposed Condition of Certification **LAND-3**, the proposed project would be consistent with the applicable state and San Bernardino County LORS pertaining to the Subdivision Map Act.
- The proposed project would not disrupt or divide the physical arrangement of an established community.
- The proposed project would be compatible with existing on-site and surrounding land uses.
- The proposed project's contribution to the overall significant cumulative land use impacts in the project area would not be cumulatively considerable.

If the California Energy Commission approves the project, staff is proposing Conditions of Certification **LAND-1** to ensure that the proposed project mitigates for the permanent loss of 1,588.5 acres agricultural lands; **LAND-2** to ensure that the project closure/decommissioning complies with the county's suggested Conditions of Approval; and **LAND-3** to ensure the project is in compliance with the Subdivision Map Act.

PROPOSED CONDITIONS OF CERTIFICATION

LAND-1 The project owner shall mitigate for the loss of 1,588.5 acres of significant farmland, as defined by the California Agricultural Land Evaluation and Site Assessment (LESA) Model (DOC 1997), at a level not to exceed a one-to-one ratio.

Verification: The project owner shall provide a mitigation fee payment to an agricultural land trust such as the Transition Habitat Conservancy or any other land trust that has been previously approved by the Compliance Project Manager (CPM) at least 120 days prior to the start of construction. The fee payment will be determined by an independent appraisal conducted on available, comparable, farmland property on behalf of the agricultural land trust. The project owner shall pay all costs associated with the appraisal. The project owner shall provide documentation to the CPM that the fee has been paid and that the 1,588.5 acres of farmland and/or easements shall be purchased within three years of start of operation as compensation for the 1,588.5 acres of agricultural land to be converted by the AMS project. The documentation also shall guarantee that the land/easements purchased by the trust will be located in San Bernardino County and will be farmed in perpetuity. If no available land or easements can be purchased in San Bernardino County, then the purchase of lands/easements in other areas within western Mojave or adjacent counties, such as Kern County of Riverside County, is acceptable. The project owner shall provide to the CPM updates in the Annual Compliance Report on the status of farmland/easement purchase(s).

LAND-2 The project owner shall ensure that permanent closure of the project and its associated facilities comply with the County of San Bernardino's suggested Conditions of Approval (CSB 2010b) regarding project closure and decommissioning and San Bernardino County Development Code Chapter 84.29.060, Decommissioning Requirements.

Verification: Consistent with the requirements of **COMPLIANCE-11**, the project owner shall incorporate the applicable requirements of the San Bernardino County Development Code section 84.29.060, Decommissioning Requirements, into the AMS Facility Closure Plan, to the extent feasible, and in as much as the county requirements do not conflict with the California Energy Commission's requirements and standards related to the closure of power generating facilities. Consistent with the requirements of **COMPLIANCE-11,** the Project owner shall submit the Facility Closure Plan to the CPM at least 12 months prior to commencement of planned facility closure/decommissioning.

LAND-3 The project owner shall comply with the Subdivision Map Act (Pub. Resources Code Section 66410-66499.58) by adhering to the provisions of Chapter 87.04 of the San Bernardino County Code of Ordinances to ensure legality of parcels and site control.

Verification: At least 30 days prior to construction of the AMS project, the project owner shall submit evidence to the CPM, indicating approval of the merger of parcels by San Bernardino County, or written approval of another process (i.e., to adjust lot lines) that is acceptable to the county. The submittal to the CPM shall include evidence of compliance with all conditions and requirements associated with the approval of the Certificate of Merger and/or Notice of Lot Line Adjustment by the county. If all parcels or portions of parcels are not owned by the project owner at the time of the merger, a separate deed shall be executed and recorded with the county recorder. A copy of the recorded deed shall be submitted to the CPM, as part of the compliance package.

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APPENDIX LU-1
ABENGOA MOJAVE SOLAR PROJECT SITE
LESA MODEL WORKSHEETS

Appendix A. California Agricultural LESA Worksheet

The California Agricultural LESA Model is composed of six different factors. Two "Land Evaluation" factors are based upon measures of soil resource quality. Four "Site Assessment" factors provide measures of a given project's size, water resource availability, surrounding agricultural lands, and surrounding protected resource lands. For a given project, each of these factors is separately rated on a 100 point scale. The factors are then weighted relative to one another and combined, resulting in a single numeric score for a given project, with a maximum attainable score of 100 points. It is this project score that becomes the basis for making a determination of a project's potential significance, based upon a range of established scoring thresholds. The California Agricultural LESA Instruction Manual found at the California Department of Conservation, Division of Land Resource Protection website provides detailed instructions on how to complete the LESA worksheet.

Calculation of the Land Evaluation (LE) Score

Part 1. Land Capability Classification (LCC) Score

(1) Determine the total acreage of the project.
(2) Determine the soil types within the project area and enter them in **Column A** of the **Land Evaluation Worksheet** provided on page A-2.
(3) Calculate the total acres of each soil type and enter the amounts in **Column B**.
(4) Divide the acres of each soil type (**Column B**) by the total acreage to determine the proportion of each soil type present. Enter the proportion of each soil type in **Column C**.
(5) Determine the LCC for each soil type from the applicable Soil Survey and enter it in **Column D**
(6) From the LCC Scoring Table below, determine the point rating corresponding to the LCC for each soil type and enter it in **Column E**.

LCC Scoring Table

LCC Class	I	IIe	IIs, w	IIIe	IIIs, w	IVe	IVs, w	V	VIe, s, w	VIIe, s, w	VIII
Points	**100**	**90**	**80**	**70**	**60**	**50**	**40**	**30**	**20**	**10**	**0**

(7) Multiply the proportion of each soil type (**Column C**) by the point score (**Column E**) and enter the resulting scores in **Column F**.
(8) Sum the LCC scores in **Column F**.
(9) Enter the LCC score in box <1> of the Final LESA Score Sheet on page A-10.

Part 2. Storie Index Score

(1) Determine the Storie Index rating for each soil type and enter it in **Column G**.
(2) Multiply the proportion of each soil type (**Column C**) by the Storie Index rating (**Column G**) and enter the scores in **Column H**.
(3) Sum the Storie Index scores in **Column H** to gain the Storie Index Score.
(4) Enter the Storie Index Score in box <2> of the Final LESA Score Sheet on page A-10.

Land Evaluation Worksheet
Land Capability Classification (LCC) and Storie Index Scores

A	B	C	D	E	F	G	H
Soil Map Unit	Project Acres	Proportion of Project Area	LCC	LCC Rating	LCC Score	Storie Index	Storie Index Score
112	866.8	0.498	IIIe	70	34.86	50	24.9
117	668.5	0.384	IIIe	70	26.88	57	21.89
137	41	0.024	IIe	90	2.16	86	2.06
152	148.4	0.085	IVs	40	3.4	40	3.4
178	16.4	0.009	NR	0	0	NR	0
Totals	**1,741.10**	**1.00** (Must Sum To 1.0)		***LCC Total Score***	**67.30**	***Storie Index Total Score***	**52.25**

Site Assessment Worksheet 1.
Project Size Score

	I	J	K
	LCC Class I - II	LCC Class III	LCC Class IV- VIII
		866.8	
		668.5	
	41		
			148.4
Total Acres	**41**	**1,535.30**	**148.4**
Project Size Scores	**80**	**100**	**40**
Highest Project Size Score		**100**	

Part 1. Project Size Score

(1) Using **Site Assessment Worksheet 1** provided on page A-2, enter the acreage of each soil type from **Column B** in the **Column I, J or K** that corresponds to the LCC for that soil. (Note: While the Project Size Score is a component of the Site Assessment calculations, the score sheet is an extension of data collected in the Land Evaluation Worksheet, and is therefore displayed beside it.)

(2) Sum **Column I** to determine the total amount of class I and II soils on the project site.

(3) Sum **Column J** to determine the total amount of class III soils on the project site.

(4) Sum **Column K** to determine the total amount of class IV and lower soils on the project site.

(5) Compare the total score for each LCC group in the Project Size Scoring Table below and determine which group receives the highest score.

Project Size Scoring Table

Class I or II		**Class III**		**Class IV or Lower**	
Acreage	Points	Acreage	Points	Acreage	Points
>80	100	>160	100	>320	100
60-79	90	120-159	90	240-319	80
40-59	80	80-119	80	160-239	60
20-39	50	60-79	70	100-159	40
10-19	30	40-59	60	40-99	20
10<	0	20-39	30	40<	0
		10-19	10		
		10<	0		

(6) Enter the **Project Size Score** (the highest score from the three LCC categories) in box <3> of the Final LESA Score Sheet on page A-10.

Part 2. Water Resource Availability Score

(1) Determine the type(s) of irrigation present on the project site, including a determination of whether there is dry land agricultural activity as well.

(2) Divide the site into portions according to the type or types of irrigation or dry land cropping that is available in each portion. Enter this information in **Column B** of **Site Assessment Worksheet 2 - Water Resources Availability** provided on page A-5.

(3) Determine the proportion of the total site represented for each portion identified, and enter this information in **Column C**.

(4) Using the <u>Water Resources Availability Scoring Table</u> provided on page A-6, identify the option that is most applicable for each portion, based upon the feasibility of irrigation in drought and non-drought years, and whether physical or economic restrictions are likely to exist. Enter the applicable Water Resource Availability Score into **Column D**.

(5) Multiply the Water Resource Availability Score for each portion by the proportion of the project area it represents to determine the weighted score for each portion in **Column E**.

(6) Sum the scores for all portions to determine the project's total Water Resources Availability Score.

(7) Enter the Water Resource Availability Score in box <4> of the Final LESA Score Sheet on page A-10.

Site Assessment Worksheet 2.
Water Resource Availability

A Project Portion	B Water Source	C Proportion of Project Area	D Water Availability Score	E Weighted Availability Score (C x D)
1	Harper Valley Groundwater Basin - part of the Centro Sub-Basin of the Mojave River Basin	1	100	100
2				
3				
4				
5				
6				
		1.00 **(Must Sum to 1.0)**	***Total Water Resource Score***	**100.00**

Water Resource Availability Scoring Table

Option	Non-Drought Years: Irrigated Production Feasible?	Non-Drought Years: RESTRICTIONS: Physical Restrictions?	Non-Drought Years: RESTRICTIONS: Economic Restrictions?	Drought Years: Irrigated Production Feasible?	Drought Years: RESTRICTIONS: Physical Restrictions?	Drought Years: RESTRICTIONS: Economic Restrictions?	WATER RESOURCE SCORE
1	YES	NO	NO	YES	NO	NO	100
2	YES	NO	NO	YES	NO	YES	95
3	YES	NO	YES	YES	NO	YES	90
4	YES	NO	NO	YES	YES	NO	85
5	YES	NO	NO	YES	YES	YES	80
6	YES	YES	NO	YES	YES	NO	75
7	YES	YES	YES	YES	YES	YES	65
8	YES	NO	NO	NO	– –	– –	50
9	YES	NO	YES	NO	– –	– –	45
10	YES	YES	NO	NO	– –	– –	35
11	YES	YES	YES	NO	– –	– –	30
12	Irrigated production not feasible, but rainfall adequate for dry land production in both drought and non-drought years.						25
13	Irrigated production not feasible, but rainfall adequate for dry land production in non-drought years but not in drought years).						20
14	Neither irrigated nor dry land production feasible.						0

Part 3. Surrounding Agricultural Land Use Score

(1) Calculate the project's Zone of Influence (ZOI) as follows:

(a) a rectangle is drawn around the project such that the rectangle is the smallest that can completely encompass the project area.

(b) a second rectangle is then drawn which extends one quarter mile (1,320 feet) on all sides beyond the first rectangle.

(c) The ZOI includes all parcels that are contained within or are intersected by the second rectangle, less the area of the project itself.

(2) Sum the area of all parcels to determine the total acreage of the ZOI.

(3) Determine which parcels are in agricultural use and sum the areas of these parcels.

(4) Divide the area in agriculture found in step (3) by the total area of the ZOI found in step (2) to determine the percent of the ZOI that is in agricultural use.

(5) Determine the Surrounding Agricultural Land Score utilizing the Surrounding Agricultural Land Scoring Table below.

Surrounding Agricultural Land Scoring Table

Percent of ZOI in Agriculture	Surrounding Agricultural Land Score
90-100	100
80-89	95
70-79	90
65-69	85
60-64	80
55-59	70
50-54	60
45-49	50
40-44	40
35-39	30
30-34	20
20-29	10
<19	0

(6) Enter the Surrounding Agricultural Land Score in box <5> of the Final LESA Score Sheet on page A-10.

Part 4. Surrounding Protected Resource Land Score

The Surrounding Protected Resource Land scoring relies upon the same Zone of Influence information gathered in Part 3, and figures are entered in Site Assessment Worksheet 3, which combines the surrounding agricultural and protected lands calculations.

(1) Use the total area of the ZOI calculated in Part 3 for the Surrounding Agricultural Land Use score.

(2) Sum the area of those parcels within the ZOI that are protected resource lands, as defined in the LESA Instruction Manual (e.g., Williamson Act contracted lands, publicly owned lands maintained as park, forest, or watershed resources).

(3) Divide the area that is determined to be protected in step (2) by the total acreage of the ZOI to determine the percentage of the surrounding area that is under resource protection.

(4) Determine the Surrounding Protected Resource Land Score utilizing the Surrounding Protected Resource Land Scoring Table below.

Surrounding Protected Resource Land Scoring Table

Percent of ZOI Protected	Protected Resource Land Score
90-100	100
80-89	95
70-79	90
65-69	85
60-64	80
55-59	70
50-54	60
45-49	50
40-44	40
35-39	30
30-34	20
20-29	10
<20	0

(5) Enter the Surrounding Protected Resource Land score in box <6> of the Final LESA Score Sheet on page A-10.

Surrounding Agricultural Land and Surrounding Protected Resource Land

A	B	C	D	E	F	G
Zone of Influence					Surrounding Agricultural Land Score (from table on page A-7)	Surrounding Protected Resource Land Score (from table on page A-8)
Total Acres	Acres in Agriculture	Acres of Protected Resource Land	Percent in Agriculture (B/A)	Percent Protected Resource Land (C/A)		
11,035	220	480	2	4	0	0

Final LESA Score Sheet

Calculation of the Final LESA Score

(1) Multiply each factor score by the factor weight to determine the weighted score and enter in Weighted Factor Scores column.
(2) Sum the weighted factor scores for the LE factors to determine the total LE score for the project.
(3) Sum the weighted factor scores for the SA factors to determine the total SA score for the project.
(4) Sum the total LE and SA scores to determine the Final LESA Score for the project.

		Factor Scores	Factor Weight	Weighted Factor Scores
LE Factors				
Land Capability Classification (see page A-2)	<1>	67.3	0.25	16.8
Storie Index Rating (see page A-2)	<2>	52.25	0.25	13.06
LE Subtotal			**0.50**	**29.89**
SA Factors				
Project Size (see page A-2)	<3>	100	0.15	15
Water Resource Availability (see page A-5)	<4>	100	0.15	15
Surrounding Agricultural Land (see page A-9)	<5>	0	0.15	0
Surrounding Protected Resource Land (see page A-9)	<6>	0	0.05	0
SA Subtotal			**0.50**	**30**
			Final LESA Score	**59.89**

California Agricultural LESA Scoring Thresholds

Total LESA Score		Scoring Decision
0 to 39 points		Not Considered Significant
40 to 59 points		Considered Significant only if LE and SA subscores are each greater than or equal to 20 points
60 to 79 points		Considered Significant unless either LE or SA subscore is less than 20 points
80 to 100 points		Considered Significant

The California Agricultural LESA Model is designed to make determinations of the potential significance of a project's conversion of agricultural lands during the Initial Study phase of the CEQA review process. Scoring thresholds are based upon both the total LESA score as well the component LE and SA subscores. In this manner the scoring thresholds are dependent upon the attainment of a minimum score for the LE and SA subscores so that a single threshold is not the result of heavily skewed subscores (i.e., a site with a very high LE score, but a very low SA score, or vice versa). For additional information on the significance scoring thresholds under the California Agricultural LESA Model, consult Section 4 in the LESA Instruction Manual.

NOISE AND VIBRATION

Testimony of Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

The Abengoa Mojave Solar (AMS), if built and operated in conformance with the proposed conditions of certification below, 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 applicant has proposed 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 AMS 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.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Noise Table 1
Laws, Ordinances, Regulations and Standards

Applicable Law	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
Local	
County of San Bernardino Noise Development Code, §§ 83.01.080, 83.01.090	Limits project noise levels at noise-sensitive receptors. 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 decibels (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 five 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

County of San Bernardino LORS

The project site is located within San Bernardino County, and thus, the County’s noise requirements apply to this project.

The County of San Bernardino’s noise standards are given in its Development Code in sections 83.01.080 and 83.01.090 (CSB 2007). This code establishes standards concerning acceptable noise levels for noise-sensitive land uses. This LORS limits the project’s operational noise level at residential receptors to 55 dBA L_{eq} during the daytime (between 7:00 a.m. and 10:00 p.m.), and to 45 dBA L_{eq} during the nighttime (between 10:00 p.m. and 7:00 a.m.).

This code also allows construction between the hours of 7:00 a.m. and 7:00 p.m., Mondays through Saturdays, to be exempt from the County’s noise requirements.

SETTING

The proposed AMS project site is located in an unincorporated area in San Bernardino County, California, approximately nine miles northwest of the Town of Hinkley. The project area is sparsely populated with approximately six to eight widely-separated residences located between approximately 0.46 and 1.58 miles from the two proposed power blocks. These are the closest known residential properties and there are no other noise-sensitive receptors (such as schools, places of worship, or medical facilities) in the vicinity of the study area (AMS 2009a, AFC § 5.8.4.2).

As the area around the project site is relatively remote, there are few daytime noise sources. According to the AFC, traffic noise from vehicles on State Route 58 was never audible to field engineers; most probably due to this roadway being nearly six miles from area with residential land uses. The only paved road into the Lockhart/Harper Lake area is Harper Lake Road, which was observed to have very sporadic traffic (typically less than one or two vehicles per hour during the daytime). During the mid-day hours, high-altitude over-flights of aircraft were observed; primarily military planes to and from Edwards Air Force Base. Other daytime noise sources included natural sounds from birds and insects. No agricultural activities were noted during the May survey sessions (AMS 2009a, AFC § 5.8.4.2). According to the AFC, during the nighttime, after the wind died down and when other mechanical-related sources such as vehicles, aircraft, and air conditioners were not present, the noise environment was quiet (AMS 2009a, AFC § 5.8.4.2).

Sensitive noise receptors[1] in the vicinity of the project include four residential homes located south of the project site, between approximately 2,400 and 4,500 feet from the planned location of the nearest power block.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

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

[1] 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).

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 may exist 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 typically 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]

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[3] activities is limited to daytime hours.

Staff uses the above method and threshold to protect the most sensitive populations.

Ambient Noise Monitoring

In order to establish a baseline for the comparison of predicted project noise with existing ambient noise, the applicant has presented the results of an ambient noise survey (AMS 2009a, AFC § 5.8.4.3; Tables 5.8-4, 5.8-5, 5.8-6, 5.8-7). This survey was

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

[3] Noise that draws legitimate complaint.

performed from May 19 through May 20, 2009, using acceptable equipment and techniques. The noise survey monitored existing noise levels at the following five locations, shown in **Noise Figure 1**:

1. Location LT-1: Near the Ramirez residence located at 15563 Edie Road. This location was monitored continuously from 1:23 p.m. on May 19 through 3:00 p.m. on My 20, 2009.

2. Location LT-2: Near the Grieder residence located at 41234 Harper Lake Road. This location was monitored continuously from 1:37 p.m. on May 19 through 3:00 p.m. on My 20, 2009.

3. Location ST-1: Near the Holmes residence at 15635 Lockhart Road. 15-minute measurements were taken at this location at several times during the survey period.

4. Location ST-2: Near the Lucy residence at 15654 Roy Road. This location represents 3 to 4 homes in cluster. 15-minute measurements were taken at this location at several times during the survey period.

5. Location ST-3: At the entrance to the abandoned Boys' Oasis facility at the junction of Harper Lake Road and Santa Fe Road. There are no noise receptors near this location. Staff, thus, does not evaluate project noise impacts at this location.

As explained above, the noise environment in the vicinity of the project site is dominated by transportation-related and natural sources.

NOISE Table 2 summarizes the ambient noise measurements (AMS 2009a, AFC § 5.8.4.3; Tables 5.8-4, 5.8-5, 5.8-6, 5.8-7).

Noise Table 2
Summary of Measured Noise Levels

Measurement Sites	Measured Noise Levels, dBA	
	Average During Daytime Hours[1] L_{eq}	Nighttime Hours[2] L_{90}
LT-1, Residence at 15563 Edie Road	49	21
LT-2, Residence at 41234 Harper Lake Road	42	27
ST-1, Residence at 15635 Lockhart Road	47	21
ST-2, Residence at 15654 Roy Road	46	21

Source: AMS 2009a, AFC § 5.8.4.3; Tables 5.8-4, 5.8-5, 5.8-6, 5.8-7
1. Staff calculation of average of the daytime hours
2. Staff calculations of average of four quietest consecutive hours of the nighttime (see NOISE APPENDIX A)

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 AMS project is expected to be typical of similar projects in terms of schedule, equipment used, and other types of activities (AMS 2009a, AFC § 5.8.5.3.4).

Compliance with LORS

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

The applicant has predicted construction noise levels to range between approximately 54 to 60 dBA at the above residential receptors. They are summarized here in **Noise Table 3**.

Noise Table 3
Predicted Construction Noise Levels

Receptor/ Distance	Highest Construction Noise Level (dBA) [1]	Measured Existing Ambient, Average Daytime L_{eq} (dBA) [2]	Project Plus Ambient	Change
LT-1	60	49	60	+11
LT-2	54	42	54	+12
ST-1	60	47	60	+13
St-2	56	46	56	+10

Sources: [1] AMS 2009a, AFC Table 5.8-9
[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 (please see the following discussion under **CEQA Impacts**).

The applicant commits to performing noisy construction work during the times specified in the County of San Bernardino Noise Development Code (AMS 2009a, AFC § 5.8.9). To ensure that these hours are, in fact, enforced, staff proposes Condition of Certification **NOISE-6**.

Therefore, the noise impacts of the AMS project construction activities would comply with the noise LORS.

CEQA Impacts

Construction of this project would likely last 26 months. Since construction noise typically varies with time, it is most appropriately measured by, and compared with, the L_{eq} (energy average) metric. As seen in **Noise Table 3** above, last column, construction noise would increase the existing ambient noise level at the project's identified noise-sensitive receptors by 10-13 dBA. Such an increase is considerable. The above construction noise predictions are conservative; that is construction activities with the most equipment items in use and most intense activities were used to calculate these noise levels. For example, the equipment mixes for months 4, 15, and 16 were used to define the aggregate noise emissions for site grading, power block construction, and solar field build-out, respectively. In addition, a considerable portion of the construction period would occur in the power blocks, which are 0.46 to 1.58 miles away from these receptors. Also, 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. Because construction would be during the daytime hours and due to the temporary nature of construction activities, the noise effects of plant construction are considered to be less than significant.

In light of the following proposed conditions of certification, the noise impacts of the AMS 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 two or three minutes each, are performed several times daily over a period of two or three 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 96 dBA at LT-1. 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.

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 two or three 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 applicant anticipates that pile driving would not be required for construction of the AMS project (AMS 2009a, AFC § 5.8.5.3.5). Therefore no vibration impacts are expected.

Worker Effects

The applicant has acknowledged the need to protect construction workers from noise hazards and has recognized applicable LORS that would protect construction workers (AMS 2009a, AFC § 5.8.5.4.1). 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 project would be the power block, where the steam turbine generator, cooling tower, electric transformer, and various pumps and fans would be located. Staff compares the projected project noise with applicable LORS, in this case the County of San Bernardino 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 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.

Compliance with LORS

The applicant performed noise modeling to determine the project's noise impacts on sensitive receptors (AMS 2009a, AFC § 5.8.5.4, Tables 5.8-10). The applicant has predicted operational noise levels; they are summarized in **Noise Table 4** below.

As explained above, the County of San Bernardino Development Code limits the project's operational noise level at residential receptors to 55 dBA L_{eq} during the daytime (between 7:00 a.m. and 10:00 p.m.), and to 45 dBA L_{eq} during the nighttime (between 10:00 p.m. and 7:00 a.m.).

The applicant predicts the project's operational noise levels at the project's noise-sensitive receptors to range between 40 dBA and 53 dBA, less than the 55 dBA daytime LORS limit (See **Noise Table 4** and **Noise Table 4**, below).

The applicant also predicts the project's nighttime noise levels at the project's noise-sensitive receptors to range between 7 dBA and 22 dBA, less than the 45 dBA nighttime LORS limit (See **Noise Table 4** and **Noise Table 4**, below).

To ensure compliance, staff proposes Condition of Certification **NOISE-4**. This condition states that if the project's noise levels alone exceed the predicted project noise levels at the project's noise-sensitive receptors, mitigation measures must be implemented to bring the noise levels into compliance with these limits. 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 applicant to resolve any complaints caused by operational or nighttime noise.

With implementation of the following conditions of certification, noise due to the operation of the AMS project would be in compliance with the applicable LORS.

CEQA Impacts

As explained above, the AMS project would operate during the daylight hours. Thus, staff compares the project's operational noise levels to the existing daytime ambient noise levels at the project's noise-sensitive receptors. (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 operational noise levels to the daytime ambient L_{eq} levels at the project's noise-sensitive receptors.

The applicant has predicted operational noise levels; they are summarized here in **Noise Table 4**.

Noise Table 4
Predicted Operational Noise Levels at All Identified Sensitive Residential Receptors

Receptor/ Distance	Operational Noise Level (dBA) [1]	Measured Existing Ambient, Average Daytime L_{eq} (dBA) [2]	Project Plus Ambient	Change
LT-1	53	49	54	+5
LT-2	40	42	44	+2
ST-1	52	47	53	+6
St-2	46	46	49	+3

Sources: 1 AMS 2009a, AFC Table 5.8-10
2 Noise Table 2, above

Combining the ambient noise level of 49 dBA L_{eq} (**Noise Table 4**, above) with the project noise level of 53 dBA at LT-1 would result in 54 dBA L_{eq}, 5 dBA above the ambient. As described above (in **Method and Threshold for Determining**

Significance), staff always regards an increase of up to 5 dBA as a less-than-significant impact. Therefore, staff considers the above noise impact at LT-1 to be less than significant.

Combining the ambient noise level of 42 dBA L_{eq} (**Noise Table 4**) with the project noise level of 40 dBA at LT-2 would result in 44 dBA L_{eq}, 2 dBA above the ambient, an unnoticeable increase. Staff considers this impact to be less than significant.

Combining the ambient noise level of 47 dBA L_{eq} (**Noise Table 4**) with the project noise level of 52 dBA at ST-1 would result in 53 dBA L_{eq}, 6 dBA above the ambient. Although such an increase would be noticeable, because operations would occur during the daylight hours, staff believes it would not likely cause disturbance. Thus, staff considers this impact to be less than significant.

Combining the ambient noise level of 46 dBA L_{eq} (**Noise Table 4**) with the project noise level of 46 dBA at ST-2 would result in 49 dBA L_{eq}, 3 dBA above the ambient. Staff considers this impact to be less than significant.

Staff proposes Condition of Certification **NOISE-4** to ensure that the noise levels due to project operation would not exceed the above levels (in **Noise Table 4**, second column).

The applicant has predicted the project's nighttime noise levels resulting from facility-related activities; they are summarized here in **Noise Table 5**.

Because during the nighttime, most intermittent noises cease, the noise that stands out at night is most represented by the background noise, or L_{90}. For residential receptors, staff evaluates project noise emissions by comparing them with nighttime ambient background levels; this evaluation assumes that the potential for public annoyance from power plant noise is greatest at night when residents are trying to sleep. Nighttime ambient noise levels are typically lower than daytime levels. Staff believes it is prudent to average the lowest nighttime hourly background noise levels to arrive at a reasonable baseline for comparison with the project's predicted noise level.

Noise Table 5
Predicted Nighttime Project Noise Levels at All Identified Sensitive Residential Receptors

Receptor/ Distance	Project Noise Level (dBA) [1]	Measured Existing Ambient, Average Nighttime L_{90} (dBA) [2]	Project Plus Ambient	Change
LT-1	22	21	25	+4
LT-2	7	27	27	0
ST-1	21	21	24	+3
ST-2	15	21	22	+1

Sources: 1 AMS 2009a, AFC Table 5.8-10
2 Noise Table 2, above

Combining the nighttime ambient noise level of 21 dBA L_{90} (**Noise Table 4**) with the project noise level of 22 dBA at LT-1 would result in 25 dBA L_{90}, 4 dBA above the ambient. Staff considers this impact to be less than significant.

Combining the nighttime ambient noise level of 27 dBA L_{90} (**Noise Table 4**) with the project noise level of 7 dBA at LT-2 would result in 27 dBA L_{90}; no change in ambient would occur.

Combining the nighttime ambient noise level of 21 dBA L_{90} (**Noise Table 4**) with the project noise level of 21 dBA at ST-1 would result in 24 dBA L_{90}, 3 dBA above the ambient. Staff considers this impact to be less than significant.

Combining the nighttime ambient noise level of 21 dBA L_{90} (**Noise Table 4**) with the project noise level of 15 dBA at ST-2 would result in 22 dBA L_{90}, 1 dBA above the ambient. Staff considers this impact to be less than significant.

Wind Effect

As explained in the AFC (AMS 2009a, AFC §§ 5.8.4.2, 5.8.4.3.4), wind is part of the normal daytime noise environment in the project area. Since the noise-sensitive receptors near the project site are all mostly to the south of the plant's principal noise sources and since the predominant wind direction is from the west (see AFC Appendix G.2), these receptors will be in the side-wind orientation; meaning, power plant noise would not likely intensify significantly at these receptors due to wind. However, to ensure this, staff's proposed Condition of Certification **NOISE-4** requires that the power plant's noise level be measured at these receptors during a windy day.

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. The applicant plans to address overall noise in project design, and to take appropriate measures, as needed, to eliminate tonal noises as possible sources of annoyance (AMS 2009a, AFC § 5.8.5.4.10). 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 a simple cycle power plant consist of high-speed gas turbines, compressors, and various pumps. All of these pieces of equipment must be carefully balanced in order to operate; permanent vibration sensors are attached to the turbines and generators. Based on experience with numerous previous projects employing similar equipment, staff agrees with the applicant that ground-borne vibration from the AMS 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 AMS would cause perceptible airborne vibration effects at any offsite noise-sensitive receptor.

Worker Effects

The applicant acknowledges the need to protect plant operating and maintenance workers from noise hazards and commits to compliance with all applicable LORS (AMS 2009a, AFC § 5.8.9). 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.

CUMULATIVE IMPACTS AND MITIGATION

Section 15130 of the CEQA guidelines (Cal. Code Regs., tit. 14) requires a discussion of cumulative environmental impacts. Cumulative impacts are two or more individual impacts that, when considered together, compound or increase other environmental impacts. CEQA guidelines require that this discussion reflect the severity of the impacts and the likelihood of their occurrence, but do not need to provide as much detail as the discussion of impacts solely attributable to the project.

Staff is not aware of any other projects which, when combined with the AMS project, would create direct cumulative noise impact in the project area. Therefore, the project's cumulative noise impact is considered to be insignificant.

FACILITY CLOSURE

All operational noise from the project would cease when the AMS 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 could 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.

RESPONSES TO AGENCY AND PUBLIC COMMENTS

No agency or public comments in the area of **NOISE AND VIBRATION** have been received.

CONCLUSIONS

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

PROPOSED CONDITIONS OF CERTIFICATION

PUBLIC NOTIFICATION PROCESS

NOISE-1 Prior to ground disturbance, the project owner shall notify all residents and business owners within two miles of the project site boundaries and within ½-mile of 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: At least 15 days prior to the start of 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 daylight hours (when the project is capable of producing electricity), to exceed an average of 53 dBA measured at or near monitoring location LT-1 (15563 Edie Road), an average of 40 dBA measured at or near monitoring location LT-2 (41234 Harper Lake Road), an average of 52 dBA measured at or near monitoring location ST-1 (15635 Lockhart Road), and an average of 46 dBA measured at or near monitoring location ST-2 (15654 Roy Road).

Also, 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 four quietest consecutive hours of the nighttime, to exceed an average of 22 dBA measured at or near monitoring location LT-1 (15563 Edie Road), an average of 7 dBA measured at or near monitoring location LT-2 (41234 Harper Lake Road), an average of 21 dBA measured at or near monitoring location ST-1 (15635 Lockhart Road), and an average of 15 dBA measured at or near monitoring location ST-2 (15654 Roy Road).

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.

A. When the project first achieves a sustained output of 90% or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at monitoring location LT-1, or at a closer location acceptable to the CPM. This survey shall be conducted during a windy day. This survey during the power plant's full-load operation 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.

   During the period of this survey, the project owner shall conduct a short-term survey of noise at each of the monitoring locations LT-2, ST-1, and ST-2, or at closer locations acceptable to the CPM. The short-term noise measurements at these locations shall be conducted during the daylight hours and again during the nighttime hours of 10:00 p.m. to 7:00 a.m.

   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 sites exceeds the above values during the above specified period(s) of time, mitigation measures shall be implemented to reduce noise to a level of compliance with these limits.

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 90% 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 will 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 90% or greater of its rated capacity, the project owner shall conduct an occupational noise survey to identify any noise hazardous areas in the facility.

The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations, sections 5095-5099 (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 proposed 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 shall be restricted to the times delineated below, unless a special permit has been issued by the County of San Bernardino:

Mondays through Sundays: 7 a.m. to 7 p.m.

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.

CONSTRUCTION RESTRICTIONS

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 offsite impacts would not cause annoyance to noise 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 and business owners within two miles of the project site. 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.

EXHIBIT 1 - NOISE COMPLAINT RESOLUTION FORM

Abengoa Mojave Solar Project
(09-AFC-5)

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 three feet from noise source _________dBA Date: ______________

Initial noise levels at complainant's property: __________ dBA Date: _____________

Final noise levels at three 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).

REFERENCES

AMS 2009a - Abengoa Solar Inc. / E. Garcia (TN 52813). Application for Certification for Abengoa Mojave Solar (09-AFC-5). Dated 7/2009. Submitted to CEC on 8/10/2009.

CSB 2007 - County of San Bernardino. Development Code, Land Use Services Division, adopted March 13, 2007, effective April 12, 2007, amended January 15, 2009. Section 83.01.080 and 83.01.090, “Noise”.

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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 seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise, which does not decrease relative to daytime levels, are often considered objectionable. Noise levels above 45 dBA at night can result in the onset of sleep interference effects. At 70 dBA, sleep interference effects become considerable (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 (often used for an existing or pre-project noise condition for comparison study).
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 three dB change is considered a barely noticeable difference.

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

4. A ten 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 three dB increase (i.e., the resultant sound level is the sound level from a single passing automobile plus three dB). The rules for decibel addition used in community noise prediction are in the table below.

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 six 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:

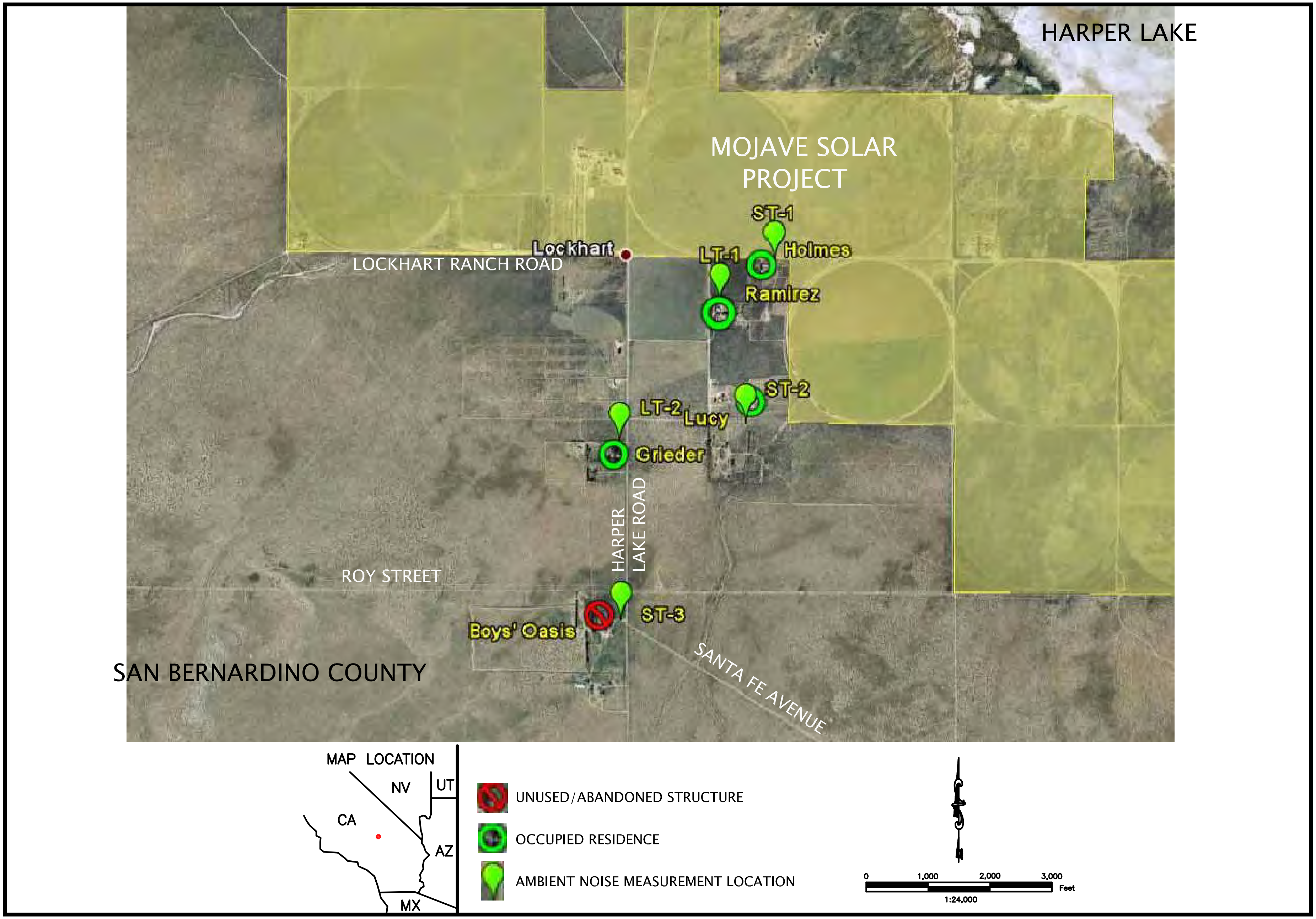
Noise Table A4
OSHA Worker Noise Exposure Standards

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 C.F.R. § 1910.

NOISE AND VIBRATION - FIGURE 1

Abengoa Mojave Solar Project - Measurement Locations for May, 2009 Ambient Survey



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

SOURCE: AFC Fig. 5.8-2

PUBLIC HEALTH

Testimony of Alvin Greenberg, Ph.D.

SUMMARY OF CONCLUSIONS

Staff has analyzed potential public health risks associated with construction and operation of the Abengoa Mojave Solar (AMS) project and does not expect there would be any significant adverse cancer, or short - or long-term noncancer health effects from project toxic emissions. Staff's analysis of potential health impacts from the proposed AMS project was based on a conservative health protective methodology that accounts for impacts to the most sensitive individuals in a given population, including newborns and infants. According to the results of staff's health risk assessment, emissions from AMS would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area.

INTRODUCTION

The purpose of this Staff Assessment (SA) is to determine if emissions from the proposed AMS project would have the potential to cause significant adverse public health impacts or to violate standards for public health protection. If potentially significant health impacts are identified, staff will evaluate mitigation measures to reduce such impacts to insignificant levels.

Staff addresses potential impacts of regulated or criteria air pollutants, including small particulate matter that have been linked to causing or exacerbating respiratory diseases, in the **AIR QUALITY** section of this SA. Impacts on public and worker health from accidental releases of hazardous materials are examined in the **HAZARDOUS MATERIALS MANAGEMENT** section. Health effects from electromagnetic fields are discussed in the **TRANSMISSION LINE SAFETY AND NUISANCE** section. Project releases in the form of hazardous and nonhazardous wastes are described in the **WASTE MANAGEMENT** section.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

Public Health Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
Clean Air Act section 112 (42 U.S. Code section 7412)	Requires new sources which emit more than ten 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 (MACT).
State	
California Health and Safety Code 25249.5 et seq. (Proposition 65)	Establishes thresholds of exposure to carcinogenic substances above which Prop 65 exposure warnings are required.
California Health and Safety Code section 41700	This section states that "no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property."
California Health and Safety Code Sections 44300 et seq.	Air Toxics Hot Spots Program requires participation in the inventory and reporting program at the District level.
California Health and Safety Code Sections 44360 - 44366	Air Toxics Hot Spots Information and Assessment Act requires that based on results of an HRA conducted per CARB/OEHHA guidelines, toxic contaminants do not exceed acceptable levels.
California Public Resource Code Section 25523(a); Title 20 CCR Section 1752.5, 2300-2309; and Division 2 Chapter 5, Article 1, Appendix B, Part (1); California Clean Air Act, H&SC 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.
Local	
Mojave Desert Air Quality Management District Rule 1320	Requires the use of BACT and T-BACT at certain projects and the preparation of an HRA.

SETTING

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

SITE AND VICINITY DESCRIPTION

The proposed facility would be located in San Bernardino County in the western desert of California, approximately nine miles northwest of the city of Hinkley. The topography of the site is essentially flat (about 2,070 feet above sea level) consisting of open desert and agricultural lands adjacent to the Harper Dry Lake depression. Elevated terrain can be found in all directions within one to three miles of the site (AS 2009a, Section 5.2.1.1).

The general population includes many sensitive subgroups that may be at greater risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. Sensitive receptors in the project vicinity are listed in Section 5.6.2.1 of the AFC. There are no sensitive receptors within a 3-mile radius of the project site. The nearest sensitive receptor is the Hinkley Elementary School located about 10 miles southeast of the project site. The nearest residence is approximately 60 feet south of the southern boundary and several additional residences are located within 0.6 miles of the project boundaries (AS 2009a, Section 5.6.2.1 and Table C.4-4). As mentioned above, the location of sensitive receptors near the proposed site is an important factor in considering potential public health impacts.

METEOROLOGY

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

This region of San Bernardino County (part of the Mojave Desert) is characterized by a dry-hot desert climate; summers are hot and dry, winters are moderate with low precipitation, and temperature inversions are strong. The region has an average annual precipitation between three and seven inches, and typically over 345 sunny days per year. Winds generally flow from the southwest across the region (AS 2009a, section 5.2.1.3).

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

EXISTING AIR QUALITY

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

The criteria pollutant air quality monitoring sites nearest to the proposed AMS are the stations located at Lancaster, Mojave, Victorville, and Barstow (AS 2009a, Section 5.2.4.6). The average annual concentrations of PM10 recorded at the four stations between the years 2006 and 2008 ranged between 21.4 $\mu g/m^3$ and 38.4 $\mu g/m^3$, and the average annual concentrations of PM2.5 recorded at the Lancaster, Mojave, and Victorville stations during the same period ranged between 6.2 $\mu g/m^3$ and 10.4 $\mu g/m^3$ (AS 2009a, Table 5.2-14).

The California Air Resources Board (CARB) published a report on emissions and air quality in the state of California in 2008 (The California Almanac of Emissions and Air Quality), showing that concentrations of the top ten toxic air contaminants (TAC) and their associated health risk have been substantially reduced since 1990. The concentrations of TACs measured in the Mojave Desert Air Basin (MDAB) during 2008 are presented in AFC Table 5.10-2 (AS 2009a), which shows that diesel PM, formaldehyde, benzene, and acetaldehyde contribute the majority of TAC emissions in the MDAB. The cancer risk based on these TAC levels was not calculated.

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 CARB air toxics monitoring station that actively reports values is located on Mission Boulevard in Riverside, approximately 70 miles south of the project site. Although staff does not consider this location to be representative of air quality in the area of the proposed site, especially due to its urban setting, it serves to show the upper-bound levels of toxic air contaminants found in the region. In 2008, the background cancer risk calculated by CARB for the Riverside monitoring station was 104 in one million (CARB 2009). The pollutants 1,3-butadiene and benzene, emitted primarily from mobile sources, accounted together for about half of the total risk. The risk from 1,3-butadiene was about 22 in one million at Riverside, while the risk from benzene was about 30 in one million. Formaldehyde accounts for about 20% of the 2008 average calculated cancer risk based on air toxics monitoring results, with a risk of about 21 in one million. Formaldehyde is emitted directly from vehicles and other combustion sources, such as the proposed facility. The risk from hexavalent chromium was about 23 in one million, or

~22% of the total risk. Fifty-one percent of hexavalent chromium in California is emitted from stationary sources with activities such as chrome plating, welding, spray painting, and leather tanning, while mobile sources such as jet aircrafts and ships contribute about 38%.

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

EXISTING PUBLIC HEALTH CONCERNS

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

ENVIRONMENTAL SITE CONTAMINATION

Site disturbances occur during demolition of existing structures, facility construction from excavation, grading, and earth moving. Such activities have the potential to adversely affect public health through various mechanisms, such as the creation of airborne dust, material being carried off-site through soil erosion, and uncovering buried hazardous substances. The Phase I Environmental Site Assessment conducted for this site in 2009 found no "Recognized Environmental Conditions" per the American Society for Testing and Materials Standards (ASTM) definition. That is, there was no evidence or record of any use, spillage, or disposal of hazardous substances on the site, nor was there any other environmental concern that would require remedial action (AS 2009a, Section 5.16.2.3 & Appendix I).

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

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

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

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

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

- Identify the types and amounts of hazardous substances that AMS could emit to the environment;
- Estimate worst-case concentrations of project emissions in the environment using dispersion modeling;
- Estimate amounts of pollutants that people could be exposed through inhalation, ingestion, and dermal contact; and
- Characterize potential health risks by comparing worst-case exposure to safe standards based on known health effects.
- Initially, a screening level risk assessment is performed using simplified assumptions that are intentionally biased toward protection of public health. That is, an analysis is designed that overestimates public health impacts from exposure to project emissions. In reality, it is likely that the actual risks from the power plant will be much lower than the risks as estimated by the screening level assessment. The risks for screening purposes are based on examining conditions that would lead to the highest, or worst-case risks, and then using those conditions in the study. Such conditions include:
- Using the highest levels of pollutants that could be emitted from the plant;
- Assuming weather conditions that would lead to the maximum ambient concentration of pollutants;
- Using the type of air quality computer model which predicts the greatest plausible impacts;
- Calculating health risks at the location where the pollutant concentrations are estimated to be the highest;
- Assuming that an individual’s exposure to cancer-causing agents occurs continuously for 70 years; and

- Using health-based standards designed to protect the most sensitive members of the population (i.e., the young, elderly, and those with respiratory illnesses).

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

The risk assessment process addresses three categories of health impacts: acute (short-term) health effects, chronic (long-term) noncancer effects, and cancer risk (also long-term). Acute health effects result from short-term (one-hour) exposure to relatively high concentrations of pollutants. Acute effects are temporary in nature, and include symptoms such as irritation of the eyes, skin, and respiratory tract.

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

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

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

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

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

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

Significance Criteria

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

As described earlier, non-criteria pollutants are evaluated for short-term (acute) and long-term (chronic) noncancer health effects, as well as cancer (long-term) health effects. The significance of project health impacts is determined separately for each of the three categories.

Acute and Chronic Noncancer Health Effects

Staff assesses the significance of non-cancer health effects by calculating a “hazard index.” A hazard index is a ratio comparing exposure from facility emissions to the reference (safe) exposure level. A ratio of less than one signifies that the worst-case exposure is below the safe level. The hazard index for every toxic substance that has the same type of health effect is added to yield a total hazard index. The total hazard index is calculated separately for acute and chronic effects. A total hazard index of less than one indicates that cumulative worst-case exposures are less than the reference exposure levels. Under these conditions, health protection from the project is likely to be achieved, even for sensitive members of the population. In such a case, staff presumes that there would be no significant non-cancer project-related public health impacts.

Cancer Risk

Staff relies 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 ten in one million, or $10x10^{-6}$. An important distinction is that the Proposition 65 significance level applies separately to each cancer-causing substance, whereas staff determines significance based on the total risk from all cancer-causing chemicals. Thus, the manner in which the significance level is applied by staff is more conservative (health-protective) than that which applies to Proposition 65. The significant risk level of 10 in 1 million is consistent with the level of significance adopted by the MDAQMD in Rule 1320.

As noted earlier, the initial risk analysis for a project is typically performed at a screening level which is designed to overstate actual risks so that staff is confident that that risk and hazard are not underestimated. Staff’s analysis also addresses potential impacts on all members of the population including the young, the elderly, people with existing medical conditions that may make them more sensitive to the adverse effects of toxic air contaminants and any minority or low income populations that are likely to be disproportionately affected by impacts (because these populations often have a greater incidence of pre-existing medical conditions). In order to accomplish this goal, staff utilizes the most current acceptable public health exposure levels (both acute and chronic) set to protect the public from the effects of airborne toxics. When a screening analysis shows cancer risks to be above the significance level, refined assumptions would likely result in a lower, more realistic risk estimate. If facility risk, based on refined assumptions, exceeds the significance level of ten in one million, staff would require appropriate measures to reduce the risk to less than significant. If, after all risk reduction measures had been considered, a refined analysis identifies a cancer risk greater than ten in one million, staff would deem such risk to be significant, and would not recommend project approval.

DIRECT/INDIRECT IMPACTS AND MITIGATION

CONSTRUCTION IMPACTS AND MITIGATION

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

The operation of construction equipment will result in air emissions from diesel-fueled engines. Diesel emissions are generated from sources such as trucks, graders, cranes, welding machines, electric generators, air compressors, and water pumps. Although diesel exhaust contains criteria pollutants such as nitrogen oxides, carbon monoxide, and sulfur oxides, it also includes a complex mixture of thousands of gases and fine particles. These particles are primarily composed of aggregates of spherical carbon particles coated with organic and inorganic substances. Diesel exhaust contains over 40 substances that are listed by the U.S. Environmental Protection Agency (U.S. EPA) as hazardous air pollutants and by the California Air Resources Board (ARB) as toxic air contaminants.

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

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

Construction of the AMS, including site preparation, is anticipated to take place over a period of 26 months (AS 2009a, Section 5.15.2.2). As noted earlier, assessment of chronic (long-term) health effects assumes continuous exposure to toxic substances over a significantly longer time period, typically from eight to seventy years.

AFC Appendix C.5 (AS 2009a) and Pages 20-22 of the Second Supplemental Response to Data Request Set 1A (ESH 2010g) present estimated emissions from construction activities including fugitive dust and diesel exhaust. In response to Data Request # 85, the applicant conducted a health risk assessment for diesel particulate matter (DPM) from construction equipment emissions. The applicant's modeling of worst-case construction emissions adjusted to a 26-month period (lifetime exposure adjustment factor of 0.0106) found that the cancer risk was estimates to be 2.54 in one million at the maximum impact receptor (MIR), below the level of significance (10 in one million). The chronic hazard index was found to be 0.055 at the MIR, below the level of significance of 1.0 (ESH 2010g, Revised Data Response Item 85).

Mitigation measures are proposed by both the applicant and Air Quality staff to reduce the maximum calculated PM10 as well as PM2.5 concentrations. These include the use of extensive fugitive dust control measures that are assumed to result in 90% reduction of fugitive dust emissions. In order to mitigate potential impacts from particulate emissions during the operation of diesel-powered construction equipment, Air Quality staff recommends the use of ultra low-sulfur diesel fuel and Tier 2 or Tier 1 California Emission Standards for Off-Road Compression-Ignition Engines or the installation of an oxidation catalyst and soot filters on diesel equipment. The catalyzed diesel particulate filters are passive, self-regenerating filters that reduce particulate matter, carbon monoxide, and hydrocarbon emissions through catalytic oxidation and filtration. The degree of particulate matter reduction is comparable for both mitigation measures in the range of approximately 85-92%. Such filters will reduce diesel emissions during construction and further reduce the impacts associated with diesel exhaust. (See the **AIR QUALITY** section of this SA for staff's proposal to control particulate matter.)

OPERATION IMPACTS AND MITIGATION

Emissions Sources

The emissions sources at the proposed AMS site include two auxiliary boilers, two diesel-fueled emergency generators, two diesel-fueled emergency fire pumps, two cooling towers, HTF fugitives, and DPM from maintenance vehicles.

As noted earlier, the first step in a health risk assessment is to identify potentially toxic compounds that may be emitted from the facility. Table 5.10-3 of the AFC lists toxic air contaminants that may be emitted by the project. Toxicity values are used to calculate each TAC's health effects, which include RELs used to calculate short-term and long-term noncancer health effects and cancer unit risks used to calculate the lifetime risk of developing cancer, as published in the OEHHA Guidelines (OEHHA 2003). **Public Health Table 2** lists these materials and shows how each contributes to the health risk analysis. For example, the first row shows that oral exposure to acetaldehyde is not of concern, but if inhaled, may have cancer and chronic (long-term) noncancer health effects, but not acute (short-term) effects.

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

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

*Source: OEHHA 2003 Appendix L and AS 2009a, Table 5.10-3.

Tables C.1-2 through C.1-4, and C.1-6 of the AFC lists non-criteria pollutants and their emission factors that may be emitted from the sources listed above (AS 2009a, Appendix C.1). Revised Table C.1-7 lists emissions from maintenance vehicles including DPM (ESH 2010e and ESH 2010g, Revised Data Response Item 86). Emission factors for most plant components were obtained from the U.S. EPA emission factors database (AP-42) and the California Air Toxics Emission Factors (CATEF II) database.

Staff requested in Data Requests 83 and 84 that emissions of HTF toxic thermal degradation products be determined and considered in a HRA. According to the applicant's revised response, HTF may decompose into the following gases under elevated temperatures (ESH 2010g, Revised Data Response Item 83):

- 41.2% by weight Diphenyl Ether
- 40.6% by weight Benzene
- 14.9 % by weight Biphenyl
- 2.86% by weight Toluene
- 0.44% by weight Phenol

The applicant stated that benzene and phenol degradation products in the solar field components would occur in trace amounts and that 5% by weight of total VOCs was used for each in the HRA calculations. Estimates of HTF emissions from the various plant components are presented in the Table titled "Summary of HTF Subsystem Degradation Product Emissions" in the revised Data Response #83 (ESH 2010g).

In response to Data Request 88, the applicant provided total cumulative daily and yearly PM2.5 emissions including fugitive dust and DPM. The total PM2.5 emissions were estimated to be 2.8 tons per year. The applicant provided a revised HRA including all emissions discussed above in Data Response 87 (ESH 2010e).

Emissions Levels

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

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

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

Impacts

The applicant's revised screening health risk assessment for the project including all sources resulted in a maximum acute hazard index of 0.0087 and a maximum chronic hazard index of 0.00992 at the Maximum Impact Receptor (MIR). The maximum cancer risk was predicted to be 6.85 in 1,000,000 at the MIR (ESH 2010e, Data Response 87).

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

Public Health Table 3
Operation Hazard/Risk at Point of Maximum Impact

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
Acute Noncancer	0.0087	1.0	No
Chronic Noncancer	0.00992	1.0	No
Individual Cancer	6.85 in one million	10 in one million	No

Source: Data Response Item 87 (EHS 2010e)

Staff conducted a quantitative evaluation of the risk assessment results presented in the Abengoa Mojave Solar Project Power Plant AFC (09-AFC-5) and the following documents:

- Written Response to Data Request Set 1 (nos. 1-93) (ESH 2009c)
- Supplemental Written Response to Data Request Set 1A (nos. 1-93) for Air Quality and Public Health (ESH 2010e)
- Second Supplemental Written Response to Data Request Set 1A (Nos. 1-93) for Air Quality and Public Health (ESH 2010g)
- Modeling files provided by the applicant were also reviewed

Construction Phase Analysis

For the construction phase analysis, atmospheric dispersion modeling of diesel particulate matter (DPM) emissions from construction equipment and vehicles was conducted by the applicant. In this analysis, risk calculations are based on the assumption that diesel PM is the surrogate for whole diesel exhaust, and PM10 is used for risk calculations.

The daily DPM emission rate for exhaust emissions from onsite construction equipment and vehicles was provided in the January 2010 data responses and is 25.9 lb/day for Phase I of the project (expected to last 12 months) and 34.6 lb/day for Phases II – IV of the project (expected to last 26 months or 2.167 years). Based on the construction schedule of 10 hours/day for 6 days/week for 50 weeks/year, these emissions values are equivalent to 3.9 tons/year and 5.2 tons/year, respectively.

The maximum predicted offsite concentration of diesel particulate matter was reported by the applicant to be 0.14289 ug/m^3. Cancer risk due to diesel exhaust emissions was determined by multiplying the DPM concentration by the diesel cancer inhalation unit risk of 0.0003 (ug/m^3)$^{-1}$ and adjusting by the exposure duration of 26 months of a 70 year lifetime (26 months/840 months = 0.031). Cancer risk at the location of the maximum offsite concentration was determined to be 1.33 in a million and chronic HI to be 0.029 (noncancer chronic REL is 5 ug/m^3).

Operations Phase Analysis

For the operations phase analysis, atmospheric dispersion modeling of facility emissions was conducted by the applicant using AERMOD. Local meteorological data were used, building downwash effects were included for 30 buildings, and 16,277 grid receptors were modeled.

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

- 2 auxiliary boilers
- 12 wet cooling tower cells (2 wet cooling towers, each with 6 cells)
- 2 HTF heaters
- 2 diesel emergency generators
- 2 diesel firewater pumps
- 3 sources of fugitive losses from the HTF system (from valves, flanges, pumps, seals, etc.) and emissions from onsite mobile sources involved in facility operations

The HTF (heat transfer fluid) is circulated through the solar field where it is heated by sunlight concentrated on the heat collection elements of the solar collectors. HTF is comprised biphenyl/diphenyl oxide. Thermal decomposition of HTF results in decomposition products that can include benzene, phenol and toluene, with benzene and phenol produced in “trace amounts” according to the manufacturer’s Material Safety Data Sheet for HTF. In modeling HTF fugitive loss emissions, the applicant assumed a value of 5% by weight of total VOCs of each decomposition compound to represent “trace amounts.”

Staff used the HARP On-Ramp program to load the applicant’s AERMOD results into the CARB/OEHHA Hotspots Analysis and Reporting Program (HARP), Version 1.4a for the risk analysis. Exposure pathways assessed include inhalation, ingestion of home-grown produce, dermal absorption, soil ingestion and mother’s milk. Emission factors obtained from the applicant’s modeling files and used in this analysis are listed in **Public Health Tables 5 and 6**. For risk calculations using the HARP model, the “Derived (Adjusted) Method” was used for cancer risk and the “Derived (OEHHA) Method” was used for chronic noncancer hazard.

Cancer risk and chronic and acute hazard index values obtained by staff are compared to results reported by the applicant in the January 2010 response to data requests in **Public Health Table 7**. Risk and hazard were determined at the point of maximum impact, PMI, under the 70 year residential scenario, located east of the project. Six to eight residences were reported to be located to the southwest of the project site and ten sensitive receptors within a two mile radius, however these specific locations were not modeled by the applicant.

Public Health Table 8 presents substance- and source-specific cancer risks at the PMI. Analysis of this table indicates that 95% of the cancer risk at the PMI is attributed to emissions from two sources: 67% due to fugitive emissions and 28% due to emissions from the HTF heater. Additional analysis indicates that 98% of cancer risk at the PMI is attributed to emissions of two substances: 59% due to diesel particulate matter (from onsite mobile sources as well as the two diesel engines) and 39% due to benzene (from the auxiliary boiler, HTF heater and HTF fugitives).

Cumulative impacts were not evaluated although there is one facility located within one mile north of the project site, the Luz SEGS VIII which "has a low risk prioritization score indicating that facility risk is either "insignificant" or below the levels which would require a formal risk assessment" (source: page 5.10-13 of the AFC).

Public Health Table 5.
Operation Phase Peak Hourly Emission Rates (lb/hr)

Substance	Auxiliary Boiler (2 units)	Cooling Tower (12 cells)	Diesel Generator (2 units)	Diesel Firewater Pump (2 units)	HTF Heater (2 units)	Fugitive Emissions #1	Fugitive Emissions #2	Fugitive Emissions #3
Peak Hourly Emissions from each source (lb/hr)								
Acetaldehyde	9.67E-05							
Acrolein	9.46E-05							
Aluminum		4.40E-06						
Arsenic		2.13E-06						
Benzene	5.10E-05				2.32E-01	3.34E-02	3.09E-02	5.77E-02
biphenyl					8.60E-02	1.77E-01	1.64E-01	3.06E-01
Cadmium		4.40E-07						
Chromium		1.05E-06						
Copper		1.56E-06						
DieselPM			3.30E-01	1.10E-01		6.84E-03	6.33E-03	1.18E-02
Ethylbenzene	4.72E-05							
Formaldehyde	9.96E-05							
Hexane	1.32E-04							
Lead		7.47E-07						
Manganese		5.49E-04						
Mercury		4.40E-11						
Naphthalene	4.97E-06							
Nickel		8.79E-07						
PAHs (4)	1.70E-06							
Phenol					2.50E-03	3.34E-02	3.09E-02	5.77E-02
Propylene	9.71E-03							
Selenium		2.86E-06						
Silver		4.40E-07						
Toluene	6.78E-04				1.63E-02			
Xylene	3.92E-04							
Zinc		8.79E-06						

Public Health Table 6.
Operation Phase Annual Emission Rates (lb/yr)

Substance	Auxiliary Boiler (2 units)	Cooling Tower (12 cells)	Diesel Generator (2 units)	Diesel Firewater Pump (2 units)	HTF Heater (2 units)	Fugitive Emissions #1	Fugitive Emissions #2	Fugitive Emissions #3
Annual Emissions (lb/yr)								
Acetaldehyde	4.44E-03							
Acrolein	4.35E-03							
Aluminum		2.57E-02						
Arsenic		1.25E-02						
Benzene	2.34E-03				6.75E+02	1.32E+02	1.22E+02	2.28E+02
biphenyl					2.52E+02	7.00E+02	6.47E+02	1.21E+03
Cadmium		2.57E-03						
Chromium		6.16E-03						
Copper		9.11E-03						
DieselPM			1.73E+01	5.94E+00		6.00E+01	5.54E+01	1.04E+02
Ethylbenzene	2.17E-03							
Formaldehyde	4.58E-03							
Hexane	6.07E-03							
Lead		4.36E-03						
Manganese		3.21E+00						
Mercury		2.57E-07						
Naphthalene	2.28E-04							
Nickel		5.13E-03						
PAHs (4)	7.80E-05							
Phenol					7.30E+00	1.32E+02	1.22E+02	2.28E+02
Propylene	4.46E-01							
Selenium		1.67E-02						
Silver		2.57E-03						
Toluene	3.11E-02				4.75E+01			
Xylene	1.80E-02							
Zinc		5.13E-02						

Public Health Table 7
Results of Staff's Analysis and the Applicant's Analysis for Cancer Risk and Chronic and Acute Hazard.

	Staff's Analysis			Applicant's Analysis		
	Cancer Risk (per million)	**Chronic HI**	**Acute HI**	**Cancer Risk (per million)**	**Chronic HI**	**Acute HI**
PMI (for cancer risk and chronic HI, Rec. #302)	6.9	0.017	0.0087	6.9	0.0099	0.0087
PMI (acute HI, Rec. #130)	6.3	0.0068	0.026	6.3	0.0045	0.026

Note: PMI = point of maximum impact

Public Health Table 8
Results of Staff's Analysis: Contribution to Total Cancer Risk by Individual Substances from All Sources at the Point of Maximum Impact (PMI).

Substance	Auxiliary Boiler (2 units)	Cooling Tower (12 cells)	Diesel Generator (2 units)	Diesel Firewater Pump (2 units)	HTF Heater (2 units)	Fugitive Emissions (3 sources modeled)	Total Cancer Risk
Acetaldehyde	4.83E-13						4.83E-13
Arsenic				6.35E-08			6.35E-08
Benzene	2.54E-12				1.90E-06	7.63E-07	2.67E-06
Cadmium				1.07E-09			1.07E-09
Chromium				8.69E-08			8.69E-08
DieselPM		8.30E-08	1.52E-07			3.83E-06	4.06E-06
Ethylbenzene	2.06E-13						2.06E-13
Formaldehyde	1.05E-12						1.05E-12
Lead				7.84E-11			7.84E-11
Naphthalene	2.97E-13						2.97E-13
Nickel				1.29E-10			1.29E-10
PAHs (4)	4.78E-10						4.78E-10
TOTAL	4.82E-10	8.30E-08	1.52E-07	1.51E-07	1.90E-06	4.59E-06	6.88E-06

Cooling Towers

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

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

The State of California regulates recycled water for use in cooling towers in Title 22, Section 60303, California Code of Regulations. This section requires that, in order to protect workers and the public who may come into contact with cooling tower mists, chlorine or another biocide must be used to treat the cooling system water to minimize the growth of Legionella and other micro-organisms. This regulation does not apply to the AMS project since it intends to use on-site well water; however, the potential remains for Legionella growth in cooling water at the AMS 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% of industrial cooling towers tested was found to contain Legionella. More recently, staff has received a 2005 report of testing in cooling towers in Australia that found the rate of Legionella presence in cooling tower waters to be extremely low, approximately 3-6%. The cooling towers all had implemented aggressive water treatment and biocide application programs similar to that required by proposed condition of certification **PUBLIC HEALTH-1**.

To minimize the risk from Legionella, the CTI noted that consensus recommendations included minimization of water stagnation, minimization of process leads into the cooling system that provide nutrients for bacteria, maintenance of overall system cleanliness, the application of scale and corrosion inhibitors as appropriate, the use of high-efficiency mist eliminators on cooling towers, and the overall general control of microbiological populations.

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

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

In order to ensure that Legionella growth is kept to a minimum, thereby protecting both nearby workers as well as members of the public, staff has proposed Condition of Certification **PUBLIC HEALTH-1**. The condition would require the project owner to prepare and implement a biocide and anti-biofilm agent monitoring program to ensure that proper levels of biocide and other agents are maintained within the cooling tower water at all times, that periodic measurements of Legionella levels are conducted, and that periodic cleaning is conducted to remove bio-film buildup. Staff believes that with the use of an aggressive antibacterial program coupled with routine monitoring and biofilm removal, the chances of Legionella growing and dispersing would be reduced to insignificance. The applicant has stated that an appropriate biocide program and anti-biofilm agent monitoring program would be implemented for the cooling towers (AS 2009a, Section 5.15.2.9).

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 Regulation, Title 14, section 15130).

GEOGRAPHIC EXTENT

For the purpose of the public health cumulative analysis, emissions from construction or operation of the AMS could potentially combine with emissions from past, present and reasonably foreseeable projects to result in adverse health effects to the public. Cumulative impacts in the area of public health could occur if emission sources are close enough so that their plumes combine. Due to differences in emission source elevations, terrain features, wind direction, and other meteorological factors, it is unlikely that emission plumes from two or more facilities would combine unless they are located in very close proximity. Furthermore, dispersion of plumes tends to occur in parallel, preventing the mixing of plumes from separate locations. On the basis of numerous previous air dispersion modeling conducted by staff to assess public health cumulative impacts, staff finds that the geographic area considered for cumulative impacts on Public Health is only within the project boundaries or within ½ mile of the project.

EXISTING CUMULATIVE CONDITIONS

Staff analyzed the potential of existing projects in the vicinity of the AMS to contribute to cumulative impacts. The only nearby existing projects are the SEGS VIII and IX, two solar power plants with a combined generation capacity of 160 MW, located immediately northwest of the proposed AMS site. These sources are located close enough to the proposed AMS site for public health cumulative impacts to be feasible. However, due to the low emissions of TACs modeled for this project and the resulting minimal health risks, the potential for significant cumulative impacts is extremely low. Furthermore, solar projects such as the proposed AMS and the SEGS VIII and IX units have minimal public health impacts that even when combined represent an insignificant risk to the public.

FUTURE FORESEEABLE PROJECTS

Foreseeable Projects in the Project Area

Staff analyzed the potential of foreseeable projects in the vicinity of the AMS to contribute to cumulative impacts. Nearby future projects that may contribute to a public health cumulative impact include only one solar photovoltaic project that is planned to be located about one mile northeast of the proposed AMS. Staff finds that at this distance there is no potential for significant cumulative impacts to occur during construction or operation of the AMS and the solar photovoltaic project. As mentioned above, staff's previous experience with modeling public health impacts has shown that unless two sources are practically adjacent their impacts do not combine to turn an insignificant individual health risk into a significant one.

Furthermore, the maximum cancer risk for operations emissions from the AMS (calculated by staff) is 6.9 in 1,000,000, which is below the level of significance. Similarly, the maximum chronic HI calculated by staff is 0.017 and the maximum acute HI is 0.026 at the locations of maximum impact. The maximum impact location occurs where pollutant concentrations from AMS would theoretically be the highest. Even at this location, staff does not expect any significant change in lifetime risk to any person, and the increase does not represent any real contribution to the average lifetime cancer incidence rate due to all causes (environmental as well as life-style and genetic). Modeled facility-related residential risks are lower at more distant locations, and actual risks are expected to be much lower since worst-case estimates are based on conservative assumptions and thus overstate the true magnitude of the risk expected. Therefore, staff does not consider the incremental impact of the additional risk posed by AMS project to be either individually or cumulatively significant.

Foreseeable Renewable Projects in the Western Mojave Desert

The nature of public health impacts from exposure to materials that could result in negative health effects combined with the vast area over which the future solar and wind development projects would be built in southeastern California, as well as the relative isolation of these projects from sensitive receptors, precludes the potential for impacts of these projects to combine with each other to result in significant impacts. Any emission from construction of these projects would be dispersed over these areas and would not be expected to result in chronic health problems to sensitive receptors. Operation of the future solar and wind energy projects would result in negligible emissions, mostly related to worker vehicles and maintenance trucks, therefore, operation of these future projects would not result in negative regional health effects.

FACILITY CLOSURE

The AMS project would be designed for an operating life of between 30 years to 40 years. Depending on maintenance factors, at an appropriate point beyond the designed operating life, the project would cease operation and close down. At that time, it would be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts.

Although the setting for this project does not appear to present any special or unusual closure problems, it is impossible to foresee what the situation would be in 30 years or more when the project ceases operation. Therefore, provisions must be made which provide the flexibility to deal with the specific situation and project setting at the time of closure. Facility closure would be consistent with laws, ordinances, regulations and standards in effect at the time of closure.

OVERALL CONCLUSION

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

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments have been received.

COMPLIANCE WITH LORS

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

CONCLUSIONS

Staff has analyzed potential public health risks associated with construction and operation of the AMS 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 AMS 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 AMS project would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area.

PROPOSED CONDITIONS OF CERTIFICATION

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

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

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SOCIOECONOMICS

Testimony of Scott Debauche

SUMMARY OF CONCLUSIONS

California Energy Commission (Energy Commission) staff concludes that the approximately 250 MW combined nominal solar power generating facility, referred to as the Abengoa Mojave Solar project (AMS or proposed project), will not result in significant adverse direct or indirect socioeconomics impacts. In addition, the AMS project would not contribute to a cumulative socioeconomic impact on the area's population, housing, police, schools, hospitals, or recreational facilities because the construction and operation workforce required for the proposed project would reside in the regional or local labor market area. The construction and operation of the proposed project would not result in any disproportionate adverse socioeconomic impacts to any low-income or minority population. Gross public benefits from the AMS project include capital costs and sales taxes as well as the generation of direct and secondary jobs and income.

INTRODUCTION

The socioeconomics impact analysis evaluates project-related changes on existing population and housing patterns, and community services. In addition, this section provides demographic information related to environmental justice. A discussion of the estimated beneficial economic impacts of the construction and operation of the AMS project and other related socioeconomic impacts are provided.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Socioeconomics Table 1 contains socioeconomics laws, ordinances, regulations, and standards (LORS) applicable to the proposed project.

Socioeconomics Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	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.
Local	**None**

SETTING

The 1,765-acre AMS site is located approximately nine miles west of the outermost edge of the city of Hinkley in unincorporated San Bernardino County, California. San Bernardino County is located in the southern Central Valley of the state of California, east of the Los Angeles area. The AMS site is largely uncultivated agricultural land originally sited as Harper Lake Solar Electric Generating Stations (SEGS) XI and XII and is located adjacent to the existing SEGS VIII and IX facilities.

DEMOGRAPHIC SCREENING

The demographic screening process is conducted based on information contained in two documents: *Environmental Justice: Guidance Under the National Environmental Policy Act* (Council on Environmental Quality, 1997) and *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (Council on Environmental Quality, 1998). Based on the demographic screening analysis, the potential affected area is a six-mile radius of the proposed AMS site. The six-mile radius is consistent with the radius used in the Air Quality section of this document to determine potential air quality impacts. The screening process relies on Year 2000 U.S. Census data to determine levels of minority and below-poverty-level populations.

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. A minority population, for the purposes of environmental justice, is identified when the minority population of the potentially affected area is greater than 50% or meaningfully greater than the percentage of the minority population in the general population or other appropriate unit of geographical analysis.

For the AMS project, the total population within a six-mile radius of the proposed site is 181 persons, and the total minority population is 89 persons or 49.17% of the total population (see **Socioeconomics Figure 1**). While the demographic screening area as a whole does not exceed 50.0%, as shown in **Socioeconomics Figure 1,** several Census Blocks within the six-mile radius of the proposed site contain a minority population greater than 50%. Therefore, staff in several technical areas identified in the Executive Summary has considered environmental justice in their environmental impact analyses.

Below-Poverty-Level Populations

Staff has also identified the current below-poverty-level population based on Year 2000 U.S. Census block group data within a six-mile radius of the project site. The total population within a six-mile radius of the proposed site evaluated for low-income populations is 5,837 persons, and the total low-income population is 596 persons or 10.21% of the total population.[1]

[1] The smallest geographic unit available within the Year 2000 US Census data for income status is the Block Group, while racial profile data is available in the smaller Block unit. Therefore, the total population

ASSESSMENT OF IMPACTS

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Staff uses Appendix G (Environmental Checklist Form) of the California Environmental Quality Act (CEQA) Guidelines to determine whether project-related socioeconomic impacts would be significant (see **Socioeconomics Table 2**). As required by the guidelines, staff determines a project's potentially significant impact on population, housing, recreation, and emergency medical and public services by evaluating the impact of the project on those areas.

Criteria for subject areas such as utilities, fire protection, water supply, and wastewater disposal are analyzed in the **RELIABILITY, WORKER SAFETY AND FIRE PROTECTION,** and **SOILS WATER RESOURCES** sections of this document. Impacts on housing, parks and recreation, schools, medical services, law enforcement, and cumulative impacts are based on subjective judgments and input from local and state agencies as well as data provided by the AMS applicant. Typically, long-term employment of people from regions outside the study area could potentially result in significant adverse socioeconomic impacts as a result of relocations and population influx.

presented for the low income demographic profile is larger than the minority demographic profile due to the Block Group extending beyond the six-mile radius of the AMS site.

Socioeconomics Table 2
CEQA Environmental Checklist Form

	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact
POPULATION AND HOUSING —Would the project:				
A. Induce substantial population growth in a new area, either directly or indirectly.				**X**
B. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				**X**
C. Displace substantial numbers of people, necessitating construction of replacement housing elsewhere?				**X**
PUBLIC SERVICES —Would the project:				
D. Result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new of physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service rations, response times, or other performance objectives for any of the public services:				
- Police protection				**X**
- Schools				**X**
- Emergency medical services				**X**
RECREATION—Would the project:				
A. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				**X**
B. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				**X**

DIRECT/INDIRECT IMPACTS AND MITIGATION

Induce Substantial Population Growth

The AMS project is located in San Bernardino County, near the boundary of Los Angeles County. The nearest urban centers to the AMS project are the city of Victorville in San Bernardino County, and the cities of Lancaster and Palmdale in Los Angeles County. Due to this project location, regional socioeconomic impacts could potentially occur in these two counties, which therefore comprise the regional project study area. To characterize the existing and projected future population profile of the study area, staff summarized the current and forecasted population trends for the study area in **Socioeconomics Table 3**. As shown in **Table 3**, currently, the city of Victorville accounts for approximately 5.3% of the San Bernardino County Year 2009 total population, while the cities of Lancaster and Palmdale account for approximately 1.4 and 1.5% of the total Los Angeles County Year 2009 total population, respectively.

Socioeconomics Table 3
Population Profile of the Study Area, Year 2009–2020

Area	2009 Population	2020 Projected Population	2030 Projected Population
City of Victorville	109,441	N/A	N/A
San Bernardino County	2,060,950	2,581,371	2,958,939
City of Lancaster	145,074	N/A	N/A
City of Palmdale	151,346	N/A	N/A
Los Angeles County	10,393,185	11,214,237	11,920,289

N/A: Data Not Available
Source: DOFa 2009; DOFb 2009

For the purpose of this analysis, staff defines “induce substantial population growth” as workers permanently moving into the project area because of project construction and operation, thereby encouraging construction of new homes, extension of roads or other infrastructure, and/or require the needs for new or expanded public services. To determine whether the project would induce population growth, staff analyzes the availability of the local workforce within the regional study area. Staff defines “local workforce” for the AMS project to be the Riverside/San Bernardino/Ontario (Riverside and San Bernardino Counties) and Los Angeles County Metropolitan Statistical Areas (MSA).[2]

[2] 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.

As stated in the Application for Certification (AFC), the applicant expects that construction of the proposed AMS project would last approximately twenty six months, starting in 2011 (AS2009a, p. 2-27). There would be an average of approximately 830 daily construction workers, with a peak daily workforce of 1,162 during month 17 of construction (AS2009a, p. 5.11-23). This peak employment number is used to analyze worst-case construction population and employment impacts. **Socioeconomics Table 4** shows Year 2006-2016 occupational employment projections for the Riverside/San Bernardino/Ontario and Los Angeles County MSA's by construction labor skill as compared to the estimated number of total construction workers by craft needed during the peak month (month 17) as presented in the AFC (AS2009a, p. 5.11-24).

As shown in **Socioeconomics Table 4**, California Economic Development Department (EDD) data indicates there is more than adequate local workforce for peak month project construction. In addition, for construction trades not required during peak month (grading supervisors, mechanics, and painters), **Table 4** identifies that the study area workforce will provide a sufficient supply of workers in these areas. As such, construction of the proposed project would not induce substantial growth or concentration of population in the project area and construction of the AMS project would not encourage people to permanently relocate to the area. Should some construction workers from within the study area choose to stay temporarily at a local area motel or hotel close to the AMS site, there is ample transient housing available. There are approximately 1400 hotel/motel rooms and suites among 19 different establishments in the Lancaster/Palmdale area (AS2009a, p. 5.11-27). Therefore, staff concludes that construction of the AMS project would have no direct or indirect impact on population growth in the area.

Socioeconomics Table 4
Total Labor by Skill in Riverside/San Bernardino/Ontario and Los Angeles County MSA's (2006 and 2016 Estimate) and AMS Required Construction by Craft – Peak Month

Trade	Total # of Workers for Project Construction – Peak Month	Riverside/San Bernardino/Ontario MSA 2006	Los Angeles County MSA 2006	Riverside/San Bernardino/Ontario MSA 2016	Los Angeles County MSA 2016
Carpenters, Masons, Finishers	75	32,960	35,480	37,080	39,340
Electricians	125	6,740	13,040	7,600	13,700
Equipment Operators	35	4,790	4,410	5,460	4,780
Grading Supervisors	0	10,990[1]	15,490[1]	12,380[1]	16,440[1]
Heavy Equipment Operator	3	4,790	4,410	5,460	4,780
Insulators, Sheetmetal Workers	52	27,930[2]	31,330[2]	32,080[2]	34,810[2]
Ironworkers	45	19,460	54,990	20,800	52,230
Construction Laborers	65	27,930	31,330	32,080	34,810
Mechanic	0	22,580	43,270	26,110	47,420
Mechanics Helper	0	22,580	43,270	26,110	47,420
Millwrights	55	2,630	10,400	2,960	10,380
Painters	0	7,950	13,240	9,210	14,250
Pipefitters	145	4,630	12,090	5,330	12,900
Security	12	10,000	52,150	11,550	61,130
Sprinklerfitters	24	4,630[3]	12,090[3]	5,330[3]	12,900[3]
Supervisors, Planners	85	10,990[1]	15,490[1]	12,380[1]	16,440[1]
Surveyors, Designers	30	1,420	6,470	1,670	7,030
Welders	90	3,960	8,410	4,640	8,840
Assembly Workers (Semi Skilled)	298	10,990[1]	15,490[1]	12,380[1]	16,440[1]

Notes: [1] The "Supervisors, Construction and Extraction Workers" EDD category was used; [2] The "Construction Laborers" EDD category was used; [3] The "Plumbers, Pipefitters, and Steamfitters" EDD category was used.
Source: AS2009a (Table 5.11-16), EDD 2009a, EDD 2009b

The proposed AMS project is expected to require a total of 68 permanent full-time employees (AS2009a, p. 5.11-30). **Socioeconomics Table 5** shows Year 2006-2016 occupational employment projections for the Riverside/San Bernardino/Ontario and Los Angeles County MSA's by operational labor skill as compared to the estimated number of total operational workers needed as presented in the AFC.

Socioeconomics Table 5
Total Labor by Skill in Riverside/San Bernardino/Ontario and Los Angeles County MSA's (2006 and 2016 Estimate) and AMS Required Operation

Trade	Total # of Workers for Project Operation	Los Angeles County MSA 2006	Riverside/San Bernardino/Ontario MSA 2006	Los Angeles County MSA 2016	Riverside/San Bernardino/Ontario MSA 2016
Plant and System Operators	--	4,620	2,030	4,980	2,380
Power Plant Operators	--	320	310	360	370
Total	*68*	*4,940*	*2,340*	*5,340*	*2,750*

Source: EDD 2009a and 2009b.

As shown in **Socioeconomics Table 5**, due to the available operational labor force located in proximity of the AMS site, particularly within the Riverside/San Bernardino/Ontario MSA, Staff concludes that the new operational employees required for the BSPP would be found locally. In the event any permanent operational employees chose to live closer to the AMS site, the current vacancy rates for the cities of Lancaster and Palmdale are 8.4 and 7.6%, respectively (AS2009a, pp. 5.7-7 and 5.11-8). These vacancy rates indicate ample local housing is available to the AMS project. Therefore, staff concludes that operation of the AMS project would have no direct or indirect impact on population growth in the area.

Displace Existing Housing

The proposed AMS site is located on uncultivated agricultural land, with the nearest housing units to the site consisting of approximately 10 rural residences and small farms located approximately 50 to 1,000 feet from the project site (AS2009a, p. 5.7-16). No housing structures exist on the project site. As such, no housing would be directly displaced. While the proposed project is currently zoned RL (Rural Living), which allows for the development of residential homes, electric power generation is listed as a use that requires a conditional use permit (CUP) as part of the project (AS2009a, p. 5.7-8). Refer to the **LAND USE** section of this document regarding potential indirect housing impacts resulting from the conversion of lands zoned for residential use. As discussed above, staff finds that the required construction and operational workforce of the proposed AMS project would be found locally and no inmigration to the proposed project area would occur that would trigger the need for new housing. Furthermore, staff has determined that no housing would be displaced from required transmission line connections associated with the AMS project. Therefore, staff concludes that no significant construction or operation-related impacts are expected for local housing supply availability or demand, and the AMS project would not displace existing housing or necessitate construction of replacement housing elsewhere.

Displace Substantial Numbers of People

As discussed above, no housing structures exist on the AMS property. Furthermore, staff has determined that no housing would be displaced from required transmission line connections associated with the AMS project. As such, no persons would be displaced.

Result in Substantial Physical Impacts to Government Facilities

As discussed under the subject headings below, the proposed AMS project would not cause significant impacts to service ratios, response times, or other performance objectives relating to law enforcement, schools, or emergency medical services. Fire protection is analyzed in the **WORKER SAFETY AND FIRE PROTECTION** section of this document.

Law Enforcement

The proposed AMS site is located within the jurisdiction of the San Bernardino County Sheriff's Department, which is headquartered at 655 East 3rd Street in San Bernardino. The nearest Sheriff's Office to the AMS site is the Barstow Station in the city of Barstow located at 225 East Mountain View Road, which is the largest patrol area in the county covering 9,219 square miles (SBCo Sheriff 2009). The California Highway Patrol (CHP) is the primary law enforcement agency for California highways and roads (CHP 2009). CHP services include law enforcement, traffic control, accident investigation, and the management of hazardous materials incidents.

As shown above in **Socioeconomics Tables 4 and 5**, there is more than adequate local workforce available for proposed project construction and operational workforce needs. Therefore, due to the labor force located within the AMS study area, staff concludes that the required construction and operational workforce required for the AMS project would be found locally. Therefore, construction and operation of the AMS project would have no direct or indirect impact on population growth in the area that would require the need for new or expanded law enforcement facilities or staff levels. Furthermore, the proposed project Applicant will provide a security fence will be erected around the entire perimeter of the construction site (AS2009a, p. 5.11-29). In addition, once operational the AMS solar field and support facilities' perimeter will be secured with chain-link metal-fabric fencing, six to eight feet tall (AS2009a, p. 2-25). These security features will deter trespassing and reduce the need for San Bernardino County Sheriff Department calls to the AMS site. Staff concludes no impacts to law enforcement providers serving the proposed AMS site would occur from construction or operation.

Schools

The AMS site is located within the boundaries of the Barstow Unified School District. During the 2006-2007 school year, the Barstow School District had nine elementary schools which 2,862 students were enrolled, two middle schools (grades 5-8) which 2,080 students were enrolled, and one high school where 1,931 students were enrolled (AS2009a, p. 5.11-20). As shown above in **Socioeconomics Tables 4 and 5**, there is more than adequate local workforce available for proposed project construction and operational workforce needs. Therefore, due to the labor force located within the AMS study area, staff concludes that the required construction and operational workforce required for the AMS project would be found locally and have no direct or indirect impact on population growth in the area and would therefore not impact existing or future service levels of the Barstow Unified School District.

Education Code section 17620 authorizes a school district to levy a fee against any construction within a district. However, in January of 2008, the Barstow Unified School District suspended the collection of development impact fees for industrial and residential development (AS2009a, p. 5.11-31). Therefore, the proposed AMS project would not be required to pay a development impact fee to the Barstow Unified School District. As no school impact fee is imposed by the applicable school districts, the AMS project would be in compliance with Education Code section 17620 (as described in **Socioeconomics Table 1)**.

Emergency Medical Services

As discussed earlier, there would be an average of approximately 830 daily construction workers, with a peak daily workforce of 1,162 during month 17 of construction (AS2009a, p. 5.11-23). Operation of the proposed AMS project is expected to employ a total of 68 full-time employees (AS2009a, p. 5.11-30). As shown above in **Socioeconomics Tables 4 and 5**, there is more than adequate local workforce available for proposed project construction and operational workforce needs. Therefore, due to the labor force located within the AMS study area, staff concludes that the required construction and operational workforce required for the AMS project would be found locally and have no direct or indirect impact on population growth in the area that would require the need for new or expanded emergency medical facilities or staff levels.

The nearest hospital to the AMS site is the Barstow Community Hospital, located approximately 41 miles east of the site, and offers general and acute care in a 56-bed facility (AS2009a, p. 5.11-18). In addition to this hospital facility, the Victor Valley Community Hospital is located approximately 55 miles south in the city of Victorville and contains an urgent and primary care unit within a 110-bed facility (AS2009a, p. 5.11-8). In the event a worker or employee requires emergency medical care at the AMS site, staff concludes these emergency care facilities would provide sufficient care within an adequate emergency response time. In addition, communication equipment will be available on site at all times to contact outside agencies if emergencies arise (AS2009a, p. 5.11-29). Based on the available hospital facilities serving the AMS site, the proposed AMS project would not significantly impact the existing service levels or response times of the emergency medical facilities serving the study area.

Increase the Use of Existing Recreation Facilities

Within the proposed AMS study area, no park or recreational land currently exists (AS2009a, p. 5.7-16). The demand for new or expanded park and recreational facilities is generally associated with an increase in housing or population. As shown above in **Socioeconomics Tables 4 and 5**, there is more than adequate local workforce available for proposed project construction and operational workforce needs. Due to the labor force located within the AMS study area, staff concludes that the required construction and operational workforce required for the AMS project would be found locally and have no direct or indirect impact on population growth in the area that would require the need for new or expanded recreational facilities. Therefore, construction and operation of the proposed AMS project would not have a significant adverse socioeconomic impact on parks and recreational facilities.

CUMULATIVE IMPACTS AND MITIGATION

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 (Title 14, California Code of Regulations, section 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 thus resulting in a housing shortage, change in local employment conditions, and an increased demand on public services.

Geographic Scope of Cumulative Impact Analysis

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

Cumulative Impact Types

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

- Existing cumulative conditions
- Future foreseeable projects

Existing Cumulative Conditions

A wide variety of past and present development projects contribute to the cumulative conditions for socioeconomics. As noted above in the "Setting and Existing Conditions" subsection, past development has further urbanized the area and increased population, housing, and employment conditions. As shown in the AFC, from 2000 to 2008 the population of San Bernardino County increased by 16.2% while the population within Los Angeles increased by 7.6% during the same time frame (AS2009a, Table 5.11-3). This is an example of the steady growth rate that has occurred throughout the study area. As a result, past and present residential, commercial, and industrial development has contributed to the overall socioeconomic growth within the study area.

Future Foreseeable Projects

Foreseeable Projects in the Project Area. According to **Cumulative Impacts Figure 2** and **Cumulative Impacts Table 3**, one industrial and three infrastructure development projects are proposed within the Harper Lake region. Two of the proposed infrastructure projects include wind (Iron Mountain) and solar (Desert Onyx) electrical generation facilities.

Foreseeable Renewable Projects in the Western Mojave Desert. As shown on **Cumulative Impacts Figure 1** and **Cumulative Impacts Table 1**, solar and wind applications for use of BLM and private land are proposed on approximately 553,000 acres of BLM land and 13,900 acres of non-federal land in the Western Mojave Planning Area.

Overall Conclusion

Foreseeable development in the project area includes a mixture of industrial and infrastructure (including renewable energy) projects, with the proposed biosolids industrial facility and portions of the Caltrans State Route 58 improvement project and proposed renewable projects located in San Bernardino County. A number of foreseeable renewable projects in the Western Mojave Desert area include energy projects, including the SES Solar One/Stirling Power solar project and the West Fry and Granite Mountain Wind Energy projects, located in San Bernardino County (AS2009a, p. 5.11-34).

With the large number of renewable energy projects occurring within the AMS regional study area, it is possible that some overlap of construction phasing could occur between the AMS project and the cumulative development projects. A large influx in construction labor to the area could create demand for temporary housing that is greater than the existing supply, however all projects would be expected to draw on the large regional construction workforce in Los Angeles County and San Bernardino County MSA's. **Socioeconomics Tables 4 and 5** present the most recently published data (Year 2006-2016 projections) on labor force characteristics for the AMS regional study area. As discussed above, Staff concludes that the required construction and operational workforce of the proposed AMS project would be found locally, with no population inmigration occurring that would increase the local population. Therefore, because the local labor force will adequately serve construction and operation of the AMS project, it would not contribute to cumulative increases in population that would generate an increase in demand for local housing and public services. In the event an influx of construction workers occurred within the area as a result of the large renewable energy projects being constructed, due to the temporary duration of construction activities it is assumed these construction workers would choose to stay at a local area motel or hotel and not permanently relocate to the area. Within the AMS site area, there is ample transient housing including approximately 2400 hotel/motel rooms and suites among 34 different establishments in the area surrounding Barstow, California City, and Mojave, with extensive additional available temporary housing in the communities within two hours of the proposed project site (AS2009a, p. 5.11-34).

Despite the potential for construction schedule overlaps with known projects within the proposed AMS study area, Staff concludes construction and operation of the AMS project would not contribute to adverse cumulative socioeconomic impacts. In addition, both the short-term construction-related and long-term operation-related spending activities of the AMS project are expected to have cumulative economic benefits for the study area (refer to **Socioeconomics Table 6**). The cumulative benefits would increase when revenues accrued as a result of the proposed AMS project are combined with spending, and any local revenues accrued as a result of current and future reasonably foreseeable cumulative development projects.

NOTEWORTHY PUBLIC BENEFITS

Important public benefits include both the short-term construction and long-term operational related increases in local expenditures and payrolls, as well as sales tax revenues. Estimated gross public benefits from the AMS project include increases in sales taxes and employment payrolls. **Socioeconomics Table 6** provides a summary of economic benefits of the proposed AMS project.

Socioeconomics Table 6
AMS Economic Benefits (2009 dollars)

Fiscal Benefits	
Construction materials and capital expenditures - Local	$121 million
Annual Operations and Maintenance - Labor	$8.2 million
Annual Operations and Maintenance - Materials	$12.7 million
State and local sales taxes: Construction	$4.9 million
State and local sales taxes: Operation	$90,000
Estimated annual property taxes	$300,000
School Impact Fee	$0
Direct, Indirect, and Induced Benefits	
Estimated Direct Employment	
Construction Employment	830 jobs (maximum)
Construction Payroll	$272 million
Operational Employment	68 jobs (maximum)
Operational Payroll	$12.6 million
Estimated Indirect and Induced Effects	
Construction Jobs	1,711 jobs
Indirect Construction Labor Income	$39.2 million
Induced Construction Labor Income	$107.7 million
Operational Jobs	92 jobs
Indirect Operational Labor Income	$3.5 million
Induced Operational Labor Income	$2.8 million

Source: AS2009a.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are required for socioeconomic resources because no significant adverse socioeconomics impacts would occur as a result of construction and operation of the proposed AMS project.

CONCLUSIONS

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

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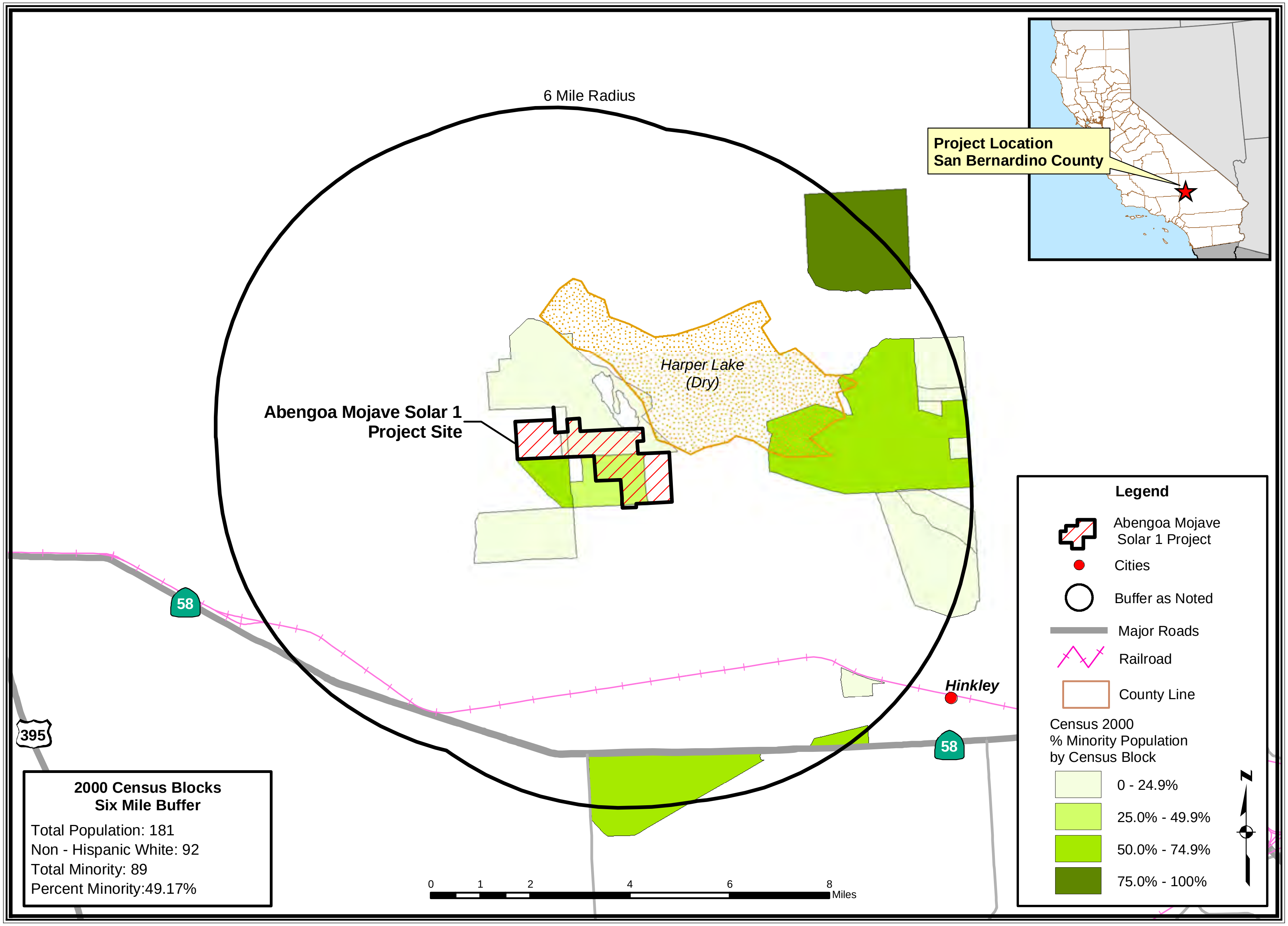
SOCIOECONOMICS - FIGURE 1

Abengoa Mojave Solar 1 Project - Census 2000 Minority Population by Census Block - Six Mile Radius



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

SOURCE: California Energy Commission Statewide Power Plant Maps 2009 - Census 2000 PL 94-171 Data - Matrix PL2

SOIL AND WATER RESOURCES

Testimony of Christopher Dennis, P.G., John Fio, Gus Yates, P.G., C.H.g., And Mike Conway

SUMMARY OF CONCLUSIONS

Based on the assessment of the proposed Abengoa Mojave Solar (AMS) project, the California Energy Commission (Energy Commission) staff finds that:

- The proposed use of groundwater for industrial cooling would not significantly impact groundwater levels in the Harper Valley Groundwater Basin (HVGB), the basin balance, or quality of groundwater in the basin. Staff has proposed Condition of Certification **SOIL&WATER-6** to establish pre-construction and project related groundwater quality and groundwater elevation levels that can be quantitatively compared against observed and simulated levels near the project pumping wells and near potentially impacted existing wells, and to avoid, minimize, or mitigate impacts to the Harper Lake marsh from potential reduction or degradation in the quantity or quality of groundwater conveyed to the Harper Lake marsh.
- The proposed method of sanitary wastewater disposal by a septic system and leach field would have no significant impacts provided the requirements of Condition of Certification **SOIL&WATER-8** are met.
- The proposed project will not significantly increase or decrease erosion rates within its watershed, if Condition of Certification **SOIL&WATER-1** and **-2** are implemented as proposed during construction and operation. Staff are currently working with the Lahontan Regional Water Quality Control Board (RWQCB) to develop additional requirements that will be included in the Supplemental Staff Assessment as a part of Condition of Certification **SOIL&WATER-2**. Using these protective measures, the natural processes of erosion due to wind and water would not be significantly affected during either project construction or operation.
- Staff is awaiting submittal of the storm water surface profile analysis for flows in the main storm water diversion channel to complete analysis of the drainage design and potential flooding off-site in the Supplemental Staff Assessment.
- Staff is awaiting information from the applicant needed to address San Bernardino County's concerns and comments documented in their letter dated 2/1/2010, and discussed below under 'Response to Agency Comments'.
- The proposed on-site drainage management design would perform adequately and any potential impacts would be mitigated if Condition of Certification **SOIL&WATER-1** and **-3** are implemented as proposed.
- Requirements for mitigation of discharges of Heat Transfer Fluid (HTF) to a land treatment unit, brines to evaporation ponds, and stormwater are currently under development and completion of these requirements is contingent upon the submittal of additional information from the applicant. These requirements will be included in Condition of Certification **SOIL & WATER - 2**.
- Based on the elements of the proposed project submitted by the applicant to date, and with the exception of the applicant's proposed use of groundwater for wet

cooling purposes and of evaporation ponds for wastewater disposal (as discussed further below), staff believes the project would comply with all applicable federal, state, and local laws, ordinances, rules, and standards (LORS) with the adoption of the recommended conditions of certification.

- Based on the elements of the proposed project submitted by the applicant to date, staff believes that construction and operation of the project would not result in immitigable project-specific direct or indirect or cumulative significant impacts to soil or water resources with the adoption of the recommended conditions of certification.
- The applicant has proposed to use groundwater for wet cooling when other feasible technologies are available. Staff believes the proposed use of groundwater for wet cooling would not comply with the state's water policies. To address this inconsistency with state water policy, staff recommends implementation of Condition of Certification **SOIL&WATER-9** that would require the project owner to reduce the proposed water use through a project design change(s) and/or through a water conservation program.
- The applicant has proposed the use of evaporation ponds as the preferred method of wastewater disposal. Staff believes potential impacts related to the use of evaporation ponds to dispose of the industrial wastewater could be mitigated through effective application of state and local LORS. However, this method of wastewater disposal is not consistent with the Energy Commission's policy that encourages the use of zero liquid discharge (ZLD) systems that are designed to eliminate wastewater discharge and inherently conserve water. Therefore, staff finds that this method of wastewater disposal does not comply with the state's water policies. As discussed above, to resolve this impact, staff recommends implementation of Condition of Certification **SOIL&WATER-9**.

The state has expressed a strong interest in developing its solar energy resources. However, the construction and operation of solar energy facilities requires the use of water, which state policy also protects. The Energy Commission must balance the state's interest in promoting solar energy development with its interest in conserving and protecting the state's water resources. Several projects currently proposed for the Mojave and Colorado deserts would use water for power plant cooling, which staff believes is contrary to the state's long term interest in maximizing solar power generation and minimizing adverse environmental impacts. This will be an especially critical issue in the renewable development areas that will be identified in the Desert Renewable Energy Conservation Plan (DRECP). Later this year, staff plans to file a request for an Order Instituting an Informational Proceeding to address this issue.

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

- Submittal of the following to the RWQCB and County of San Bernardino for review and comment and to the Energy Commission for approval:
    A. Engineering design detail and vadose and groundwater monitoring plans for the four proposed wastewater evaporation ponds (surface impoundments);
    B. Location and construction details of proposed groundwater monitoring wells for the evaporation ponds;

C. Engineering design detail and monitoring plans for the proposed HTF bioremediation units;

D. Characterization of the anticipated waste streams proposed to be discharged into the evaporation ponds and bioremediation units;

E. A description of the frequency and chemical analysis of waste and a plan that describes actions that will be taken in case of a detectable release;

F. A closure plan for the evaporation ponds and bioremediation units; and

G. Demonstration that the proposed project would be in compliance with RWQCB Order 2009-0009-DWQ Storm Water requirements that go into effect July 1, 2010.

- Submittal of the storm water surface profile analysis for flows in the main storm water diversion channel to the San Bernardino County for review and comment and to the Energy Commission for approval.

INTRODUCTION

The California Environmental Quality Act (CEQA) requires that the significant environmental effects of a proposed project be identified and that such impacts be eliminated or mitigated to the extent feasible (Pub. Resources Code, § 21002). CEQA defines a “significant effect” on the environment as a “substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including … water” (Cal. Code Regs., tit. 14, § 15382).

This section analyzes potential impacts to soil and water resources from the construction and operation of the AMS project. Where the potential of a significant impact is identified, staff has proposed mitigation to reduce the significance of the impact and, as appropriate, has recommended conditions of certification. Similarly, staff has included conditions of certification to ensure that the project complies with all laws that are or would be, absent the Energy Commission’s exclusive jurisdiction, applicable to the project.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following federal, state, and local environmental LORS apply to the proposed AMS project and similar facilities, and help ensure the best and appropriate use and management of both soil and water resources by protecting human health and the environment.

Soil & Water Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORs	Description
Federal LORS	
Clean Water Act (33 USC Section 1257 et seq.)	The Clean Water Act (CWA) (33 USC § 1257 et seq.) requires states to set standards to protect water quality, which includes regulation of storm water and wastewater discharges during construction and operation of a facility. California established its regulations to comply with the CWA under the Porter-Cologne Water Quality Control Act of 1967. The CWA also establishes protection of navigable waters. Activities that result in the dredging or filling of jurisdictional waters of the United States require authorization under a Section 404 permit issued by the Army Corps of Engineers (USACE). The USACE may grant authorization under either an individual permit or a nationwide permit to address operations that may affect the ephemeral washes. Section 404 permits are also subject to CWA Section 401 water quality certification through the Regional Water Quality Control Board (RWQCB). Section 401 certification through the RWQCB is required if there are potential impacts to surface waters of the State and/or Waters of the United States, such as perennial and ephemeral drainages, streams, washes, ponds, pools, and wetlands. The RWQCB can require impacts to these waters to be quantified and mitigated.
Resource Conservation and Recovery Act, 42 USC 6901 *et seq.*; 40 CFR Part 260 et seq.	The Resource Conservation Recovery Act (RCRA) is a comprehensive body of regulations that give U.S. EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also sets forth a framework for the management of non-hazardous solid wastes.
State LORS	
California Constitution, Article 10, Section 2	This section requires that the water resources of the State be put to beneficial use to the fullest extent possible and states that the waste, unreasonable use, or unreasonable method of use of water is prohibited.
The Porter-Cologne Water Quality Control Act of 1967, Water Code Sec 13000 et seq.	Requires the State Water Resources Control Board (SWRCB) and the nine RWQCBs to adopt water quality criteria to protect state waters. Those regulations require that the RWQCBs issue Waste Discharge Requirements specifying conditions for protection of water quality as applicable. Section 13000 also states that the State must be prepared to exercise its full power and jurisdiction to protect the quality of the waters of the State from degradation.
California Water Code Section 13050	Defines "waters of the State."

Applicable LORs	Description
California Water Code Section 13240, 13241, 13242, 13243, & Water Quality Control Plan for the Lahontan Region (Basin Plan)	The Basin Plan establishes water quality objectives that protect the beneficial uses of surface water and groundwater 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. 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, Present and Potential Beneficial Uses; Chapter 3, Water Quality Objectives, and the sections of Chapter 4, Implementation, entitled “Requirements for Site Investigation and Remediation,” “Cleanup Levels,” “Risk Assessment,” “Stormwater Problems and Control Measures,” Erosion and Sedimentation,” “Solid and Liquid Waste Disposal to Land,” and “Groundwater Protection and Management.”
California Water Code Section 13260	Requires filing, with the appropriate RWQCB, a report of waste discharge that could affect the water quality of the state unless the requirement is waived pursuant to Water Code section 13269.
California Code of Regulations, Title 23, Division 3, Chapter 30	This chapter requires the submission of analytical test results and other monitoring information electronically over the internet to the SWRCB’s Geotracker database.
State Water Resources Control Board General Permit CAS000002.	The SWRCB regulates storm water discharges associated with construction projects affecting areas greater than or equal to 1 acre to protect state waters. Under General Permit CAS000002, the SWRCB has issued a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges associated with construction activity. Projects can qualify under this permit if specific criteria are met and an acceptable Storm Water Pollution Prevention Plan (SWPPP) is prepared and implemented after notifying the SWRCB with a Notice of Intent.
State Water Resources Control Board 2003-003-DWQ	This general permit applies to the discharge of water to land that has a low threat to water quality. Categories of low threat discharges include piping hydrostatic test water.
California Code of Regulations, Title 22	Title 22, Division 4, Chapter 15 specifies Primary and Secondary Drinking Water Standards in terms of Maximum Contaminant Levels (MCLs). These MCLs include total dissolved solids (TDS) ranging from a recommended level of 500 milligrams per liter (mg/l), an upper level of 1,000 mg/l and a short term level of 1,500 mg/l. Other water quality MCLs are also specified, in addition to MCLS specified for heavy metals and chemical compounds.
California Code of Regulations, Title 23	Title 23, Division 3, Chapter 15 applies to waste discharges to land and requires the Regional Board issue Waste Discharge Requirements specifying conditions for protection of water quality as applicable.
Warren-Alquist Act, Section 25008	Requires that the Commission promote “all feasible means” of water conservation and “all feasible uses” of alternative water supply sources.
The California Safe Drinking Water and Toxic Enforcement Act	The California Health & Safety Code Section 25249.5 et seq. prohibits actions contaminating drinking water with chemicals known to cause cancer or possessing reproductive toxicity. The RWQCB administers the requirements of the Act.

Applicable LORs	Description
Local LORS	
Mojave River Basin Adjudication	The Mojave River Basin water rights adjudication has divided the basin into subareas with the Mojave Water Agency as the Watermaster and administer of the judgment. The adjudication's physical solution is to balance long-term supply and demand with any deficit accounted for by the purchase and recharge of supplemental water. In addition, the adjudication specifically states that no party to the judgment is relieved of their responsibility to comply with state or federal water quality protection laws or any permits, standards, requirements, or orders intended to protect water quality. The adjudication also states there is a need to conserve water and make the maximum beneficial use of the water resources in the State
County of San Bernardino General Plan and Development Code	Grading in San Bernardino County is subject to terms and conditions of San Bernardino County's General Plan, Development Code and California Building Code, based upon the 2006 International Building Code. If a county grading permit is required, the grading plan would need to be completed in compliance with San Bernardino County's General Plan and Development Code.
California Safe Drinking Water Act and San Bernardino County Code Title 3, Division 3, Chapter 6, Public Water Supply Systems	Requires public water systems to obtain a Domestic Water Supply Permit. The California Safe Drinking Water Act requires public water systems to obtain a Domestic Water Supply Permit. Public water systems are defined as a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out the year. California Department of Public Health (CDPH) administers the Domestic Water Supply Permit program, and has delegated issuance of Domestic Water Supply Permits for smaller public water systems in San Bernardino County to the County. Under the San Bernardino County Code Title 3, 5.15-6 Division 3, Chapter 6, Public Water Supply Systems, the County Department of Environmental Services monitors and enforces all applicable laws and orders for public water systems with less than 200 service connections. The proposed project would likely be considered a non-transient, non-community water system.
San Bernardino County Development Code Section 82.13.080, Soil Erosion and Sediment Control Plans/Permits	Section 82.13.080 establishes regulations and procedures to control human existing and potential induced accelerated erosion. Elements of this ordinance include project planning, preparation of Soil Erosion and Sediment Control Plans, runoff control, land clearing, and winter operations.
San Bernardino County Ordinance Code, Title 3, Division 3, Chapter 8, Waste Management, Article 5, Liquid Waste Disposal	This ordinance requires the following compliance for all liquid waste disposal systems: (1) compliance with applicable portions of the Uniform Plumbing Code and the San Bernardino County Department of Environmental Health (DEHS) standards; (2) approval by the DEHS and building authority with jurisdiction over the system; or (3) for alternative systems, approval by the DEHS, the appropriate building official of this jurisdiction, and the appropriate California RWQCB.
San Bernardino County Ordinance Code, Title 6, Division 3, Chapter 3, Uniform Plumbing Code	This ordinance describes the installation and inspection requirements for locating disposal/leach fields and seepage pits.

Applicable LORs	Description
State Policies and Guidance	
Integrated Energy Policy Report (Public Resources Code, Div. 15, Section 25300 et seq.)	In the 2003 Integrated Energy Policy Report (IEPR), consistent with SWRCB Policy 75-58 and the Warren-Alquist Act, the Energy Commission adopted a policy stating they will approve the use of fresh 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 Resources Control Board Res. No. 68-16	The "Antidegradation Policy" mandates that: 1) existing high quality waters of the State are maintained until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonable affect present and anticipated beneficial uses, and will not result in waste quality less than adopted policies; and 2) requires 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 WDRs 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.
State Water Resources Control Board Res. 75-58	The principal policy of the SWRCB that addresses the specific siting of energy facilities is the Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling (adopted by the Board on June 19, 1976, by Resolution 75-58). This policy states that use of fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound. In a letter dated January 20, 20100, the SWRCB clarified that this policy applies in most cases to surface water, not groundwater.
State Water Resources Control Board Res. No. 88-63	States that all groundwater and surface water of the State are considered to be suitable for municipal or domestic water supply with the exception of those waters that meet specified conditions.
State Water Resources Control Board Res. 2005-0006	Adopts the concept of sustainability as a core value for State Water Board programs and directs its incorporation in all future policies, guidelines, and regulatory actions.
State Water Resources Control Board Res. 2008-0030	Requires sustainable water resources management such as low impact development (LID) and climate change considerations, in all future policies, guidelines, and regulatory actions. Directs Regional Water Boards to "aggressively promote measures such as recycled water, conservation and LID Best Management Practices where appropriate and work with Dischargers to ensure proposed compliance documents include appropriate, sustainable water management strategies."

SETTING

The proposed project would be located on a relatively flat and previously developed area in Harper Valley, in the eastern Mojave Desert, near Hinkley, San Bernardino County, California (**Soil & Water Figure 1**). Water resources in this area are extremely limited and vegetation sparse. Due to these limitations, there is a need for a high degree of water use management and protection against accelerated soil erosion.

HARPER VALLEY

The proposed project would be developed on the western edge of Harper Lake, an alkali playa in Harper Valley. Harper Valley is a topographically closed basin, surrounded by Black Mountain, Fremont Peak, the Gravel and Mud Hills, Harper and Kramer Hills, the Rand Mountains, Iron Mountain, Mount General, and the Waterman Hills (DWR2003). Surface water runoff from mountain precipitation flows through washes and discharges to the alluvium-filled valley. Excess surface flow drains to Harper Lake where it evaporates, creating the Harper Lake playa. There are no documented seeps or springs in the Harper Lake area.

The AMS project site is underlain by the HVGB, which is approximately 410,000 acres in size as defined by the California Department of Water Resources (DWR) (DWR2003). However, the HVGB is part of the Centro subarea, one of five subareas defined in the Mojave River Area adjudication (MBAA1996). The HVGB as defined by the DWR is larger than the Harper Valley groundwater subarea as delineated within the U.S. Geological Survey (USGS) numerical model developed for the Mojave River Area adjudication (USGS2001). The area delineated in the USGS model is herein referred to as the “Harper Lake model zone” for the purposes of staff’s analysis.

The Harper Lake model zone is defined by the Lockhart Fault in the southwest and the contact between alluvium and bedrock to the north, east, and south. The AMS project site is within the northwest trending Lenwood-Lockhart fault zone (DWR2003; AS2009a). This fault zone appears to laterally impede groundwater flow, and this impedance across the fault is incorporated into the USGS model (USGS2001)[1].

Groundwater from the Harper Lake model zone is the primary natural water supply for the valley region. Groundwater in the Harper Lake model zone is generally unconfined and has limited hydraulic connection with the regional Mojave River Basin. Groundwater inflow is primarily across the Lockhart Fault and through the Hinkley Gap towards Harper Lake. Groundwater outflow is primarily through agricultural and industrial pumping and consumption. Historically, as a result of agricultural development, groundwater consumption exceeded groundwater recharge. As a result, groundwater levels and storage declined. Following the Mojave River Basin adjudication, groundwater consumption decreased and groundwater levels have begun to rise and storage increase in the Harper Lake model zone.

The groundwater occurs in two Quaternary alluvial aquifers beneath the AMS project site and generally flows towards Harper Lake (MG1989; AS2009a). At the proposed project location, the depth to groundwater in the upper aquifer (uQal) is approximately 125 to 145 feet below ground surface (bgs) (AS2009a).[2] Transmissivity of the upper

[1] The USGS Mojave River Valley Model is a groundwater model developed out of the adjudication of the Mojave River Basin area. This model includes the Harper Valley Groundwater Basin.
[2] Perched water is present in the vicinity of Harper (dry) Lake. The depth to this perched water at the proposed project site appears to occur at approximately 27 to 33 feet bgs, based on boring logs recorded by the applicant during an on-site geotechnical investigation (AS2009a).

aquifer, estimated from well tests, ranges from 100,000 to 300,000 gallons per day per foot (gpd/ft) (AS2009a). Groundwater in the vicinity of the proposed project contains varying concentrations of sodium, chloride, bicarbonate, sulfate, boron, and Total Dissolved Solids (TDS) (DWR2003).

The upper aquifer is approximately 300 to 400 feet thick and overlays the laterally extensive Black Mountain Basalt (MG1989). This Pleistocene basalt flow originated from Black Mountain and is approximately 200 feet thick beneath the AMS project site and confines to semi-confines the aquifer beneath it (MG1989; AS2009a). Most of the groundwater wells in the vicinity of the AMS project appear to be completed to depths above the basalt layer (MG1989), with an average well depth of approximately 365 feet bgs. Beneath the AMS project site, the aquifer below the basalt layer (lQal) appears to extend to the bedrock at approximately 950 feet bgs (MG1989).

Under pre-development conditions (prior to the 1930s), groundwater discharged to Harper Lake (USGS2001; CSUF2007). However, as agricultural use of the land developed, the groundwater elevation lowered due to pumping and consumption from storage to such a degree that discharge from the regional aquifer to the lakebed no longer occurs. Now, perched water conditions generally exist at approximately 27 to 33 feet bgs near Harper Lake (USGS2001; AS2009a). A perched water condition occurs when water in the ground is retained by an underlying low permeability strata that separates that water from a deeper aquifer.

Precipitation and groundwater underflow supply water to the basin. Recharge from precipitation is considered negligible in the USGS numerical model (USGS2001). Direct recharge from rainfall to the valley floor and surrounding low hills is substantially less than the potential rate of evapotranspiration and potential for soil moisture retention. When runoff or precipitation does reach the dry lake, infiltration to groundwater is negligible and most of the water is removed by evaporation (Hogan2004; USGS2001).

The Mojave River and its tributaries supply groundwater to the Mojave Basin area. Due to continued overdraft, the Mojave Basin area was adjudicated (MBAA1996). For purposes of administration of the judgment, the Mojave Basin area was divided into five separate hydrologic subareas: Este (East Basin), Oeste (West Basin), Alto (Upper Basin), Centro (Middle Basin) and Baja (Lower Basin) (MBAA1996). The proposed AMS project, the Harper Lake model zone, and HVGB are all located in the adjudication's Centro subarea.

The adjudication also states there is a need to conserve water and make the maximum beneficial use of the water resources in the state (MBAA1996). Under the Porter-Cologne Water Quality Act (Water Code Sec 13000 et seq.), each regional water quality control board is required to develop a basin plan that defines and protects the beneficial uses of water in all basins within a region. The beneficial uses of the surface water and groundwater in Harper Valley were defined in the 2005 *Water Quality Control Plan for the Lahontan Region, North and South Basins* (the Basin Plan). The beneficial use designations for surface water and groundwater in Harper Valley, which are most applicable to the AMS project, are presented below in **Soil & Water Table 2**.

Soil & Water Table 2
Beneficial Use Designations for the Harper Valley

SURFACE WATER	
Beneficial Use Designation	**Description**
Groundwater Recharge	Beneficial uses of waters used for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.
Flood Peak Attenuation/Flood Water Storage	Beneficial uses of riparian wetlands in flood plain areas and other wetlands that receive natural surface drainage and buffer its passage to receiving waters.
Wildlife Habitat	Beneficial uses of waters that support wildlife habitats including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.
Freshwater Replenishment	Beneficial uses of waters used for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).
Rare, Threatened, or Endangered Species	Beneficial uses of waters that support habitat necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened or endangered.
Cold Freshwater Habitat	Beneficial uses of waters that support cold water ecosystems including, but not limited to, reservation and enhancement of aquatic habitats, vegetation, fish, and wildlife, including invertebrates.
Warm Freshwater Habitat.	Beneficial uses of waters that support warm water ecosystems including, but not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, and wildlife, including invertebrates.
GROUNDWATER	
Beneficial Use Designation	**Description**
Municipal and Domestic Supply	Beneficial uses of waters used for community, military, or individual water supply systems including, but not limited to, drinking water supply.
Agricultural Supply	Beneficial uses of waters used for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, and support of vegetation for range grazing.
Industrial Service Supply	Beneficial uses of waters used for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, geothermal energy production, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.
Freshwater Replenishment	Beneficial uses of waters used for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).

Source: RWQCB2005.

The Basin Plan gives equal priority to each beneficial use of the surface water and groundwater. Included in the definition of surface water are playas and ephemeral washes. As presented in the table above, the desert washes provide beneficial functions and values such as groundwater recharge, flood peak attenuation and floodwater storage, and wildlife habitat. In the vicinity of the AMS project site are wetlands that are maintained by the Federal Bureau of Land Management (BLM). Up to 75 acre-feet per year (AF/y) of groundwater is pumped to Harper Lake to maintain water levels in the wetlands by a well located on the proposed AMS project site. This well is located within the proposed solar field and is expected to be properly abandoned by the project owner. A new well is expected to be installed by the BLM on land adjacent to the project site near the wetlands. The existing well would not be abandoned until the new well is functional and used as the new wetlands water supply well. Please refer to the **BIOLOGICAL RESOURCES** section for additional discussion regarding the wetlands water supply.

PROPOSED PROJECT DESCRIPTION

The AMS project would be a 250-MW capacity solar electric generating system that would consist of rows of parabolic mirrors (collectors) that would heat a fluid (therminol) inside piping placed at the focal point of each mirror row (AS2009a). The hot therminol would pass through a series of coils to boil water and create steam for a steam turbine generator. The solar field would be kept free of vegetation by hand pulling or the use of spot spraying of commercially available herbicides (AS2009a). The potential for wind erosion would be minimized by the use of dust palliatives (AS2009a). Mirror washing would be conducted at regular intervals. Operation of the project would require 63 fulltime and 10 seasonal employees (AS2009a).

Construction of the proposed power plant would involve approximately 1,765 acres (2.8 square miles) in an unincorporated portion of San Bernardino County (AS2009a). The project would be divided into two nearly identical, independently-operable, solar fields and power blocks (alpha and beta), each connected to a shared electrical transmission line interconnection substation (AS2009a). Each power block would have a 125-MW capacity, with the alpha plant occupying approximately 884 acres and the beta plant occupying approximately 800 acres (AS2009a). Approximately 81 acres would be used by both plants for managing storm water flowing to the project site and redirecting that flow to Harper Lake (AS2009a). In addition, each power block would have its own water treatment unit, evaporation ponds, therminol (heat transfer fluid) bioremediation unit, and natural-gas powered auxiliary boiler to prevent freezing of the therminol[3] (AS2009a). Construction of the AMS project is estimated to take 26 months, with an average workforce of 830 persons and a peak workforce of 1,162 persons (AS2009a).

<u>Soil Erosion and Storm Water Control</u>

The project proposes to manage stormwater in accordance with site-specific grading plans, a construction Storm Water Pollution Prevention plan (SWPPP), a Drainage Erosion and Sediment Control Plan (DESCP), and in accordance with the San

[3] Therminol freezes at 54^{o}F (AS2009a).

Bernardino County ordinances. These plans and ordinances would establish methods of when and how to control and manage storm water flow as it reaches, flows across, and then leaves AMS.

Water Supply and Use

Groundwater from the upper (uQal) aquifer would supply all proposed water uses at the AMS project (AS2009a). Four new wells are proposed to supply water for both construction[4] and operation of the project (AS2009a). Each of the two solar plants would have its own production well and a backup well. Each power block would also have a dedicated water treatment unit for plant process needs and a package treatment unit for potable water (AS2009a). Well installation would occur prior to the beginning of construction to support grading and other construction water needs (AS2009a).

Wastewater Management

Hydrostatic Test Water

An estimated 1.2 acre-feet of hydrostatic test water would be used for pressure testing the AMS project's piping and vessels (AS2009b). Depending on analysis of the water, the hydrostatic test water would either be trucked to a wastewater treatment facility or discharged to land where it would infiltrate the soil or evaporate (AS2009a).

Sanitary Waste

Sanitary waste would be contained in portable facilities during construction and routinely disposed of at a local treatment facility (AS2009a). During plant operation, sanitary waste at each power block would be disposed of through a septic and leach field system (AS2009a). Approximately 1,250 gallons per day (gpd) of wastewater would be disposed of through each septic system (AS2009a).

Process Wastewater

Process wastewater would be generated from cooling tower blowdown, chemical feed area, and general plant drains at each power block (AS2009a). The cooling tower blowdown would be processed by clarification, reverse osmosis (RO), a demineralizer system, and other treatment systems before being used for mirror washing and reused as steam system makeup water (AS2009a). Reject water from this treatment process at each power block would be discharged to four 10-acre, double-lined evaporation ponds (AS2009a). The evaporation ponds would be sized to retain all solids generated by the evaporation of the wastewater during the life of the project (AS2009a).

Wastewater from the chemical feed area and general plant drains would be processed through an oil/water separator (AS2009a). The separated oil and sludge would be containerized and transported to an off-site oil recycling facility. The remaining wastewater would be pumped to the plant's evaporation ponds (AS2009a).

[4] As an additional supply of construction water, the existing on-site Ryken well would be used during construction only (AS2009b).

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 would be caused by construction, operation, and maintenance of the project. Staff's analysis of potential impacts consists of a description of the potential effect, an analysis of the relevant facts, and application of the threshold criteria for significance to the facts. Staff has identified potential impacts, staff provides a summary of the applicant's proposed mitigation and a discussion of the adequacy of the proposed mitigation. If necessary, staff presents additional or alternative mitigation measures and refers to specific conditions of certification related to a potential impact and the required mitigation. Mitigation is designed to reduce the effects of potential significant project impacts to a level that is less than significant.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Impacts leading to soil erosion or depletion or degradation of water resources are among those staff believes could be most potentially significant soil and water resource issues associated with the proposed project. The thresholds of significance for these issues are discussed below.

Soil Resources

Staff evaluated the potential impacts to soil resources including the effects of construction and operation activities that could result in erosion and downstream transportation of soils and the potential contamination of soils and groundwater. There are extensive regulatory programs in effect that prevent or minimize these types of impacts. These programs are effective and, absent unusual circumstances, an applicant's ability to identify and implement Best Management Practices (BMPs) to prevent erosion or contamination is sufficient to ensure that these impacts would be less than significant. In addition, soils would be protected by the development and implementation of grading plans, construction SWPPP, and a DESCP.

Although these programs and BMPs are generally effective on most gas-fired power projects, the proposed project is of a substantially larger scale. Modeling and calculations can be used to estimate future scenarios and provide a basis for design parameters; however, these methods are based on assumptions and projections that can be imprecise. To account for the potential imprecision in the modeling and calculations, staff has proposed conditions of certification that would mitigate potential impacts. The LORS and policies presented in **Soil & Water Table 1** were used to determine the threshold of significance for the proposed AMS project.

Water Resources

To evaluate if significant CEQA impacts to soil or water resources would occur, the following criteria were used. Where a potentially significant impact was identified, staff or the applicant proposed mitigation to ensure the impacts would be less than significant.

- Would the project violate any water quality standards or waste discharge requirements?

- Would the project 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)?
- Would the project 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 on- or off-site?
- Would the project 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 on- or off-site?
- Would the project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?
- Would the project otherwise substantially degrade water quality?
- Would the project place housing 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?
- Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?
- Would the project 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?
- Would the project inundation by seiche, tsunami, or mudflow?
- Would the project result in substantial soil erosion or the loss of topsoil?
- Does the project 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)?
- Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

DIRECT/INDIRECT IMPACTS AND MITIGATION

A discussion of the direct and indirect AMS project construction and operations impacts and mitigation is presented below. For each potential impact evaluation, staff describes the potential effect and applies the threshold criteria for significance to the facts. If mitigation is warranted, staff provides a summary of the applicant’s proposed mitigation and a discussion of the adequacy of the proposed mitigation. In the absence of an applicant-proposed mitigation or if mitigation proposed by the applicant is inadequate, staff mitigation measures are recommended. Staff also provides specific conditions of certification related to a potential impact.

During construction, groundwater would be used for dust suppression, soil compaction, and hydrostatic pipeline and vessel testing. Potential impacts to soils related to increased erosion or release of hazardous materials could be possible during construction. Potential storm water impacts could result if increased runoff flow rates and volume discharge from the site increase flooding downstream. Water quality could be impacted by discharge of hazardous materials released during construction or by project-induced migration of poorer quality groundwater to higher quality groundwater. Project water demand could affect the quantity of available groundwater.

Operation of the AMS project could lead to potential impacts to soil, storm water runoff, water quality, and water supply. Soils may be potentially impacted through accelerated erosion or the release of hazardous materials used during the operation of the AMS project. Storm water runoff from the proposed project could result in impacts if increased runoff flow rates and volumes discharged from the AMS project increase erosion or downstream flooding. Water quality could be impacted by discharge of eroded sediments from the project or by the discharge of hazardous materials released during operation. Potential impacts to soil, storm water, water quantity, water quality, and water supply related to the construction and operation of the project, including the applicant's proposed mitigation measures and staff's proposed mitigation measures, are discussed below.

Soil and Wind Erosion

Construction and operation activities proposed by the applicant can adversely impact soil resources including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water dependant habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters. The magnitude, extent, and duration of those impacts would depend on several factors, including the proximity of the AMS project site to surface water, the soil types 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 can result in on-site erosion. In addition, high winds during grading and excavation activities can result in wind borne erosion leading to increased particulate emissions that adversely affect air quality.

The proposed project would discharge to Harper Lake, which has no direct connection to a perennial stream or other navigable waters or permanent water source such as a lake or spring and do not qualify as jurisdictional features subject to regulation under the federal Clean Water Act (USACE2010a). Discharges from the proposed project are, therefore, not expected to have a significant impact on sensitive surface waters.

The AMS project site would be subject to wind and water erosion during construction. Construction of the project is scheduled to take approximately 26 months to complete. The total earth movement would be substantial with approximately four million cubic yards of soil to be cut, moved, and reused in a 1,765-acre site area (AS2009a).

The Natural Resources Conservation Service (NRCS) classifies soils at the project site as Cajon sand and Cajon sandy loam with lesser amounts of Kimberlina loamy fine sand and Norob-Halloran complex soils. Eighty percent or more of the proposed project site is underlain by Cajon sand and Cajon sandy loam (AS2009a). According to the Unified Soils Classification System (USCS), Cajon sand and Cajon sandy loam soils contain poorly graded sand (SP) and silty sands (SM). These excessively well drained soils have a high rate of water transmission. Minor soils within the proposed project site boundary include Kimberlina loamy fine sand and the Norob-Halloran complex. Kimberlina loamy fine sand consists of loamy fine sand, sandy loam, fine sandy loam (SM), and loam (ML). The Norob-Halloran complex consists of loamy sand and sandy loam (SM), sand (SP, SP-SM), gravelly loamy sand (SC-SM), sand clay loam (SC), and clay loam (CL). These soils may have low infiltration rates in some areas, but generally have a high rate of water transmission. Collectively the proposed project boundary contains soils with a low to moderately low susceptibility to sheet and rill erosion. Local soils are also poorly consolidated and highly susceptible to wind erosion (AS2009a).

Construction

The Revised Universal Soil Loss Equation, version 2 (RUSLE2) was used to estimate potential soil loss from water erosion. In its current state, the potential project area could lose approximately 0.58 tons/acre/year from water erosion. Given the planned construction activities, the impacts from water erosion could be significant. Some of the soils are prone to significant erosion and could cause significant off site impacts without the proper measures in place. The applicant proposes to implement sediment and erosion control BMP's that would mitigate and limit soil loss to approximately 0.61 tons/acre/year during construction. Projected wind erosion rates are similarly high for the existing site condition and the construction phase. The estimated wind erosion rate for these phases is over 100 tons/acre/year.

In the draft project grading plan and DESCP, the applicant proposes BMPs for wind and water erosion control during project construction. The implementation of appropriate erosion control measures would help conserve soil resources, maintain water quality, and prevent accelerated soil loss. The erosion and sedimentation control measures include: applying water or soil binders to the roads in active construction and laydown areas; controlling speed on unpaved surfaces; installing stabilized entrances/exits; use of earthen berms, silt fences, or fiber rolls to control sedimentation; and preserving existing vegetation. During grading work, soil would also be stabilized by maintaining sufficient water content to make it resistant to weathering and erosion by wind and water (AS2009a).

Operations

The proposed project would have lower rates of erosion during the operations phase of the project, approximately 0.066 tons/acre/year. The reduced rate of erosion during operations is achievable through use of BMPs and site design features. During the operations phase, berms would surround each solar field and minimize sediment migration off-site (AS2009a). The applicant also proposes regular applications of dust palliatives and water during operations that would reduce wind erosion to 1 ton/acre/year. Reduced wind erosion would also result in reduced mirror damage due to sediment abrasion (AS2009a).

Given the low frequency of precipitation and storm water runoff, BMPs proposed by the applicant should limit potential soil loss from water erosion caused by on-site precipitation events. BMPs would be applied and erosion and sedimentation control measures repaired as soon as erosion is evident. Temporary erosion control measures would be implemented as needed to control erosion during both construction and operation. Temporary sediment control materials would be maintained on-site throughout the life of the project to respond as needed to unforeseen rain or emergencies. With implementation of BMPs identified by the applicant in the AFC and proposed in Condition of Certification **SOIL&WATER-1**, significant soil erosion and subsequent sedimentation would be avoided. Overall, staff believes the applicant has identified a reasonable plan and sequence for implementing BMPs in the DESCP that would avoid significant adverse erosion and sedimentation impacts resulting from precipitation runoff. Staff concludes that through the proper application of BMPs as proposed by these conditions of certification, the impact to soil resources from water and wind erosion during construction would be reduced to a level that is less than significant.

High winds during grading and excavation activities can result in 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, protect downstream properties and resources, and protect air quality. Conditions of Certification in the **AIR QUALITY** section require a construction mitigation plan to prevent significant impacts from fugitive dust and wind erosion during construction. These prevention measures include: employing an on-site mitigation manager, limiting vehicle speed to five miles per hour during construction; requiring all unpaved roads and disturbed areas and linear construction sites to be watered as frequently as necessary during grading and stabilized thereafter with a non-toxic soil stabilizer or soil weighting agent to comply with the dust mitigation objectives; and establish performance standards for controlling fugitive dust and requirements for response should they be exceeded. The requirement to use soil weighting and bonding agents following grading would conserve freshwater by reducing the need for water as a means to control fugitive dust.

The applicant has also proposed permanent wind erosion control measures to mitigate potential erosion and subsequent fugitive dust impacts resulting from prevailing winds during construction and operation of AMS project. During operation, areas not covered by foundations, paving, or the solar array would be treated with soil stabilizers. The AMS project is expected to minimize wind erosion in an effort to protect the mirrors and minimize maintenance and damage. Erosion control measures would be required by staff in Condition of Certification **SOIL&WATER-1**. With implementation of the requirements, staff does not believe there would be significant impacts to soil resources during operation of the AMS project.

The proposed project would build solar fields, Alpha and Beta, which will contain all on-site soils and prevent off-site sedimentation. Application of soil binders could reduce infiltration in solar fields. Less infiltration means more runoff and more potential sedimentation. In compliance with **SOIL&WATER-1,** the applicant will contain all storm water generated on site, with the exception of upstream run-on diverted through the proposed drainage channel.

Additional requirements for mitigation of soil erosion impacts will also be included as a part of waste discharge requirements for stormwater that would be included in Condition of Certification **SOIL&WATER-2.** These requirements will be included in the Supplemental Staff Assessment after the applicant submits all required information to the RWQCB and County of San Bernardino and staff for review.

Storm Water and Drainage

Paved areas would include site access roads and small portions of each power island. Each 20-acre power island would include approximately 1.75 acres of paved areas, including emergency access roads, administration, and warehouse buildings. Power island access would be available year round and would not be weather dependent. Solar field access may be subject to flooding. Drainage crossings on Lockhart Road and Harper Lake Road would be routed beneath the roads. Solar field access roads would cross channel bottoms and may be subject flooding during high-flow events. Solar fields would remain unpaved.

The proposed project would contain all storm water runoff generated on-site. The proposed facilities would closely match existing topography and would contain an average slope of 1%. The solar fields would be bordered by berms of sufficient height to contain storm water runoff. The relatively flat solar fields, consisting of high permeability soils, encourage percolation of storm water. Runoff from each power island within each solar field, would sheet flow into the solar fields. Each of the two power islands is expected to have no more than 1.75 acres of pavement. Chemical storage areas and areas containing oil-filled transformers would drain to oil-water separators for treatment prior to being discharged to the site's evaporation ponds (AS2009a).

The proposed project would discharge to Harper Lake, which has no direct connection to a perennial stream or other navigable waters or permanent water source such as a lake or spring and does not qualify as jurisdictional feature subject to regulation under the federal Clean Water Act (USACE2010a). Discharges from the proposed project are, therefore, not expected to affect federally regulated surface waters. Nonetheless, staff believes implementing BMPs during construction is necessary to protect natural downstream habitat and drainage features from construction discharges.

Staff believes the terrain, originating from the Kramer Hills south of the AMS project, slopes toward the AMS project site and historically drained towards the site. The applicant has designed eight on-site drainage channels that border the solar fields and convey run-on through or around the site. The channels are sized according to the 1986 San Bernardino County Hydrology Manual and account for appropriate bulking, erosion protection, and freeboard. The applicant sized the channels for the 100-year storm to simulate a high intensity short duration rainfall event typical of a desert landscape (AS2009a).

As proposed, the graded project site would slope towards the northeast with a slope of approximately 1%. Proposed earth-lined drainage channels intercept storm water run-on from the southern and western site boundaries and convey it around the project through earth-lined drainage channels, where it would discharge in its natural location into Harper (dry) Lake. The proposed outlet structure consists of a 30-acre "spreading ground," which would allow concentrated flows passing through the site to transition back to its natural state as sheet flow. The designed diversion channel could handle flows up to 21,232 cubic feet per second (cfs), the calculated combined flow generated in channels intercepted by the proposed project. A smaller channel along the northern border of the west solar field, Channel F, would capture flows up to 458 cfs and convey them north to an existing drainage ditch. Designed site drainages convey the 100-year storm, in accordance with the County of San Bernardino Flood Control District standards. Grading plans propose to maintain drainage features to the extent possible. Storm water run-off generated on each power block would be conveyed to localized containment areas where it would be conveyed to each power block's oil-water separator (AS2009a).

Proposed drainage channels may be subject to scour and erosion, which could alter their hydraulic capacity or functionality. The AMS project would alter natural storm water drainages but is not expected to significantly alter sediment migration patterns within the drainage area. Maintenance of drainage channels and diversions is required to ensure peak flood flows are routed away from the solar field. Staff will require a channel maintenance program, which will ensure that the project's channels perform at design capacity throughout the life of the project. **SOIL&WATER-3** requires that the applicant identify activities and procedures needed to maintain the design capacity of the drainage features to avoid future potential flood related impacts. Condition of Certification **SOIL&WATER-3** requires the project owner prepare a channel maintenance program and obtain Compliance Project Manager (CPM) approval prior to implementation. These conditions will require the applicant to identify activities and procedures needed to maintain the design capacity of the drainage features to avoid future potential flood related impacts.

Staff reviewed the applicant's hydrologic calculations in the Hydrology Study to evaluate the off-site areas tributary to the AMS project site. Historically storm water from off-site areas would flow toward and across the site via eight separate drainages. As proposed, the AMS project would concentrate these flows and divert them through the property. Staff reviewed the applicant's drainage design drawings and design assumptions and agrees that the proposed drainages adequately convey run-on through the project and will return flow to its upstream volume and flow rate prior to discharge into Harper Lake.

Staff also assessed the potential for the proposed drainage design plan to cause impacts related to off-site flooding. Staff reviewed appropriate federal, state and local guidelines and specifications applicable to engineered channels. Staff used these criteria to examine the applicant's flood management plan and to provide comment on the limitations and thresholds of the plan to avoid potential impacts. Staff is awaiting submittal of the storm water surface profile analysis for flows in channels to complete analysis of the drainage design and potential flooding off-site. Information is also needed to address San Bernardino County's concerns and comments documented in their letter dated 2/1/2010, and discussed below under 'Response to Agency Comments'. Staff are also currently working with the RWQCB to develop additional requirements that will be included as a part of the final Condition of Certification **SOIL&WATER-2** in the Supplemental Staff Assessment to ensure there are no offsite storm water impacts. However, staff concludes the proposed on-site drainage management design would perform adequately and any potential impacts would be mitigated if Condition of Certification **SOIL&WATER-1**, **-2**, and **-3** are implemented as proposed.

Based on the methods proposed by the applicant, staff believes that storm water runoff from the site as well as potential nuisance flows from plant operation and maintenance would not cause significant impacts to the receiving waters with implementation of the Conditions of Certification **SOIL&WATER-1**. If implemented as proposed, staff believes the storm water management, including on-site retention, would protect the site from erosion and downstream areas from sedimentation and degradation by deleterious materials. Condition of Certification **SOIL&WATER-1** requires that the applicant develop a DESCP. Staff believes that if the AMS project complies with these conditions, there would not be significant erosion or sedimentation impacts due to on-site storm water runoff.

Flooding, Tsunami, and Seiche

All storm water overland flow reaching the proposed project would be diverted to a central channel and redirected to the Harper Lake. Storm water from a 100-year, 24-hour storm event captured on the project site would be routed to the solar fields where it would be retained until all the storm water evaporated or infiltrated into the soil (AS2009a). No storm water from storm events up to 100-year storm events would leave the AMS project site. The on-site management of the storm water would reduce potential impacts from storm water related flooding to a level that is less than significant. The redirecting of the storm water overland flow would not impact adjacent land uses and may provide a positive benefit to the Harper Lake playa marsh area during larger storm events by providing storm water to this area.

The AMS project site is too far inland to be affected by tsunami or seiche, and the proposed solar fields and power blocks are not located within the 100-year floodplain as defined by Federal Emergency Management Agency (FEMA). The electrical transmission line interconnection and natural gas supply line are immediately adjacent to the proposed project (AS2009a). To prevent potential impacts, staff recommends Conditions of Certification **SOIL&WATER-1** and **-2** that would require BMPs, as discussed above, to ensure that the service utilities line would not be affected by or exacerbate flooding.

Water Supply

The applicant has proposed to pump groundwater from on-site wells for all potable water and plant operation needs. Staff has analyzed the project's proposed groundwater use to determine if it would cause substantial depletion or degradation of local or regional groundwater quality and supply. A summary of the AMS project water requirements is presented below in **Soil & Water Table 3**.

Soil & Water Table 3
Proposed Annual Project Water Source and Use[1]

	Water Demand	Water Supply Source	Estimated Average Volume of Water Required	Estimated Maximum Volume of Water Required
Construction	Soil Compaction and Dust Suppression	Proposed On-site Groundwater Wells and One Existing On-site Well	1,716,000 gpd (1,025 AF/y)	1,716,000 gpd (1,025 AF/y)
	Ongoing Construction Needs		59,800 gpd (68 AF/y)	61,750 gpd (70 AF/y)
	Drinking Water[2]		1,660 gpd (1.9 AF/y)	2,324 gpd (2.6 AF/y)
	Total Construction Water Demand[3]		**1,095 AF/y**	**1,098 AF/y**
Operation	Cooling Water Makeup, Mirror Wash Water; and Maintenance[3]	Proposed On-site Groundwater Wells	2,140 AF/y	2,140 AF/y
	Landscaping[4]		Included in the Total Water Requirement	
	Fire Protection (used as necessary)		363,200 gallons	363,200 gallons
	Drinking and Sanitation		20 AF/y	20 AF/y
	Total Operational Water Demand		**2,160 AF/y**	**2,160 AF/y**

Source: AS2009a; AS2009b.
Notes: 1. Construction water use is based on a 26-month construction schedule. Operations water use assumes the AMS project would operate at 100% of the plant's total capacity over the life of the project. 2. Estimated at 2 gallons per day per person. 3. The AFC states that the cooling water makeup, mirror wash water, and maintenance water would be 2,163 AF/y. Groundwater impact modeling conducted by the applicant used a volume of 2,160 AF/y. To be consistent with the applicant's modeling, staff's analysis uses a volume of 2,160 AF/y. 4. Water that would be used for landscaping was not identified by the applicant and therefore is assumed to be included in the total operational water demand.

Potable water for the construction workforce would be supplied by on-site wells. A single treatment facility would be installed for each pair of wells, one in each solar field (AS2009a). The depth to groundwater at the project site is estimated to be between 125 to 145 feet bgs (AS2009a). Groundwater would not be encountered during grading activity. Staff recommends Condition of Certification **SOIL&WATER-4** to ensure that on-site groundwater wells would be constructed in accordance with state and local LORS (AS2009a).

During construction months 1 through 6, groundwater would be used at the rate of 1,025 AF/y (1,766,050 gpd) (AS2009a; AS2009b). During months 7 through 26 of construction, groundwater would be used at a rate of between 68 AF/y (58,800 gpd) and 70 AF/y (61,750 gpd) (AS2009a; AS2009b). Maximum groundwater use during project operation would be 2,160 AF/y.

All of the AMS project water would come from the HVGB located in the Centro subarea of the Mojave Basin adjudication. The adjudication is a groundwater management system, but this system does not provide absolute protection against overdraft. Groundwater quality is not a primary component of the adjudication. The adjudication focuses on groundwater volumes (water rights) with a goal to balance groundwater supply and consumption. To manage the volume of water pumped within the adjudication boundary, the adjudication has established water allowances for each subarea and each groundwater pumper in the five subareas. In the Harper Lake area, where the AMS project would be sited, the prescribed groundwater allowances are presented below in **Soil & Water Table 4**.

Soil & Water Table 4
Water Allowance and Use in the Harper Lake Area

Harper Lake Area Water Allowance		
Water Allocation	**Water Volume (AF/y)**	**Description**
Base Annual Production (BAP)	12,542	This volume is the verified maximum annual volume of production by each producer in a subbasin during the 5-year period from 1986 to 1990.
Free Production Allowance (FPA)	10,036	The amount of BAP that may be produced from a subarea free of any replacement obligation (a fee charged by the Watermaster for a volume of water used in excess of the FPA). In the Centro subbasin, the FPA is 80% of the BAP and represents an initial 20% ramp down volume.
Production Safe Yield (PSY)	4,144	PSY is defined by the highest average annual volume of water that can be produced from a subarea without causing a long-term decline in water levels. The numerical PSY volume is defined by groundwater modeling and ongoing groundwater level measurements. The goal of the adjudication is to balance long-term supply and demand and make up any deficit by the purchase and recharge of supplemental water so that the FPA is within 5% of the PSY.
AMS Project Water Allowance and Water Use		
Water Allocation	**Water Volume (AF/y)**	**Description**
Base Annual Production (BAP)	10,478	Equals the AMS project's land purchase, transfer, and option purchase BAP volume.
Free Production Allowance (FPA)	5,239	Represents a consumptive use adjustment for changing the groundwater use from agricultural to that used by the AMS project. One-half of the agricultural water is assumed to have returned to the groundwater as return flow. 5,239 AF/y = 10,478 AF/y / 2.
Adjudication Ramp Down (actual FPA)	4,192	Equals the adjudication ramp down volume, which is about 20% of the proposed AMS project's FPA.
Volume the AMS project Proposes to Use	2,160	The actual volume of groundwater Abengoa proposes to use.
Existing Cumulative Harper Lake Area Production		
Water Use	**Water Volume (AF/y)**	**Description**
2007-08 Verified Production	1,731	The verified production in the Harper Lake area during 2007 to 2008. Includes pumping by the SEGS 8 & 9 power plants.
AMS Project Proposed Production	2,160	The maximum proposed groundwater pumping by the AMS project.
Total Harper Lake Area Production	3,894	The total groundwater pumping in the Harper Lake area, when the AMS project proposed maximum pumping is included.
Remaining Balance for PSY	250	The volume of Harper Lake area Production Safe Yield (PSY) in excess of the Total Harper Lake Area Production (4,144 AF/y minus Total Harper Lake Area Production of 3,894 AF/y).

Source: MBAA1996; MBAW2009a; AS2009a.

Base Annual Production (BAP) is the verified maximum production by each user between the years 1986 to 1990 (MBAA1996). Each producer has a BAP right to the Free Production Allowance (FPA) within each subarea (MBAA1996). The FPA is the total amount of water that may be produced from a subarea in a year without the obligation to pay for replacement of water that exceeds the FPA (MBAA1996). Each subarea's production safe yield is defined as the highest average annual volume of water that can be produced from a subarea under one of three scenarios: "1) over a sequence of years that are representative of long-term average annual natural water supply to the subbasin net of long-term average annual natural outflow from the subarea; (2) under given parameters of production, applied water, return flows, and consumptive use; and (3) without resulting in a long-term net reduction of groundwater in storage in the subarea" (MBAA1996). Current groundwater pumping in the Harper Lake area is approximately 6% less than the PSY.

Based on actual water level data, the PSY level may be incrementally increased or decreased year to year. The adjudication management goal is to bring the FPA to within 5% of the PSY. The adjudication prohibits the transfer of FPA into the Harper Lake area to support a project and out of the Harper Lake area to support a project (MBAW2009a). Production in excess of the FPA is subject to a replacement obligation, which is a fee designed to fund the purchase of replacement water in the amount in excess of the FPA.

If groundwater levels are stable, the ramp down requirement to bring the FPA to within 5% of PSY may not be needed. However, the volume of water the AMS project would use (2,160 AF/y) would be less than the initial adjudicated ramp down value (4,192 AF/y). Even if the ramp down value was to increase to 50% of the FPA (approximately 2,620 AF/y), the proposed project would have enough allocated groundwater to continue to operate.

Potential Project Impacts to Groundwater Levels and the Basin Balance

While the AMS project's water requirements are within their ramp down FPA, staff also considered the potential impact of the project's proposed groundwater use on groundwater levels and the basin balance in the HVGB. The applicant and staff used a computer model of the Mojave Basin developed by the USGS for the Mojave Basin Area adjudication (USGS2001). Staff's modeling analysis is used herein and a discussion of the model and model results is presented as Appendix B.

The model results indicate that groundwater levels in the vicinity of the proposed AMS project are recovering from past impacts and the recovery effect decreases with distance from the AMS project site. It is noteworthy that observed water levels in the vicinity of the AMS project site have increased, whereas in other areas in Harper Valley observed groundwater levels seem to have stabilized or continue to decline. The local groundwater recovery was primarily the result of the termination of agricultural activity on and in the vicinity of the AMS project site.

Based on the USGS model, staff used local aquifer conditions and the expected well construction configuration to evaluate the potential project-related pumping and recharge impacts to a representative sample of wells in the Harper Lake model zone. All use of wells within a groundwater basin contributes toward a lowering of water levels at other well locations. The overlap of drawdown among two or more wells is called “well interference,” and is considered significant when it changes conditions in and around an existing well to the point that it affects well yield. Reductions in well yield can occur as the static or pumping water level drops below the top of the well screen or the water production capacity decreases as a result of incrusting deposits clogging the well screen openings and water-bearing formation around the well screen. A loss of yield is appreciable if the well becomes incapable of meeting 1) maximum daily demand, 2) dry-season demand, or 3) annual demand.

Potential Project Impacts to Groundwater Levels

Soil & Water Table 5 below summarizes available well completion data for the Harper Lake model zone and recent (2008) observed depths to water. These data show on average wells are 365 feet deep and the top of the well screens located 198 feet below land surface. Hence, pumping wells extract groundwater primarily from the deeper alluvium represented by layer 2 of the groundwater-flow model. In 2008, the average depth to water was 124 feet below land surface, indicating that on average the well screens are submerged 55 feet below the water table.

Soil & Water Table 5
Summary of Well Construction and Observed Water Level Data Available for the Harper Lake Area

Well ID	Well Depth (ft bgs)	Top of Screen	Bottom of Screen	Well Type	Static Water Level (ft bgs)	Year Measured
DWR Record 1	350	210	350	Domestic	184	2003
DWR Record 2	410	180	410	Irrigation	130	1972
DWR Record 3	545	205	545	Irrigation	190	1979
DWR Record 4	350	210	350	Domestic	---	1976
DWR Record 5	545	205	545	Irrigation	190	1979
DWR Record 6	367	155	367	Irrigation	---	1967
DWR Record 7	285	123	285	Irrigation	130	1972
DWR Record 8	415	250	415	Irrigation	250	1977
DWR Record 9	460	220	460	Irrigation	218	1974
DWR Record 10	400	180	400	Domestic	---	1974
DWR Record 11	460	160	460	Irrigation	---	1969
DWR Record 12	350	150	350	Community	192	1983
DWR Record 13	350	180	350	Domestic	340 (?)	1987
DWR Record 14	350	170	350	Domestic	209	1980
DWR Record 15	460	160	460	Irrigation	---	1969
DWR Record 16	225	160	225	Domestic	174	1979
DWR Record 17	300	189	300	Irrigation	163	1970
DWR Record 18	360	160	360	Domestic	---	1982
DWR Record 19	300	---	---	Domestic	---	1982
DWR Record 20	360	200	360	Domestic	---	1982
DWR Record 21	350	250	350	Domestic	---	1982
DWR Record 22	400	150	400	Domestic	---	1982
DWR Record 23	445	220	445	Irrigation	220	1968
DWR Record 24	425	160	425	Irrigation	---	1968
DWR Record 25	457	170	457	Irrigation	173	1969
USGS Record 1	---	---	---	---	79	2008
USGS Record 2	363	---	---	---	230	2008
USGS Record 3	126	---	---	---	206	2008
USGS Record 4	134	---	---	---	84	2008
USGS Record 5	200	---	---	---	62	2008
USGS Record 6	223	---	---	---	75	2008
USGS Record 7	---	---	---	---	16	2008
USGS Record 8	361	---	---	---	145	2008
USGS Record 9	500	---	---	---	201	2008
Ryken Well	425	58	425	Irrigation	143	2008
Average (2008)	**365**	**179**	**394**	**---**	**124**	**---**

Source: DWR2010; USGS2010.
Notes: Static water level averages are for 2008 only. A dashed line in the table is a place where data is not available. A question mark indicates an uncertain data value.

The maximum theoretical well yield can be defined as the pumping rate supplied by a well without lowering the water level in the well below the pump intake (F&C1979). Typically, pump intakes are located near the top of the screened interval because it is desirable to keep the screen submerged under water; submerging the well screen can minimize chemical clogging and physical deterioration of the well screen (Driscoll1995). In addition, submersible motors require a sufficient flow of water over the motor to maintain the manufacturer specified cooling requirements (CGA1999). These pumps are also optimized for specific water pressure at the pump intake to maintain pump performance (CGA1999). To ensure that well pumps in the Harper Lake area are adequately protected, staff recommends 25 feet of head should be maintained in the wells in the Harper Lake area. Considering the average well screen is submerged 55 feet below the water table, the maximum acceptable drawdown that can occur before impacting pump performance and theoretical well yield is on average 30 feet (55 feet of water column less the 25 feet of head recommended for pump performance and cooling purposes).

Modeling of the construction water use indicates that drawdown at 29 well locations range from -2 to 18 feet[5] (Appendix B). During plant operation, modeling indicates that drawdown in these wells would range from -2 to 19 feet over the life of the project (project operations assumed to end in the year 2042). Based on this modeling, project pumping would not significantly impact other wells by creating a drawdown in excess of 30 feet over the life of the project. To ensure that the AMS project's water use is consistent with the volume of groundwater use analyzed by staff, Condition of Certification **SOIL&WATER-5** would limit construction water use to 1,098 AF/y and operation water use to 2,160 AF/y. Staff also points out that there are variations in the natural environment that could affect the results predicted by a groundwater model. To ensure that the predictive results of the groundwater model are representative of site conditions and further determine whether mitigation may be required, staff recommends Condition of Certification **SOIL&WATER-6** which would require the project to establish a groundwater monitoring network and monitor and document groundwater use, groundwater levels, and groundwater level trends. This condition of certification would provide a baseline of groundwater elevations and groundwater elevation trend to identify potential future changes to groundwater elevations owing to the project's pumping.

Potential Project Impacts to the Basin Balance

As explained further in Appendix B and demonstrated in **Soil and Water Appendix B Table 5,** the proposed AMS project pumping would remove approximately 1,860 AF/y of groundwater from storage in the Harper Lake model zone and approximately 400 AF/y from the other portions of the Centro subarea. By 2042, the end of the functional life of the project, groundwater pumping by the project would consume from these two areas 59,500 and 12,800 AF of the simulated stored groundwater in place as of 2008, respectively. Additionally, pumping would consume about 18,200 acre-feet of simulated recharge from adjacent portions of the Centro subarea that otherwise would have

[5] Simulated water levels at some locations are recovering even with project construction pumping, and negative drawdown indicates simulated water levels in 2012 are greater than 2008.

increased basin storage in the Harper Lake model zone without the AMS project. As calculated in Appendix B, the following groundwater storage reductions would occur as a result of the AMS project pumping:

- Project pumping would remove about 1% of the estimated total storage volume (approximately 4,945,550 AF) in place within the Harper Lake model zone and less than 0.1% of the estimated total storage volume in place within the remainder of the Centro subarea.
- The accessible groundwater, which is represented by water in the saturated zone between the water table and average depth to the bottom of existing wells, is approximately 1,740,500 AF. The AMS project groundwater consumption would represent 3% of this volume of water.
- The Harper Lake model zone has limited connection with the Mojave River, and based on model results the storage decline within the Harper Lake model zone has negligible effect on simulated stream leakage to the Centro subarea from the Mojave River.

Staff believes these results indicate project pumping will not have significant impacts on aquifer storage volumes or other users in the HVGB or Centro Subarea with the implementation of Conditions of Certification **SOIL&WATER-6** and **BIO-20.**
Staff conducted additional model analysis to estimate an operational yield for the Harper Lake model zone. The operational yield is defined herein as the maximum pumping rate resulting in no long-term cumulative loss in Harper Lake model zone groundwater storage over the life of the project. With the proposed project, the simulated pumpage in the Harper Lake model zone is 7,750 AF/y (5,490 AF/y of existing pumpage plus 2,260 AF/y of pumpage by the project). The 5,490 AF/y of existing pumpage is the 2008 modeled pumping rate, which the applicant reportedly developed from Mojave Water Agency data (ESH 2009f). This volume appears to be almost 1,600 AF/y greater than that reported in the Mojave Water Agency's annual report (almost 3,900 AF/y). The higher pumping rate simulated in the model likely over estimates the projected future groundwater storage decline and model results might therefore be characterized as being conservative.

Based on the applicant's modeled pumpage, the operational yield of the Harper Lake model zone is 6,235 AF/y (about 20% less than existing pumpage plus AMS project pumpage). In other words, simulated Harper Lake model zone pumpage can be as high as 6,235 AF/y and not cause a simulated long-term net decline in Harper Lake model zone storage. A 1,515 AF/y reduction in simulated pumpage, either from mandatory pumping cut-backs or similar amount of water savings from conservation, is therefore required to bring the Harper Lake model zone to a point within 5% of this operational yield when the project consumes 2,260 AF/y of groundwater.

Under the adjudication, a 1,515 AF/y reduction to the Harper Lake model zone would translate to a 2,096 AF/y reduction to the proposed AMS project's FPA. The AMS project FPA is 5,239 AF/y. The adjudication's initial 20% ramp down value plus an additional 20% ramp down (to bring the Harper Lake model zone to within 5% of operation yield) reduces the AMS project's FPA to 3,143 AF/y. This FPA volume is still well within the project's proposed maximum groundwater use.

Potential Impacts to Biological Resources

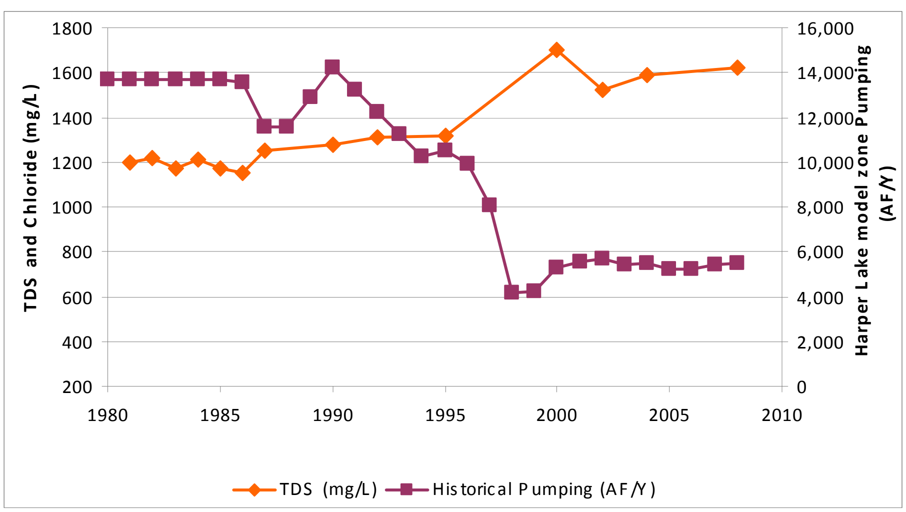
As discussed in this section and in the **BIOLOGICAL RESOURCES** section, staff determined that there would be no significant impacts to biological resources due to the projects proposed groundwater pumping with the implementation of Conditions of Certification **SOIL&WATER-6** and **BIO-20**. In addition, there are no known seeps or springs in the Harper Lake area.

Water Quality

Groundwater quality data is available from the Ryken well, located approximately in the middle between the Alpha and Beta plants of the proposed AMS project. The Ryken well is 14 inches in diameter with a screened depth of approximately 58 to 425 feet below ground surface, and used by the applicant for aquifer testing reported in the AFC (AS2009a). The Ryken well provides the most complete groundwater quality dataset available of all wells located near the proposed AMS project wells, and therefore is the focus of staff's analysis. While the Ryken well provides an indication of the groundwater quality at the AMS project location, groundwater quality beneath the site and adjacent areas varies naturally both laterally and with depth as well as over time. The proposed project wells planned for construction at the Alpha plant would be located 0.98 miles to the northwest of the Ryken well, and the proposed wells planned for construction at the Beta plant would be located 0.66 miles to the southeast of the Ryken well.

Soil & Water Graph 1 shows the relationship between historical Harper Lake Valley Basin pumping (as represented in the Harper Lake model zone of the groundwater-flow model) and TDS concentrations in Ryken well-water samples. In general, annual pumping in the Harper Lake model zone began to decrease after 1985 and corresponded to an upward trend in TDS concentrations measured in Ryken well-water samples.

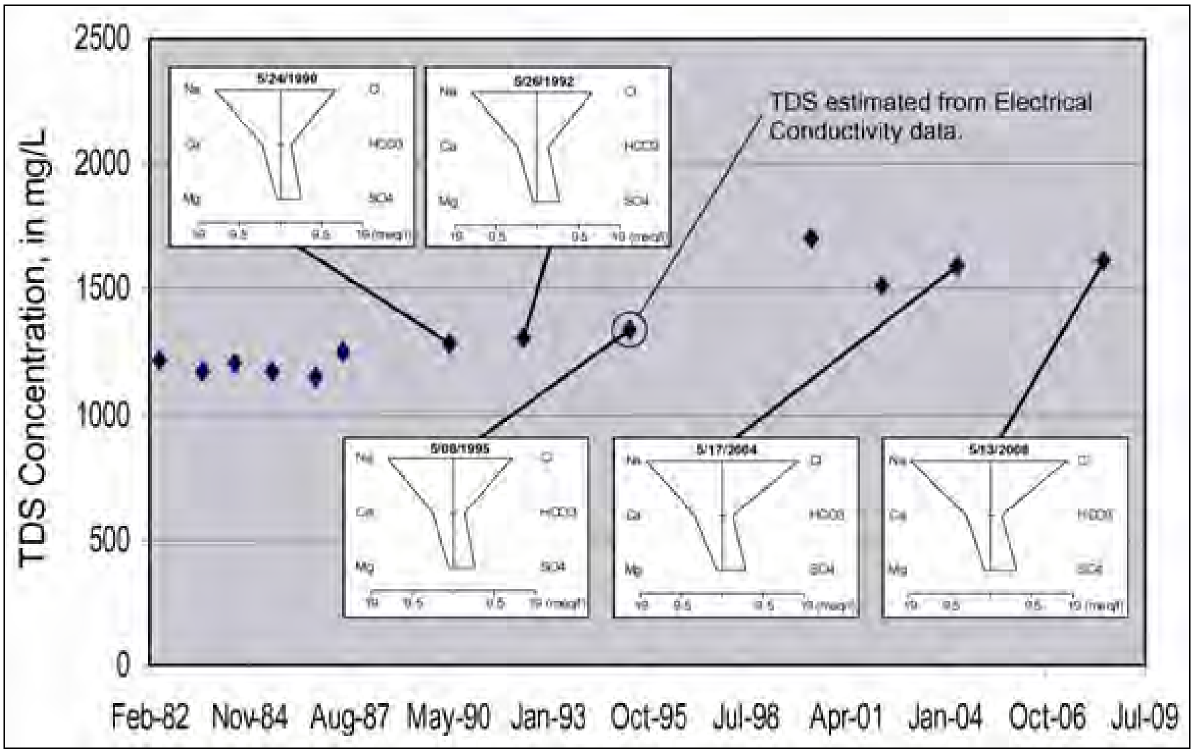
Soil & Water Graph 1
Historical TDS Concentrations in Ryken Well Water Samples
And Annual Harper Lake Model Zone Pumping Rate



Source: USGS2010; AS2009a.

Analysis of the cations and anions in the well-water samples provide an indication of the character and quality of the groundwater. **Soil & Water Graph 2** below shows that TDS concentrations and the proportional contribution of sodium and chloride to the TDS concentrations increase following the decline in annual pumping rate. As TDS concentrations and the concentrations of sodium and chloride ions increase, the desirability of groundwater as a drinking water source decreases.

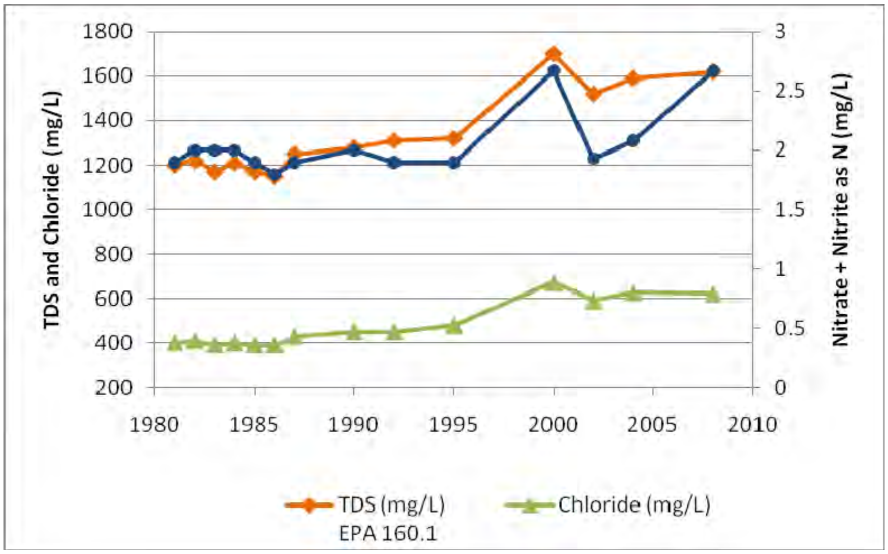
Soil & Water Graph 2
Summary of Historical Cation and Anion Concentrations
In Groundwater from the Ryken Well



Source: USGS2010.

Analysis of TDS, chloride, and total nitrogen concentrations in the groundwater from the Ryken well provides an additional indication of groundwater quality changes over time. Summarized below in **SOIL & WATER Graph 3** are the results of 14 well-water samples from the Ryken well collected between 1981 to 2008 (USGS2010). The analytical results indicate that when the Ryken well property was in use for agriculture during 1980s, the TDS, chloride, and total nitrogen concentrations appear relatively stable. However, it appears that after groundwater pumping declined starting in the late 1980s the TDS, chloride, and total nitrogen concentrations began to increase.

Soil & Water Graph 3
Total Dissolved Solids, Chloride, and Total Nitrogen Concentrations in the Ryken Well



Source: USGS2010.

The inverse relationship between groundwater pumping and quality of the well-water produced suggests that the relatively high use of groundwater for agriculture extracted greater proportions of groundwater that are relatively low in TDS, chloride ion, and total nitrogen concentrations. The top of the Ryken well screen is located at the shallow depth of only 58 feet below land surface, and the filter pack and well screen likely intersect the shallow, lower quality perched groundwater zone. During times of higher pumping rates, greater proportions of the deeper, better quality aquifer water may have been extracted, effectively diluting the contribution from the shallow, relatively lower quality perched groundwater. When the pumping rate decreased, a proportionally greater contribution of the relatively low quality perched groundwater caused TDS, chloride, and total nitrogen concentrations to increase. High TDS and chloride concentrations in groundwater are consistent with partially evaporated water such as one would expect near the playa lakebed. High nitrogen concentrations are also consistent with water associated with agricultural irrigation returns. Without additional data and analyses, it is not possible to determine the relative contributions from these different water sources, but it seems likely that a similar inverse relationship between pumping rate and water quality could be expected from the AMS project's proposed wells if constructed such that their filter pack and well screens intercept the perched water zone.

Staff notes water quality data is limited for this site. Based on staff's analysis of the limited data, it appears the AMS project's use of groundwater would not significantly impact the quality of groundwater in the HVGB, but conceivably may contribute to lateral movement of poorer quality groundwater from beneath the Harper (dry) Lake towards the BLM marsh water supply well. The marsh water supply well is located between the proposed AMS project wells and Harper (dry) Lake. The AFC reports that TDS concentrations generally increase towards Harper (dry) Lake, suggesting that poor quality groundwater may exist in the main aquifer beneath the lakebed. However, staff is not aware of any data to support or refute this assumption. Modeling results prepared by the project applicant show that the project's groundwater pumping would induce the lateral movement of groundwater from beneath the Harper (dry) Lake towards the project's water supply wells, however, the time of travel is likely on the order of 50 to 100 years.

Analyses of groundwater movement and quality provide differing results. Modeling results prepared by the project applicant show that the project's groundwater pumping would likely, over time, induce the lateral movement of poorer quality groundwater from the Harper Lake area towards the project's water supply wells. In contrast, historical data, while limited, demonstrates that groundwater has been pumped from site wells for decades. When the agricultural demand for water was at its peak, this demand was about five times greater than the proposed groundwater use for the AMS project. However, even with the historical pumping, it does not appear that groundwater produced by the Ryken well decreased in quality as a result of groundwater movement from beneath Harper (dry) Lake. It is possible that travel times from beneath the lakebed to adjacent wells are so long an impact has not yet been detected. Alternatively, groundwater in the main aquifer beneath the playa may not be sufficiently degraded to impact adjacent wells.

Staff concludes there is no evidence to confirm that a water quality impact to the existing BLM marsh water supply well would occur from proposed AMS project pumping. To ensure no impacts to groundwater quality in the existing BLM marsh water supply well occur, Condition of Certification **SOIL&WATER-6** requires that the project establish a baseline of water quality in the BLM well and collect water samples semi-annually and report the results semi-annually to the Energy Commission and BLM. If marsh water-supply well has been impacted by project pumping and the water supply quality deteriorated (exceeds pre-project constituent concentrations in TDS, sodium, or selenium concentrations) for three consecutive years, Condition of Certification **SOIL&WATER-6** would require the project to provide treatment or a new water supply to either meet or exceed pre-project water quality conditions.

Staff is concerned that the current BLM well may be constructed such that its filter pack and screen intercepts both poor quality shallow perched water and the better quality upper aquifer groundwater (uQal). A well constructed in this manner allows poor quality perched water to mix with the better quality aquifer water and degrade the quality of water in the well. Staff recommends that any well used to supply water to the marsh be constructed or retrofitted to prevent low quality perched water from entering the well and upper aquifer. Staff believes the existing Ryken well should either be abandoned or modified to prevent flow from the perched aquifer to mitigate this impact. In addition, if the perched aquifer is present in the areas where the new project wells are proposed, the well should be constructed so these flows are prevented and potential impacts are mitigated. Staff recommends the applicant be required to comply with Condition of Certification **SOIL&WATER-4** to ensure the Ryken well is abandoned properly and new wells are constructed so that water quality impacts are mitigated to a level that is less than significant.

Wastewater Management

Improper handling or containment of construction wastewater could cause a broad dispersion of contaminants to soil or groundwater. Discharge of any non-hazardous construction-generated wastewater would require compliance with discharge regulations. Sources of construction wastewater would include equipment wash water and hydrostatic test water. Equipment wash water would be transported to an appropriate treatment facility. Hydrostatic test water would be discharged to land or trucked off-site to an appropriate treatment and disposal facility. Discharge of the hydrostatic test water to land would be done in accordance with the SWRCB Water Quality Order No. 2003-003-DWQ as a discharge to land with a low threat to groundwater. Sanitary wastewater generated during construction would be containerized in portable facilities with the waste removed by a licensed waste hauler. With the use of BMPs and compliance with LORS, staff concludes that there would be no significant impact from construction-generated wastewater. To ensure that the construction wastewater is managed appropriately, staff proposes Condition of Certification **SOIL&WATER-7** to ensure that all construction wastewater is managed in accordance with appropriate BMPs and applicable LORS.

During plant operations, process wastewater would be generated from the reverse osmosis/demineralizer system, chemical feed area, and general plant drains. The reverse osmosis/demineralizer system water would be discharged to evaporation ponds. Wastewater from the chemical feed area and general plant drains would be processed through an oil/water separator with the water discharged to the evaporation ponds. The oil and sludge from the oil/water separator would be removed off-site to a recycling facility or landfill.

HTF affected soil would be temporarily stored and treated in bioremediation/land farm units on approximately 1.5-acre units near each power block (AS2009a). The HTF affected soil would be stored until chemical analysis are conducted to determine if the affected soil should be managed as hazardous or non-hazardous waste in accordance with Condition of Certification **WASTE-7**.

However, the design details and leak detection monitoring for the evaporation ponds have not been provided to staff and the RWQCB for evaluation and comment. Also, the HTF bioremediation/land faming unit design details have not been provided to staff and the RWQCB for evaluation and comment. Until staff and the RWQCB review and comment on the land treatment units and surface impoundments, staff cannot complete their analysis of the discharge of this wastewater. Once the information is provided, staff will coordinate with the RWQCB for analysis and, if appropriate, development of requirements that would be necessary for mitigation of potential impacts from the land treatment units and surface impoundments. If impacts can be mitigated, staff will recommend that the project be required to comply with the final Condition of Certification **SOIL&WATER-2** which is a placeholder that would be revised in the Supplemental Staff Assessment to ensure that the land treatment units and surface impoundments are managed in accordance with appropriate BMPs and applicable LORS.

Sanitary wastes generated during operation of the AMS project would be generated by sinks, toilets, and other sanitary facilities. Because there are no sanitary sewer connections, the sanitary wastewater would be processed through a septic system and discharged to a leach field. Solids would be periodically removed by a professional service. The maximum average daily wastewater flow from each power block to its corresponding leach field is expected to be 1,250 gallons (CH2ML2009e). Staff recommends Condition of Certification **SOIL&WATER-8** to ensure that the sanitary waste is managed in accordance with appropriate BMPs and County of San Bernardino Code Title 3, Division 3, Chapter 8, Waste Management, Article 5, Liquid Waste Disposal and Title 6, Division 3, Chapter 3, and the Uniform Plumbing Code.

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 reasonably foreseeable future projects (California Code of Regulations, Title 14, section 15130). A summary of the estimated water use of reasonably foreseeable projects in the Harper Valley and their potential water use is presented below in **Soil & Water Table 7**.

Soil & Water Table 7
Large-Scale Projects, Developed, Under Development, or Reasonably Foreseeable Projects in the Harper Valley Basin

Potential New Groundwater Users	Estimated Water Use	
	During Construction	During Operation
Hawes Composting Facility. A 160-acre biosolids and green material composting facility proposed to produce agricultural grade compost.	Negligible	1.1 AF/y (Groundwater Wells or Trucked-In Water)
State Route 58 Upgrade and Realignment. Proposed upgrade and realign of 10-miles of two-lane highway to a 4-lane divided freeway Hidden River Road to Lenwood Road, in San Bernardino County.	Negligible	None
First Solar, Solar Photovoltaic Project (BLM: CACA 48941). A 5,033-acre, 585 MW solar photovoltaic project proposed on BLM land.	Unknown	Estimated at 58 AF/y (Groundwater Wells)
Horizon Wind Energy, Wind Project (BLM: CACA 46805). A 10,073-acre wind project proposed on BLM land.	Unknown	None

Sources: BLM2010; Caltrans2010; SBCo2010.
Note: Construction of these projects would likely temporarily use water resources over a limited duration of time. Future construction in the Harper Lake area could be limited by the existing Desert Wildlife Management Area, Mojave Ground Squirrel Conservation Area, and Desert Tortoise Critical Habitat.

Cumulative Impacts to Soil and Storm Water

Construction and operation of the AMS project would result in both temporary and permanent changes to the soil and storm water drainage patterns at the AMS project site. Without the use of BMPs that would be incorporated into a final DESCP and construction SWPPP, these changes could incrementally increase local soil erosion and storm water runoff. However, as discussed above, these potential impacts would be prevented or reduced to a level of less than significant through the implementation of BMPs, a final DESCP, and construction SWPPP, and compliance with all applicable erosion and storm water management LORS. As identified in **Soil & Water Table 7**, four projects are proposed for construction within Harper Valley. Existing development consists of SEGS 8 and 9, some agriculture business, and some residences. This development has the potential to increase local soil erosion and storm water runoff. However, this development is also required to comply with all applicable erosion and storm water management LORS. Compliance with these LORS would ensure cumulative impacts would be prevented or reduced to a level of less than significant. With the implementation of **SOIL&WATER-1** and **-2**, staff believes the AMS project would not significantly contribute to the cumulative soil erosion and storm water impacts from other development within the vicinity of the proposed AMS project.

Cumulative Impacts to Wells

The AMS project would not cause a cumulatively considerable impact to water levels in other wells in the Harper Lake model zone. The reasonably foreseeable groundwater use by other proposed projects in the Harper Lake model zone may increase by 60 AF/y (**Soil & Water Table 7)**. This additional groundwater use would increase cumulative future groundwater use from 2,160 AF/y to 2,220 AF/y and is not expected to result in a cumulative lowering of groundwater levels that would exceed the 30-foot threshold for protection of wells in the Harper Lake area. For example, both staff and the applicant assessed model sensitivity to uncertainty in pumping rates by assuming a 10% increase in Harper Lake model zone pumpage. The 10% pumping increase corresponded to an actual increase of about 550 acre-feet per year in background pumping, which is over nine times greater than the estimated 60 acre-feet per year increase in the foreseeable increase in background groundwater use. Even with the 10% pumping rate increase, the model results indicate well interferences from project pumping are less than the 30-feet threshold. To provide a baseline of groundwater elevation and document groundwater elevation changes, staff recommends Condition of Certification **SOIL&WATER-6** which would require the project to establish a groundwater monitoring network and to semi-annually monitor and document groundwater use, groundwater levels, and groundwater level trends.

Cumulative Impacts to the Basin Balance

During construction of the AMS project, the groundwater demand would be as high as 1,098 AF/y. Construction of the AMS project is estimated to take 26 months to complete. During operation, the project would use groundwater for potable and plant processes at the rate of approximately 2,160 AF/y. This volume of groundwater use, combined with the additional projects identified in **Soil & Water Table 7** above, could increase total groundwater use in the Harper Lake area by up to 60 AF/y to a total of 2,220 AF/y. Both staff and the applicant assessed the groundwater model sensitivity to uncertainty in pumping rates by assuming a 10% increase in Harper Lake model zone pumpage. The 10% increase corresponded to an actual increase of about 550 acre-feet per year in background pumping; this pumping increase would remove almost 490 acre-feet per year of additional water from storage in the Harper Lake model zone, and about

60 acre-feet per year of storage from the rest of the Centro subarea. The simulated pumping increase is over nine times greater than the foreseeable increase in groundwater use. Assuming the storage change reduction is proportional to the pumping, the estimated 60 acre-feet per year increase in pumping may remove an additional 54 and 6.7 AF/y of groundwater from storage in these two areas, respectively (one-ninth of 490 and 60 acre-feet per year, respectively). Staff believes these amounts are minor and impacts to the basin balance from the foreseeable pumping would be less than significant.

COMPLIANCE WITH FEDERAL, STATE, AND LOCAL LORS

The Energy Commission has five sources for statements of policy relating to water use in California applicable to power plants. They are the California Constitution, the Warren-Alquist Act, the Commission's restatement of the State's water policy in the 2003 Integrated Energy Policy Report ("IEPR"), the State Water Resources Control Board ("SWRCB" or "Board") resolutions (in particular Resolutions 75-58 and 88-63), and the Genesis Solar Project Committee's water-issues order as guidance for interpreting all of the above.

LORS AND STATE POLICY AND GUIDANCE

California Constitution

Article X, section 2 prohibits the waste or unreasonable use, including unreasonable method of use, of water, and it requires all water users to conserve and reuse available water supplies to the maximum extent possible (Cal. Const., art. X, § 2). Groundwater is subject to reasonable use (*Katz v. Walkinshaw* (1903) 141 Cal. 116).

Warren-Alquist Act

Section 25008 of the Energy Commission's enabling statutes echoes the Constitutional concern, by promoting "all feasible means" of water conservation and "all feasible uses" of alternative water supply sources (Pub. Resources Code § 25008).

Integrated Energy Policy Report

In the 2003 Integrated Energy Policy Report (IEPR or Report), the Energy Commission reiterated certain principles from SWRCB's Resolution 75-58, discussed below, and clarified how they would be used to discourage use of fresh water for cooling power plants under the Commission's jurisdiction. The Report states that the Commission will approve the use of fresh water for cooling purposes only where alternative water supply sources or alternative cooling technologies are shown to be ''environmentally undesirable" or "economically unsound" (IEPR (2003), p. 41). In the Report, the Commission interpreted "environmentally undesirable" as equivalent to a "significant adverse environmental impact" under CEQA, and "economically unsound" as meaning "economically or otherwise infeasible," also under CEQA (IEPR, p. 41). CEQA and the Commission's siting regulations define feasible as "capable of being accomplished in a successful manner within a reasonable amount of time," taking into account economic and other factors (Cal. Code Regs., tit. 14, § 15364; tit. 20, § 1702, subd. (f)). At the time of publication in 2003, dry cooling was already feasible for three projects—two in operation and one just permitted (IEPR, p. 39).

The Report also notes California's exploding population, estimated to reach more than 47 million by 2020, a population that will continue to use "increasing quantities of fresh water at rates that cannot be sustained" (IEPR, p. 39).

State Water Resources Control Board Resolutions

The SWRCB not only considers quantity of water in its resolutions, but also the quality of water. In 1975, the Board adopted the *Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling* (Resolution 75-58). In it, the Board encourages the use of wastewater for power plant cooling. It also determined that water with a TDS concentration of 1,000 mg/L or less should be considered fresh water (Resolution 75-58). One express purpose of that Resolution was to "keep the consumptive use of fresh water for power plant cooling to that *minimally essential*" for the welfare of the state (*Ibid*; emphasis added).

In 1988, the Board determined that water with TDS concentrations of 3,000 mg/L or less should be protected for and considered as potential supplies for municipal or domestic use unless otherwise designated by one of the Regional Water Quality Control Boards (Resolution 88-63).

Order from the Genesis Solar Project Committee

The Genesis Solar Project Committee considered all these sources of policy to arrive at a simple yet flexible determination for water use by power plants under Commission jurisdiction. The Order states:

> The Committee reads [the policies] as requiring projects seeking to use groundwater for power plant cooling to use the least amount of the worst available water, considering all applicable technical, legal, economic, and environmental factors (Genesis Solar Energy Project Committee, Decision and Scoping Order, Feb. 2, 2010).

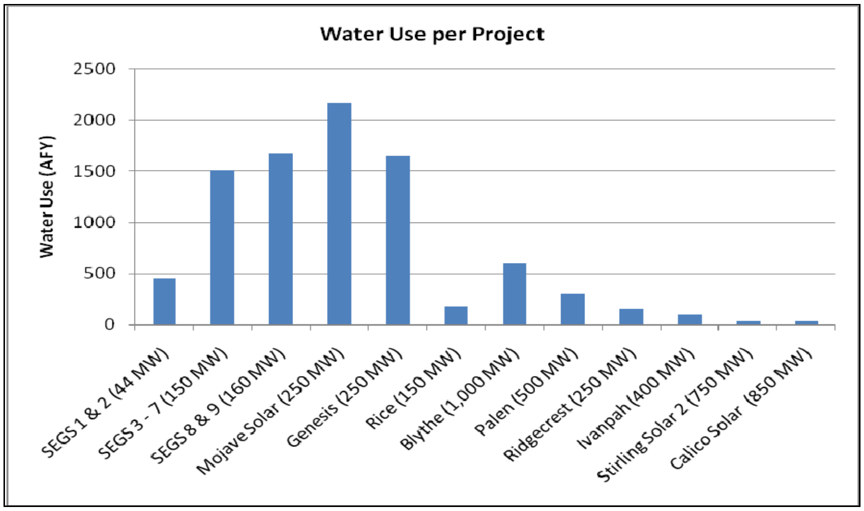
Staff carefully considers all relevant factors when conducting analysis and arriving at recommendations for the Commission. Thus, staff must determine what is the least but nevertheless feasible amount of water available for use, and also the worst, feasible available water that applicant could use for particular purposes on a project.

In several cases, the Commission has accepted conservation programs that conserve water in the region as means of accepting compliance with the water policies. Staff takes this to mean that such conservation programs are an acceptable method to ensure compliance for current projects.

PROPOSED USE OF GROUNDWATER PUMPING AND WET-COOLING BY THE AMS PROJECT

The AMS project proposes a wet-cooled facility that would use 2160 AF/y of groundwater from on-site wells. The Harper Valley Groundwater Basin is the primary natural water supply for the project area. Pumped water would be used for various purposes besides cooling, including domestic use by workers, dust suppression, and mirror washing. Water is the only feasible means of cleaning the mirrors, which must be clean to maintain efficiency of output by parabolic trough solar plants. Cooling tower blowdown would be processed before being used for mirror washing and reused as steam system makeup water. Reject water from the treatment process would be discharged to evaporation ponds. Overall use of the water would be inefficient for this technology, requiring 865 AF/y per 100 MW of capacity, or up to 3.6-acre feet per gigawatt (GW) hour generated. The **Soil & Water Graph 4** presented below shows the water use between the various solar plants currently licensed by the Energy Commission or in the licensing process.

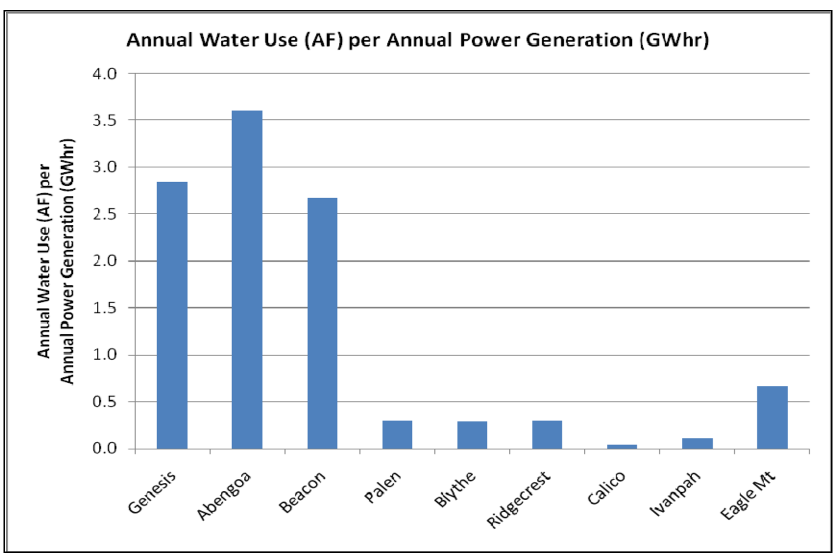
Soil & Water Graph 4
Water Use Per Project



Source: CEC2010.

The **Soil & Water Graph 5** below presents the water use per GW hour between various solar and pumped storage plants proposed to be built in the desert region.

Soil & Water Graph 5
Water Use Per Project Per Gwhr



Source: CEC2010

The quality of groundwater applicant proposes to use would also likely classify as a potential drinking water source because it meets the criteria identified in SWRCB Resolution 88-63. The quality of groundwater the AMS project proposes to use is slightly impaired but well below the policy guidance of 3,000 mg/L TDS for evaluating an aquifer as a potential drinking water source. Use of worse-quality water or reclaimed water appears infeasible at this time.

The Drinking Water Standards found in Title 22 of the California Code of Regulations provide maximum contaminant levels (MCL) which are applied to determine the acceptability of water for delivery to the public. As discussed in the groundwater quality section of the AFC, the project proposes to use groundwater with a TDS of approximately 1,200 to 1,500 mg/L. This TDS level is above the recommended limit of 500 mg/L and slightly above the secondary maximum contaminant level (MCL) for TDS in drinking water of 1,000 mg/L. Secondary MCLs are based on aesthetics and intended to protect odor, taste and appearance. A water supply with TDS concentrations exceeding the secondary MCL could not be provided to the public by community water systems. Staff notes that the current anticipated water quality only slightly exceeds the secondary MCL and believes with limited treatment could be developed as a municipal supply.

The use of groundwater for wet cooling compounds the environmental concerns because the applicant proposes to use evaporation ponds for disposal of the wastewater generated by the wet cooling process. Potential impacts from the use of evaporation ponds could be mitigated consistent with state and local LORS. However, this method of wastewater disposal is not consistent with the Energy Commission's policy that encourages the use of ZLD systems that are designed to eliminate wastewater discharge and inherently conserve water. Therefore, staff finds this method of wastewater disposal does not comply with the state's water policies.

Staff concludes that the Abengoa project, as proposed by applicant, does not comply with the State's water policies as detailed above. While the applicant does propose to recycle some water, the project could feasibly use significantly less water. Therefore, staff recommends that the Commission adopt a Condition of Certification that requires the applicant to submit a Water Conservation Plan that outlines the actions necessary to bring the project cooling water use into compliance with the water policies. Staff would like to work with the applicant between the publication of this SA and the SSA to develop the details of the Water Conservation Plan. Specific options we would like to explore include:

1. Dry-cooling or hybrid cooling systems;

2. Use of a ZLD system;

3. Increase water use efficiency through project design changes such as increasing cycles of concentration for the evaporative cooling processes;

4. Purchase and retire agricultural groundwater pumping rights in the Mojave River Area, including those held by the applicant;

5. Provide funding for the Mojave Water Agency's Water Conservation Incentive Program and/or Regional Recharge and Recovery Program;

6. Funding of Tamarisk removal; and,

7. Other water conserving activities in the Mojave River area.

After exploring these options, as well as any others the applicant would like to consider, staff will draft a Condition of Certification that identifies the types of activities the applicant could take to ensure the project's conformity with state water policy. The condition could require the Water Conservation Plan to identify the details and descriptions of these activities, including:

A. Feasibility studies and costs;

B. Identification of the activity and water source, and the quantity of basin water that would be conserved;

C. Demonstration of the project owner's legal entitlement to the water or ability to conduct the activity;

D. Discussion of whether any agency, non-government organization, or private property right holders approval of the identified activities will be needed, and, if so, whether additional approval will require compliance with CEQA;

E. Demonstration of how groundwater will be replaced for each of the activities;

F. An estimated schedule for completion of the activities;

G. Performance measures that would be used to evaluate the amount of water replaced by the activities; and

H. Monitoring and Reporting Plan outlining the steps necessary and proposed frequency of reporting to show the activities are achieving the intended conservation.

NOTEWORTHY PUBLIC BENEFITS

Staff has not identified any noteworthy public benefits of the proposed project that are associated with soil and water resources.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received comments from the County of San Bernardino and the public regarding soil and water resources.

SAN BERNARDINO COUNTY

San Bernardino County made general and specific comments regarding the proposed AMS project. Staff has reviewed these comments and incorporated these comments into this analysis. In addition, conditions of certification in this section require the project to submit various plans, such as grading plans and groundwater monitoring plans, to the

County for review and comment prior to approval of these plans by the Energy Commission. Several of the County's concerns regarding grading, drainage, and storm water control would be addressed in detailed a DESCP and SWPPP that would be submitted to the County pursuant to Conditions of Certification **SOIL&WATER-1** and **-2**. Concerns by the County regarding the project's proposed water use have been addressed in this document and in the AFC submitted by the applicant. Conditions of Certification **SOIL&WATER-4** through **-6** specifically addresses the applicant's proposed water use and require the project to develop an ongoing groundwater level and quality monitoring plan. Specific comments by the County regarding storm water and drainage have not been responded to by the applicant and are discussed below.

Comment: There is potential increase of storm water flow at the intersection of Hoffman Road and Harper Lake Road, where the drainage channel south of Hoffman Road transitions to a natural condition. Obtain drainage acceptance letters from all property owners adjacent to this intersection.

> Response: The applicant has not yet provided drainage acceptance letters from the property owners adjacent to this intersection.

Comment: The outlet structure at Harper Dry Lake is adjacent to a private property APN #0490-131-13. Adequate protection should be provided to prevent discharge from overflow onto this property.

> Response: The applicant has not yet to provide a water surface profile analysis. This water surface profile is expected to compliment the Hydrology Study already provided by the Applicant in the AFC and address this concern about overflow onto this property.

Comment: Obtain approval from California Department of Fish & Game (CDFG), RWQCB, and USACE for concentrated discharge into Harper (dry) Lake.

> Response: Staff is waiting for the applicant to submit information to the RWQCB in order for the RWQCB to review and comment on items such as discharge to Harper Lake. As discussed in the *Biological Resources – Construction Impacts to Jurisdictional Waters*, the CDFG jurisdictional waters at the AMS project discharge outlet to Harper Lake are considered and mitigated accordingly by Condition of Certification **BIO-16** in lieu of CDFG's section1600 permit. The USACE has made a determination to not exert jurisdiction over any portion of the proposed project (see *Biological Resources – Construction Impacts to Jurisdictional Waters*).

Comment: Proposed drainage channels shall be built outside the road right-of-way and maintained by the applicant.

> Response: The applicant has not yet provided evidence that the proposed drainage channels would be built outside of right-of-ways. Drainage channels would be maintained through Condition of Certification **SOIL&WATER-3**.

Comment: Submit WQMP to Land Development Division for review and approval.

> Response: A WQMP and the design standards contained within are neither necessary nor applicable to this project because the proposed project would not

discharge to a water of the U.S. and is outside of the County's permitted Municipal Separate Storm Sewer System. All applicable storm water quality and quantity control measures would be addressed within Conditions of Certification **SOIL&WATER-1** and **-2**.

THE WILDLANDS CONSERVANCY

December 10, 2009

Comment: Will the wastewater in the evaporation ponds be heated or at ambient temperatures? Will the evaporations ponds be covered or open to avian wildlife? Where will the wastewater go and will it be recycled for use in the cooling towers?

> Response: The temperature of the wastewater discharged in the evaporations ponds would be elevated (heated) with respect to ambient temperatures and allowed to equilibrate to ambient temperatures over time. The evaporation ponds would be netted to allow the wastewater to evaporate. Once the wastewater reaches the evaporations ponds, it would not be recycled. Before reaching the evaporation ponds, water in the cooling water blowdown would be recycled approximately 5.8 times (CEC2010f). For additional information, please refer to the Report of Waste Discharge submitted by the applicant as part of the Supplemental Data Adequacy package.

DEFENDERS OF WILDLIFE

December 30, 2009

Comment: The proposed use of groundwater by the project would increase the rate of overdraft in the HVGB and would interfere with the BLM's marsh water supply well's ability to pump ground water to the marsh area.

> Response: The project's proposed use of groundwater would exceed the operational yield of the Harper Lake groundwater model zone. Groundwater pumping by the project would also cause water levels to decrease in the BLM well. However, these impacts would be less than significant. For additional discussion on the basin balance and impacts to groundwater wells, please refer to the *Potential Project Impacts to Wells and the Basin Balance* section and Conditions of Certification **SOIL&WATER-6** and **BIO-20**.

Comment: The use of air-cooling technology in California deserts is technically and economically feasible. Four other projects in the California desert are proposing this technology. The use of such technology would result in a relatively minor impact to the overall steam turbine efficiency, which on the average, is 5% over a one-year cycle, and would conserve groundwater.

> Response: Staff has evaluated the proposed use of groundwater in light of CEQA and the state's policies. While staff believe there would be no significant CEQA impacts from the use of groundwater, this use of groundwater does not comply with the state's policies. Staff has therefore recommended Condition of Certification **SOIL&WATER-9** to reduce the project's proposed water use through a project design change(s) and/or through a water conservation program.

CONCLUSIONS

Based on the assessment of the proposed AMS project, the Energy Commission staff finds that:

- The proposed use of groundwater for industrial cooling would not significantly impact groundwater levels in the HVGB, the basin balance, or quality of groundwater in the basin. Staff has proposed Condition of Certification **SOIL&WATER-6** to establish pre-construction and project related groundwater quality and groundwater elevation levels that can be quantitatively compared against observed and simulated levels near the project pumping wells and near potentially impacted existing wells, and to avoid, minimize, or mitigate impacts to the Harper Lake marsh from potential reduction or degradation in the quantity or quality of groundwater conveyed to the Harper Lake marsh.
- The proposed method of sanitary wastewater disposal by a septic system and leach field would have no significant impacts provided the requirements of Condition of Certification **SOIL&WATER-8** are met.
- The proposed project will not significantly increase or decrease erosion rates within its watershed, if Condition of Certification **SOIL&WATER-1** and **-2** are implemented as proposed during construction and operation. Staff are currently working with the RWQCB to develop additional requirements that will be included in the Supplemental Staff Assessment as a part of Condition of Certification **SOIL&WATER-2**. Using these protective measures, the natural processes of erosion due to wind and water would not be significantly affected during either project construction or operation.
- Staff is awaiting submittal of the storm water surface profile analysis for flows in the main storm water diversion channel to complete analysis of the drainage design and potential flooding off-site in the Supplemental Staff Assessment.
- Staff is awaiting information from the applicant needed to address San Bernardino County's concerns and comments documented in their letter dated 2/1/2010, and discussed below under 'Response to Agency Comments'.
- The proposed on-site drainage management design would perform adequately and any potential impacts would be mitigated if Condition of Certification **SOIL&WATER-1** and **-3** are implemented as proposed.
- Requirements for mitigation of discharges of HTF to a land treatment unit, brines to evaporation ponds, and stormwater are currently under development and completion of these requirements is contingent upon the submittal of additional information from the applicant. These requirements will be included in Condition of Certification **SOIL & WATER - 2**.
- Based on the elements of the proposed project submitted by the applicant to date, and with the exception of the applicant's proposed use of groundwater for wet cooling purposes and of evaporation ponds for wastewater disposal (as discussed further below), staff believes the project would comply with all applicable federal, state, and local laws, ordinances, rules, and standards (LORS) with the adoption of the recommended conditions of certification.

- Based on the elements of the proposed project submitted by the applicant to date, staff believes that construction and operation of the project would not result in immitigable project-specific direct or indirect or cumulative significant impacts to soil or water resources with the adoption of the recommended conditions of certification.
- The applicant has proposed to use groundwater for wet cooling when other feasible technologies are available. Staff believes the proposed use of groundwater for wet cooling would not comply with the state's water policies. To address this inconsistency with state water policy, staff recommends implementation of Condition of Certification **SOIL&WATER-9** that would require the project owner to reduce the proposed water use through a project design change(s) and/or through a water conservation program.
- The applicant has proposed the use of evaporation ponds as the preferred method of wastewater disposal. Staff believes potential impacts related to the use of evaporation ponds to dispose of the industrial wastewater could be mitigated through effective application of state and local LORS. However, this method of wastewater disposal is not consistent with the Energy Commission's policy that encourages the use of ZLD systems that are designed to eliminate wastewater discharge and inherently conserve water. Therefore, staff finds that this method of wastewater disposal does not comply with the state's water policies. As discussed above, to resolve this impact, staff recommends implementation of Condition of Certification **SOIL&WATER-9**.

The state has expressed a strong interest in developing its solar energy resources. However, the construction and operation of solar energy facilities requires the use of water, which state policy also protects. The Energy Commission must balance the state's interest in promoting solar energy development with its interest in conserving and protecting the state's water resources. Several projects currently proposed for the Mojave and Colorado deserts would use water for power plant cooling, which staff believes is contrary to the state's long term interest in maximizing solar power generation and minimizing adverse environmental impacts. This will be an especially critical issue in the renewable development areas that will be identified in the DRECP. Later this year, staff plans to file a request for an Order Instituting an Informational Proceeding to address this issue.

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

- Submittal of the following to the RWQCB and County of San Bernardino for review and comment and to the Energy Commission for approval:

  A. Engineering design detail and vadose and groundwater monitoring plans for the four proposed wastewater evaporation ponds (surface impoundments);

  B. Location and construction details of proposed groundwater monitoring wells for the evaporation ponds;

  C. Engineering design detail and monitoring plans for the proposed HTF bioremediation units;

D. Characterization of the anticipated waste streams proposed to be discharged into the evaporation ponds and bioremediation units;

E. A description of the frequency and chemical analysis of waste and a plan that describes actions that will be taken in case of a detectable release;

F. A closure plan for the evaporation ponds and bioremediation units; and

G. Demonstration that the proposed project would be in compliance with RWQCB Order 2009-0009-DWQ Storm Water requirements that go into effect July 1, 2010.

- Submittal of the storm water surface profile analysis for flows in the main storm water diversion channel to the San Bernardino County for review and comment and to the Energy Commission for approval.

MITIGATION MEASURES/PROPOSED CONDITIONS OF CERTIFICATION

DRAINAGE EROSION AND SEDIMENTATION CONTROL PLAN

SOIL & WATER-1 Prior to site mobilization, the project owner shall obtain the CPM's approval for a site specific DESCP that ensures protection of water quality and soil resources of the project site and all linear facilities for both the construction and operation phases of the project. This plan shall address appropriate methods and actions, both temporary and permanent, for the protection of water quality and soil resources, demonstrate no increase in off-site flooding potential, and identify all monitoring and maintenance activities. The project owner shall complete all engineering plans, reports, and documents necessary for the CPM to conduct a review of the proposed project and provide a written evaluation as to whether the proposed grading, drainage improvements, and flood management activities comply with all requirements presented herein. The plan shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1** and shall contain the following elements:

- **Vicinity Map:** A map shall be provided indicating the location of all project elements with depictions of all major geographic features to include watercourses, washes, irrigation and drainage canals, major utilities, and sensitive areas.
- **Site Delineation:** The site and all project elements shall be delineated showing boundary lines of all construction areas and the location of all existing and proposed structures, underground utilities, roads, and drainage facilities. Adjacent property owners shall be identified on the plan maps. All maps shall be presented at a legible scale
- **Drainage:** The DESCP shall include the following elements:

a. Topography. Topography for off-site areas are required to define the existing upstream tributary areas to the site and downstream to provide enough definition to map the existing storm water flow and flood hazard. Spot elevations shall be required where relatively flat conditions exist.

b. Proposed Grade. Proposed grade contours shall be shown at a scale appropriate for delineation of on-site ephemeral washes, drainage ditches, and tie-ins to the existing topography.

c. Hydrology. Existing and proposed hydrologic calculations for on-site areas and off-site areas that drain to the site; include maps showing the drainage area boundaries and sizes in acres, topography and typical overland flow directions, and show all existing, interim, and proposed drainage infrastructure and their intended direction of flow.

d. Hydraulics. Provide hydraulic calculations to support the selection and sizing of the on-site drainage network, diversion facilities and BMPs.

- **Watercourses and Critical Areas:** The DESCP shall show the location of all on-site and nearby watercourses including washes, irrigation and drainage canals, and drainage ditches, and shall indicate the proximity of those features to the construction site. Maps shall identify high hazard flood prone areas.
- **Clearing and Grading:** The plan 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, cut/fill depths or other means. The locations of any disposal areas, fills, or other special features shall also be shown. Existing and proposed topography tying in proposed contours with existing topography shall be illustrated. The DESCP shall include a statement of the quantities of material excavated at the site, whether such excavations or fill is temporary or permanent, and the amount of such material to be imported or exported or a statement explaining that there would be no clearing and/or grading conducted for each element of the project. Areas of no disturbance shall be properly identified and delineated on the plan maps.
- **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.
- **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). BMP implementation schedules shall be provided for each project element for each phase of construction.

- **Best Management Practices:** The DESCP shall show the location, timing, and maintenance schedule of all erosion- and sediment-control BMPs to be used prior to initial grading, during project element excavation and construction, during final grading/stabilization, and after construction. BMPs shall include measures designed to control dust and stabilize construction access roads and entrances. The maintenance schedule shall include post-construction maintenance of treatment-control BMPs applied to disturbed areas following construction.
- **Erosion Control Drawings:** The erosion-control drawings and narrative shall be designed, stamped and sealed by a professional engineer or erosion-control specialist.
- **Agency Comments:** The DESCP shall include copies of recommendations from the County of San Bernardino and RWQCB.
- **Monitoring Plan:** Monitoring activities shall include routine measurement of the volume of accumulated sediment in the on-site drainage ditches, and storm water diversions and the requirements that can only be established after receipt of comments from the RWQCB regarding the complete Report of Waste Discharge to be submitted by the applicant. The monitoring plan shall be part of the channel maintenance plan in Condition of Certification **SOIL&WATER-3.**

Verification: The DESCP shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1**, and relevant portions of the DESCP shall be submitted to the chief building official (CBO) for review and approval. In addition, the project owner shall do all of the following:

1. No later than ninety (90) days prior to start of site mobilization, the project owner shall submit a copy of the DESCP to the County of San Bernardino and the RWQCB for review and comment. The CPM shall consider comments received from San Bernardino County and RWQCB and approve the DESCP.

2. During construction, the project owner shall provide an analysis in the monthly compliance report on the effectiveness of the drainage, erosion, and sediment control measures and the results of monitoring and maintenance activities.

3. Once operational, the project owner shall provide in the annual compliance report information on the results of storm water BMP monitoring and maintenance activities.

4. Provide the CPM with two (2) copies each of all monitoring or compliance reports.

WASTE DISCHARGE REQUIREMENTS

SOIL&WATER-2 Conditions to require implementation of waste discharge requirements for land treatment units, surface impoundments, and stormwater discharges will be developed when the applicant supplies the necessary information. These requirements will be included in the Supplemental Staff

Assessment after the applicant submits all required information to the RWQCB and County of San Bernardino and both the RWQCB and County have provided staff with comments.

CHANNEL MAINTENANCE PROGRAM

SOIL&WATER-3 The project owner shall develop and implement a Channel Maintenance Program (Program) that provides long-term guidance to implement routine channel maintenance projects and to comply with conditions of certification in a feasible and environmentally-sensitive manner. The Program will be a process and policy document prepared by the project owner, reviewed 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 channels to meet their original design capacity for flood protection and conveyance, support the AMS 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 AMS project engineered channels, typically extending to the top of bank, include access roads, and any adjacent property that the AMS project owns or holds an easement for access and maintenance. The program would include all channel maintenance as needed to protect the AMS project facilities and downstream property owners.

C. Channel Maintenance Activities

   1. Sediment Removal - sediment is removed if it: (1) reduces the 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 channels to maintain hydraulic capacity. Vegetation management shall include control of invasive or nonnative vegetation.

   3. Bank Protection and Grade Control Repairs – Bank protection and grade control structure repairs involve any action by the project owner to repair eroding banks, incising toes, scoured channel beds, as well as preventative erosion protection. The project owner would implement instream repairs when the problem: (1) causes or could cause significant damage to the AMS project; adjacent property, or the structural elements of the channels; (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).

D. Related Programmatic Documentation – the CPM will review and approve the Program documentation.

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 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. 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 would be developed to guide decision-making for channel maintenance activities. BMPs shall be developed to implement these policies.

<u>Verification:</u> At least 60 days prior to the start of any project-related site disturbance activities, 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:

1. Supervise the implementation of a Channel Maintenance Program in accordance with conditions of certification;

2. Ensure that the AMS project Construction and Operations Manager receive training on the Channel Maintenance Program;

3. As part of the AMS 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).

PROJECT GROUNDWATER WELLS

SOIL&WATER-4 Pre-Well Installation. The project owner shall construct and operate up to two on-site groundwater wells that produce water from the Harper Valley Groundwater Basin and two backup wells. The project owner shall ensure that the wells are completed in accordance with all applicable state and local water well construction requirements. If the perched water table is present where new wills be constructed, the project wells shall be designed to prevent cross-connection between the lower quality perched groundwater and the upper aquifer. Prior to the start of well construction activities, the project owner shall submit for review and comment a well construction packet to the County of San Bernardino, in accordance with the County of San Bernardino Code Title 2, Division 3, Chapter 6, Article 5, containing the documentation, plans, 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 the CPM provides approval to construct and operate the well.

Post-Well Installation. The project owner shall provide documentation 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.

Groundwater Well Abandonment. On property controlled by the project owner, the project owner shall protect groundwater resources by abandoning all groundwater wells that are constructed in such a manner that the screen interval of the well intercepts both the poor quality perched water and deeper better quality aquifer water (uQal). These groundwater wells shall be abandoned in accordance with all applicable state and local water well abandonments requirements, including the California Department of Water Resources Bulletins 74-81 & 74-90. Prior to the start of well construction activities, the project owner shall submit for review and comment a well abandonment packet to the County of San Bernardino, in accordance with the County of San Bernardino Code Title 3, Division 3, Article 3, containing the documentation, plans, and fees normally required for the county's well abandonment permit, with copies to the CPM. The project shall not abandon a well until the CPM provides approval.

Verification: The project owner shall ensure the Well Completion Reports are submitted and shall ensure compliance with all State and county water well standards and requirements for the life of the wells. The project owner shall do all of the following:

1. No later than 180 days prior to the construction of the on-site groundwater wells, the project owner shall submit a Groundwater Monitoring and Management Plan to the County of San Bernardino for review and comment (see Condition of Certification **SOIL&WATER-6**).

2. No later than sixty (60) days prior to the abandonment and construction of the on-site groundwater wells, the project owner shall submit to the CPM a copy of the water well abandonment and construction packet submitted to the County of San Bernardino for review and comment.

3. No later than thirty (30) days prior to the construction of the on-site water supply wells, the project owner shall submit a copy of any written comments received from the County of San Bernardino indicating whether the proposed well abandonment and construction activities comply with all county well requirements and meet the requirements established by the county's water well permit program.

4. No later than sixty (60) days after installation of each well at the project site, the project owner shall provide to the CPM copies of the Well Completion Reports submitted to the DWR by the well driller. 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.

5. During well construction and for the operational life of the well, the project owner shall submit two (2) copies to the CPM for review and approval any proposed well construction or operation changes.

6. The project owner shall provide the CPM with (2) two copies of all monitoring and other reports required for compliance with the County of San Bernardino water well standards and operation requirements.

7. No later than fifteen (15) days after completion of the on-site water supply wells, the project owner shall submit documentation to the CPM confirming that well drilling activities were conducted in compliance with Title 23, California Code of Regulations, Chapter 15, Discharges of Hazardous Wastes to Land, (23 CCR, sections 2510 et seq.) requirements and that any on-site drilling sumps used for project drilling activities were removed in compliance with 23 CCR section 2511(c).

CONSTRUCTION AND OPERATIONS WATER USE

SOIL&WATER-5 The proposed project's use of groundwater for all construction and operations activities shall not exceed 2,160 acre-feet per year. Water quality used for project construction and operation will be reported in accordance with Condition of Certification **SOIL&WATER-6** 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: Beginning six (6) months after the start of construction, the project owner shall prepare a semi-annual summary report of the 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.

At least sixty (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.

The project owner shall prepare an annual summary report, which will include daily usage, monthly range and monthly average of daily water usage in gallons per day, and total water used on a monthly and annual basis in acre-feet. For years subsequent to the initial year of operation, the annual summary report will also include the yearly range and yearly average water use by source. For calculating the total water use, the term "year" will correspond to the date established for the annual compliance report submittal.

GROUNDWATER LEVEL AND QUALITY MONITORING AND REPORTING PLAN

SOIL&WATER-6 The project owner shall submit a Groundwater Level and Quality Monitoring and Reporting Plan to the CPM for review and approval. The Groundwater Level and Quality Monitoring and Reporting Plan shall provide a description of the methodology for monitoring background and site groundwater levels and quality. Prior to project construction, monitoring shall commence to establish pre-construction base-line groundwater level conditions and shall include pre-construction, construction, and project operation water use. A water quality baseline and groundwater level baseline shall be established for the Bureau of Land Management (BLM) marsh water supply well (the existing well and any retrofitted or newly installed well). The primary objectives for the monitoring is to ensure the project uses a degraded water supply consistent with Condition of Certification **SOIL & WATER– 5,** establish pre-construction and project related groundwater quality and groundwater elevation levels that can be quantitatively compared against observed and simulated levels near the project pumping well and near potentially impacted existing wells, and to avoid, minimize, or mitigate impacts to the Harper Lake marsh from potential reduction or degradation in the quantity or quality of groundwater conveyed to the Harper Lake marsh.

Verification: The project owner shall complete the following:

1. At least six (6) weeks prior to construction, a Groundwater Level and Quality Monitoring and Reporting Plan shall be submitted to the CPM for review and approval before completion of Condition of Certification **SOIL& WATER-4**. The Plan

shall include a scaled map showing the site and vicinity, existing well locations, and proposed monitoring locations (both existing wells and new monitoring wells proposed for construction). The map shall also include relevant natural and man-made features (existing and proposed as part of this project). The plan also shall provide: (1) well construction information and borehole lithology for each existing well proposed for use as a monitoring well; (2) description of proposed drilling and well installation methods; (3) proposed monitoring well design; and, (4) schedule for completion of the work.

2. At least four (4) weeks prior to construction, a Well Monitoring Installation and Groundwater Level Network Report shall be submitted to the CPM for review and approval. The report shall include a scaled map showing the final monitoring well network. It shall document the drilling methods employed, provide individual well construction as-builds, borehole lithology recorded from the drill cuttings, well development, and well survey results. The well survey shall measure the location and elevation of the top of the well casing and reference point for all water level measurements, and shall include the coordinate system and datum for the survey measurements. Additionally, the report shall describe the water level monitoring equipment employed in the wells and document their deployment and use.

3. As part of the monitoring well network development, all newly constructed monitoring wells shall be constructed consistent with State and San Bernardino County specifications.

4. At least four (4) weeks prior to project construction, all groundwater quality and groundwater level monitoring data shall be reported to the CPM. The report shall include the following:

   - An assessment of pre-project groundwater levels, a summary of available climatic information (monthly average temperature and rainfall records from the nearest weather station), and a comparison and assessment of water level data relative to the assumptions and spatial trends simulated by the applicant's groundwater model.

   - As assessment of pre-project groundwater quality with groundwater samples analyzed for TDS, chloride, nitrates, major cations and anions, and oxygen-18 and deuterium isotopes. These analyses, and particularly the stable isotope data, can be useful for identifying partially evaporated water sources and assessing their contributions to the quality of water produced by wells.

   - For the BLM marsh water supply well, at least two (2) groundwater samples shall be collected and analyzed for TDS, sodium, selenium, and oxygen-18 and deuterium isotopes. These analyses, and particularly the stable isotope data, can be useful for identifying partially evaporated water sources and assessing their contributions to the quality of water produced by wells.

   - The data shall be tabulated, summarized, and submitted to the CPM. The data summary shall include the estimated range (minimum and maximum values), average, and median for each constituent analyzed. The data shall also be analyzed using the Mann-Kendall test for trend to assess whether pre-project water quality trends, if any, are statistically significant.

5. During project construction and during project operations, the project owner shall semi-annually monitor the quality of groundwater and changes in groundwater elevation and submit data semi-annually to the CPM and BLM. The summary report shall document water level monitoring methods, the water level data, water level plots, and a comparison between pre- and post-project start-up water level trends as itemized below. The report shall also include a summary of actual water use conditions, monthly climatic information (temperature and rainfall), and a comparison and assessment of water level data relative to the assumptions and simulated spatial trends predicted by the applicant's groundwater model.

    - Groundwater samples from all wells in the monitoring well network shall be analyzed and reported semi-annually for TDS, chloride, nitrates, cations and anions, and oxygen-18 and deuterium isotopes. These analyses, and particularly the stable isotope data, can be useful for identifying partially evaporated water sources and assessing their contributions to the quality of water produced by wells.
    - Groundwater sample from the BLM marsh water supply well shall be analyzed for TDS, sodium, selenium, and oxygen-18 and deuterium isotopes. These analyses, and particularly the stable isotope data, can be useful for identifying partially evaporated water sources and assessing their contributions to the quality of water produced by wells.
    - Semi-annually, the marsh water-supply well compliance data shall be tabulated, summarized, and analyzed to compare water quality to pre-project conditions. For analysis purposes, pre-project water quality shall be defined by samples collected prior to project construction as specified above, and compliance data shall be defined by samples collected after the construction start date. The compliance data shall be analyzed for both trends and for contrast with the pre-project data.
        - Trends shall be analyzed using the Mann-Kendall test for trend. Trends in the compliance data shall be compared and contrasted to pre-project trends, if any.
        - If no significant trends exist in the compliance data, or the data set is insufficient to assess trends, all marsh water-supply well compliance data shall be pooled and contrast to the pre-project data set. If significant pre-project trends are identified, the compliance data can first be corrected to remove pre-project trends and then contrast to the pre-project data.
        - The contrast between pre-project and compliance mean or median concentrations shall be compared using an Analysis of Variance (ANOVA). A parametric ANOVA (for example, an F-test) can be conducted on the two data sets if the residuals between observed and expected values are normally distributed and have equal variance, or the data can be transformed to an approximately normal distribution. If the data cannot be represented by a normal distribution, then a nonparametric ANOVA shall be conducted (for example, the Kruskal-Wallis test). If a statistically significant difference is identified between the two data sets, the monitoring data are inconsistent with random differences between the pre-project and baseline data indicating a significant water quality impact from project pumping may be occurring.

- If compliance data indicate the quality of the water produced by the marsh water-supply well has been impacted by project pumping, and the water supply quality has deteriorated (exceeds pre-project constituent concentrations in TDS, sodium, or selenium concentrations) for three consecutive years, the project owner shall provide treatment or a new water supply to either meet or exceed pre-project water quality conditions.

WASTEWATER COLLECTION SYSTEM REQUIREMENTS

SOIL&WATER-7 The project owner shall recycle and reuse all process wastewater streams to the extent practicable. Prior to transport and disposal of any facility operation wastewaters that are not suitable for treatment and reuse on-site, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project manager shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste Discharges to Land requirements).

Verification: Prior to transport and disposal of any facility operation wastewaters that are not suitable for treatment and reuse on-site, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project manager shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste Discharges to Land requirements).

SEPTIC SYSTEM AND LEACH FIELD REQUIREMENTS

SOIL&WATER-8 Prior to the start of construction of the sanitary waste system, the project owner shall submit to the County of San Bernardino for review and comment, and to the CPM for review and approval, plans for the construction and operation of the project's proposed sanitary waste septic system and leach field. These plans shall comply with the requirements set forth in County of San Bernardino Code Title 3, Division 3, Chapter 8, Waste Management, Article 5, Liquid Waste Disposal and Title 6, Division 3, Chapter 3, and the Uniform Plumbing Code. Project construction shall not proceed until the CPM has approved the plans. The project owner shall remain in compliance with the San Bernardino County codes requirements for the life of the project.

Verification: Sixty (60) days prior to the start of commercial operations, the project owner shall submit to the County of San Bernardino appropriate fees and plans for review and comment for the construction and operation of the project's sanitary waste septic system and leach field. A copy of these plans shall be submitted to the CPM for review and approval. The plans shall demonstrate compliance with the sanitary waste disposal facility requirements of County of San Bernardino Codes Title 3, Division 3, Chapter 8, Waste Management, Article 5, Liquid Waste Disposal and Title 6, Division 3, Chapter 3, and the Uniform Plumbing Code.

WATER POLICY COMPLIANCE

SOIL&WATER-9 Pending agreement on the actions needed to bring the project into compliance with the water policy.

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SOIL AND WATER RESOURCES - APPENDIX A

Acronyms Used in the Soil and Water Resources Section

AMS	Abengoa Mojave Solar project	gpd/ft	gallons per day per foot
amsl	above mean sea level	gpm	gallons per minute
AF	acre-feet	IEPR	Integrated Energy Policy Report
AF/y	acre-feet per year	lbs	pounds
BLM	Bureau of Land Management	LID	Low Impact Development
bgs	below ground surface	LORS	laws, ordinances, regulations, and standards
BMP	Best Management Practices	MCL	maximum contaminant level
CDPH	California Department of Public Health	mg/L	milligrams per liter
CEQA	California Environmental Quality Act	mph	miles per hour
cfs	cubic feet per second	MOU	Memorandum of Understanding
CPM	Compliance Project Manager	MW	megawatt
DESCP	Drainage, Erosion, and Sediment Control Plan	NEPA	National Environmental Policy Act
DRECP	Desert Renewable Energy Conservation Plan	NPDES	National Pollutant Discharge Elimination System
DTSC	Department of Toxic Substances Control	RCRA	Resource Conservation and Recovery Act
DWR	Department of Water Resources	REC	Recognized Environmental Condition
ESA	Environmental Site Assessment	ROC	Record of Conversation
FEMA	Federal Emergency Management Agency	RWQCB	Regional Water Quality Control Board
ft/day	feet per day	SWPPP	Storm Water Pollution Prevention Plan
fps	feet per second	SWRCB	State Water Resources Control Board
FSA	Final Staff Assessment	TDS	total dissolved solids
ft/ft	feet per foot	µS/cm	microsiemens per centimeter
ft/yr	feet per year	USCS	Unified Soil Classification System
GW	gigawatt	WWTP	wastewater treatment plant
gpd	gallons per day		

SOIL AND WATER RESOURCES - APPENDIX B

HARPER LAKE MODELING REVIEW FOR ABENGOA MOJAVE SOLAR PROJECT

The proposed Abengoa Mojave Solar Project site is located in the Harper Lake Basin, which is effectively a semi-closed basin located northwest of the Mojave River. The Harper Lake Basin lies in the Centro Subarea of the Mojave Water Agency management area of the Mojave Desert (CSU Fullerton, September 2007). Layne Christensen Company applied numerical groundwater-flow modeling to assess potential impacts resulting from the proposed extraction and use of groundwater for construction and power plant cooling (ESH 2009f). They employed a pre-existing, three-dimensional numerical groundwater-flow model of the Mojave River Basin developed by the U.S. Geological Survey (USGS 2001) to conduct their impact assessment (herein referred to as "the model"). Specifically, they utilized the model to simulate groundwater-level and storage changes in response to pumping from extraction wells for plant construction (2 years) and plant operation (30-years). The California Energy Commission requested review of model construction, assumptions, parameters, calibration, sensitivities, results, and validity.[6] Additionally, the Commission requested modeling analyses to project groundwater changes attributable to proposed power-plant groundwater use.

BACKGROUND ON GROUNDWATER-FLOW MODELING

The process of numerical groundwater-flow modeling involves first developing a conceptual model of the physical system and then applying a mathematical model to represent it quantitatively. The conceptual model is a clear, qualitative description of the natural system and its operation including water sources (recharge), flow directions, and sinks (discharge). The mathematical model utilizes equations to simulate the physical processes described by the conceptual model. The potential complexity of processes and variety of boundary conditions typically require numerical procedures to determine an approximate solution to the mathematical groundwater-flow equations. The Mojave River Basin model is based on the numerical mathematical model MODFLOW (USGS, 1988); MODFLOW is a widely accepted model code that has been verified to produce numerically stable solutions (Anderson and Woessner, 1991).

[6] The terms "verification" and "validation" are often used interchangeably in hydrologic modeling. Some consider a "valid" groundwater-flow model as meaning it has been adequately demonstrated that the model simulates the cause and effect relationships within a specific groundwater basin. For example, the model adequately simulates the magnitude and distribution of water level changes in response to a change in recharge and pumpage. This type of validation is typically accomplished by conducting a post-audit after the modeling study is completed. A post-audit assesses whether conditions predicted by the model is confirmed by new field data that has been collected. Stamos and others (USGS, 2001) conducted a post-audit on the Mojave River Basin model by comparing observed and simulated water levels for the period 1995-1999. They concluded the match between observed and simulated water levels was good, and the model could be used to predict the response of the aquifer system to stresses that are similar in type and magnitude to those used during the calibration process. As part of this model review, we extended the post-audit and compared observed and simulated water levels in the Harper Lake area and its vicinity during the period 1995-2008. The results of our post-audit are described in this appendix under the section "Model Results."

In applying models to real world groundwater-flow systems, errors can potentially arise from the following sources.

- Numerical deficiencies from errors associated with the equation solvers. These errors introduce problems with computational accuracy and precision.
- Conceptual deficiencies (i.e., erroneous basin geometry, incorrect boundary conditions, neglecting important processes, including inappropriate processes, and so forth).
- Inadequacies in parameterization (values selected to represent water transmitting and storage properties) and poorly defined stresses (specified distribution and magnitude of inflows and outflows like recharge and pumping).

The most common errors in model construction are attributed to: conceptual deficiencies and inadequate/poorly defined parameterization and stresses. Although Layne Christensen Company developed and describe a conceptual model for the Harper Lake Basin in Appendix A: “Basin Conceptual Model” of the Application for Certification (AS 2009a), the conceptual model utilized in their modeling and impact assessment is represented by the U.S. Geological Survey Mojave River Basin Groundwater Model (USGS 2001). We first describe the conceptual model of the Harper Lake Basin as represented by the U.S. Geological Survey model, and then assess the modeling assumptions, simulation results, and their inherent sensitivity to uncertainty in model input. We then summarize simulated water level and groundwater storage changes due to construction and power-plant groundwater use.

CONCEPTUAL MODEL

The Harper Lake Basin is part of the Centro Subarea of the Mojave River Basin, which is one of the adjudicated subareas overseen by the Mojave Water Agency. The Harper Lake Basin boundary, as mapped by the California Department of Water Resources, is not coincident with the Harper Lake groundwater subarea delineated within the numerical model (herein referred to as the Harper Lake model zone). The Harper Lake model zone is smaller in area than California Department of Water Resources’ Harper Lake Basin boundary.

For the purposes of this report, we focused our assessment primarily on the Harper Lake model zone as defined in the groundwater-flow model (USGS 2001). The Harper Lake model zone is delineated by the Lockhart Fault in the southwest and the contact between alluvium and bedrock to the north, east, and south. The water-bearing sediments are unconsolidated to semi-consolidated alluvial materials of Quaternary age ranging in size from coarse gravel to clay. The materials tend to become more consolidated with depth. Groundwater is generally unconfined, although confined conditions have been reported near Harper (dry) Lake.

Perched water-table conditions reportedly exist near Harper (dry) Lake (USGS 2001). A perched water-table is a special case of an unconfined aquifer whereby the perched groundwater is separated from the main groundwater system by low permeability strata and an underlying unsaturated zone (Todd 1980). The model represents the main groundwater system that underlies the perched water-table.

Since data was first available in 1916, water levels have consistently indicated that groundwater flow is towards Harper (dry) Lake (CSU Fullerton, 2007). Under pre-development conditions, groundwater discharged to Harper (dry) Lake, but since around the 1950's groundwater has been developed and extracted for primarily agricultural uses. The pumping and consumption of groundwater lowered water levels and removed groundwater from storage such that discharge from the regional aquifer to the lake bed is assumed no longer significant.

Distributed recharge from precipitation is considered minimal in the Harper Lake model zone because precipitation does not adequately meet evapotranspiration and soil-moisture requirements. Since agricultural development in the late 1940's, distributed recharge has occurred artificially from irrigation return-flow.

The hydraulic communication between the Harper Lake model zone and adjacent areas of the Centro subarea is limited to flow across the Lockhart Fault, located southwest of Harper (dry) Lake, and flow within the Hinkley Valley (a narrow alluvial valley that connects the Harper Lake model zone to the eastern portion of the Centro subarea). Previous investigations estimated inflow from Hinkley Valley ranging from 22 to about 3,000 acre-feet per year (CSU Fullerton, 2007); inflow across the Lockhart Fault has not been previously reported. These groundwater flows from the Centro subarea originate primarily as infiltration of surface water flows into the flood plain aquifer of the Mojave River (river leakage).

In summary, the Harper Lake model zone is generally characterized as an unconfined groundwater system that has limited hydraulic connection with the regional Mojave River Basin. Subsurface flows across the Lockhart Fault and through the Hinkley Valley are the primary inflows, and agricultural consumption of pumped groundwater is the primary outflow. Groundwater consumption over the past 50 or more years has exceeded inflow, resulting in the gradual decline of groundwater levels and storage. Following adjudication of the basin in the mid- to late 1990's, groundwater consumption has decreased resulting in a gradual water level rise in some wells and stabilization of the historical storage decline.

MODEL CONSTRUCTION

Assumptions

We reviewed the modeling assumptions reported by the USGS (2001) and those incorporated by Layne Christensen (ESH 2009f). The key assumptions relative to simulating groundwater-flow in the Harper Lake model zone are summarized below.

- Simulation period. The USGS calibrated model simulated steady-state groundwater-flow conditions in 1930, and transient groundwater-flow conditions during the period 1931-1994 (USGS 2001). The steady-state 1930 groundwater levels are the initial conditions for the 1931-1994 transient simulation. Additionally, the USGS updated the recharge and pumpage data sets to extend the simulation through 1999. For the purposes of this analysis, Layne Christensen (ESH 2009f) updated and extended the data sets to simulate conditions during the period 2000-2050.
- The aquifer extent is assumed to coincide with the Harper Lake model zone boundary, and no-flow boundaries are utilized around and below the model zone to

represent the contact between water bearing sediments and bedrock (the quantity of water exchanged between the aquifer and bedrock is assumed small). The two exceptions are the Lockhart Fault, which impedes the exchange of groundwater between the Harper Lake model zone and adjacent areas of the Centro subarea, and groundwater movement from the Centro subarea through the Hinkley Valley.

- Model grid. The model is a rectangular grid of 2,000 by 2,000 feet square cells. Each cell represents approximately a 92-acre part of the region, and the parameters assigned to each cell represent the average value for the real-world groundwater system. Similarly, the simulated groundwater level represents the average groundwater level for the entire cell; water levels at individual wells and at different locations within the area represented by the cell can be significantly different from the average groundwater level.
- Model layers. The regional aquifer is unconfined and in the vertical direction represented by two model layers; model layer 1 represents the upper part of the saturated regional alluvial aquifer (assumed 100 feet thick), and model layer 2 represents the lower part of the saturated regional alluvial aquifer (assumed 700 feet thick). Simulated pumping wells extract water from the lower part of the regional aquifer (layer 2).
- Model convergence. The model simulations are assumed to converge when the residuals in hydraulic head and volumetric fluxes meet the user's specified criteria. The recommended error criterion for groundwater levels should be one to two orders of magnitude smaller than the accuracy level desired, and the error in the water balance is ideally less than 0.1%, but an error of about 1% is usually considered acceptable (Anderson and Woessner, 1991). The model simulations reviewed by staff employed a water level closure criterion of 1-foot and have typical mass balance errors of less than 0.2%. Model tests conducted by staff indicated that decreasing the closure criterion from 1.0- to 0.1-foot had a negligible effect on simulated water levels (the differences between simulated water levels averaged 0.02-foot or less). Staff therefore concluded simulated water levels are probably accurate to the nearest foot or less.
- Constant transmissivity. Transmissivity values are constant for both model layers to ensure numerical stability of the model. However, this approach fails to account for the decrease in transmissivity that occurs as a result of a decline in water level (for example, the drawdown caused by pumping wells can reduce the saturated thickness of the unconfined aquifer and decrease the effective aquifer transmissivity). Ignoring these transmissivity changes introduces errors. In the model simulations we considered, the maximum drawdown near the proposed project pumping wells was never greater than 20 feet. A drawdown of 20-feet represents less than a 3% reduction in saturated thickness, and less than a 1% reduction in

effective transmissivity[7]. We therefore concluded the drawdown effect on simulated transmissivity is small and employing constant transmissivity values is a reasonable assumption for the model simulations considered.

- Constant storage coefficient. Water removed from storage in unconfined and confined aquifers are assumed to discharge instantaneously with decline in water levels. Accordingly, there is no delayed storage response and the simulated storage coefficients do not vary with time.
- Perched water table. In the Harper Lake model zone, perched water-table conditions reportedly exist near Harper (dry) Lake. Model calibration results indicated that perched groundwater is not a significant source of recharge to the regional aquifer (USGS 2001).
- Distributed water table recharge. Distributed recharge from rainfall and artificial water sources (for example, irrigation return flows) is applied to the simulated water table in model layer 1. Distributed recharge from direct precipitation is assumed minimal because precipitation does not adequately meet evapotranspiration and soil-moisture requirements. Recharge from precipitation therefore occurs primarily as infiltration of runoff from select washes and mountains (mountain-front recharge). In the greater Mojave River Basin, mountain-front recharge can be significant; however, mountain-front recharge is considered negligible in the Harper Lake model zone.

  Irrigation-return flows occur beneath irrigated areas located primarily north of Harper (dry) Lake, where the perched water table is absent (USGS 2001). For the period 2000 through 2050, simulated irrigation-return flows were assumed constant and equal to 1999 conditions (about 1,500 acre-feet per year)[8]. These return flows represent almost 20% of the combined 2008 pumping rate for wells located in the Harper Lake model zone.
- Mojave River recharge. Leakage from the Mojave River is represented with a stream-flow and routing boundary condition, which simulates stream-aquifer interactions and tracks the amount of flow in the river. Leakage from the Mojave River is a principal source of recharge to the regional groundwater basin, and leakage that occurs in the Centro subarea is most relevant to Harper Lake model zone groundwater. The modeled Mojave River parameters were determined by the USGS (2001) and are based on geologic properties of the stream bed materials and historical flow conditions (flow rates and the number of days of flow). As a result, the

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[7] The thicknesses of layers 1 and 2 are assumed 100 and 700 feet, respectively. In the vicinity of the proposed project, the transmissivity values specified for layers 1 and 2 are 500 and 3,500 ft^2/day, respectively. Hence, because the transmissivity of layer 1 is relatively low, simulated drawdown within layer 1 has a small effect on the effective transmissivity of the entire aquifer (layers 1 and 2 combined). Additionally, all pumping is assumed to extract groundwater from the deeper deposits represented by layer 2 which does not experience any dewatering or change in effective transmissivity.

[8] In the Harper Lake model zone, agricultural water use has been declining and a proportional decline in irrigation-return flow can be expected. Assuming irrigation return flow during the period 2000-2050 is constant likely over-estimates recharge if agricultural water use continues to decline. However, the percentage of pumped groundwater that is consumed is greater than the percentage that becomes return flow; hence, the storage benefit resulting from a reduction in agricultural pumpage is greater than the corresponding reduction in irrigation return flow.

model employs temporally variable river flow and stream bed conductance during the 1931-1994 calibration and 1995-1999 post-audit periods. For the 2000-2050 simulation period, Layne Christensen assumed constant annual stream flow conditions equal to historical 1962 conditions. They chose 1962 because the simulated stream inflow (62,580 acre-feet) was considered approximately the same as the average value for the 1931-1999 simulation (71,600 acre-feet).

We compared simulated net Mojave River leakage during the historical 1931-1994 calibration and the 2009-2050 projection periods. The 1931-1994 average net river leakage to the Centro subarea (25,180 AF/yr) is greater than both 1962 (14,840 AF/yr) and the 2009-2050 projection period (19,790 AF/yr). Since 1962, additional flows have been added to the river and resulted in greater leakage (for example, discharge from the California State Water Project at the Mojave Water Agency's Morongo basin pipeline, and discharge from the Victor Valley Wastewater Authority sewage pipeline). Because 1962 flow conditions do not include these additional inflows, the simulated future leakage is likely conservative (i.e., actual leakage during 2009-2050 will likely be greater than simulated by repeating 1962 flow conditions).

- Groundwater pumpage. Groundwater pumpage is the principal source of discharge from the aquifer system. In the Harper Lake model zone, groundwater is used to meet agricultural and domestic water needs (domestic pumpage is considered substantially less than agricultural pumpage). The USGS (2001) estimated total pumpage for the historical 1931-1999 simulation period. For the period 2000-2050, Layne Christensen repeated estimated 1999 pumpage for all model areas except the Harper Lake model zone. In the Harper Lake model zone, spatial and temporal variability in annual pumpage during 2000-2008 was simulated using well locations and annual pumping rates reported by the Mojave Water Agency (ESH 2009f). After 2008 (i.e., 2009-2050 simulation period), Harper Lake model zone pumpage was assumed constant and equal to 2008 conditions.
- Groundwater discharge from dry lakes. The model employs drain boundaries to simulate groundwater discharge from five dry lakes in the Mojave River Basin. Drain boundaries simulate groundwater discharge only; discharge is simulated when the groundwater level is greater than the average altitude of the dry lake surface, and ceases when the groundwater level is less than the dry lake surface. The average altitude of Harper (dry) Lake was specified as 2,020 feet above mean sea level, and the drain conductance controlling the discharge rate was estimated by model calibration to be 1.0 ft^2 per day (USGS 2001).

  Employing drain boundaries having elevations equal to the lakebed surface may ignore potential groundwater discharge to the atmosphere from a shallow water table. Detailed evapotranspiration studies in Death Valley indicate average annual groundwater discharge from dry, salt encrusted and bare-soil playa lakebeds at 0.13 to 0.15 foot per year, respectively (DeMeo 2003). The water table underlying the areas studied by DeMeo (2003) ranged from 5 to 10 feet below land surface. Simulated water levels beneath Harper (dry) Lake ranges from 30 to 60 feet below the lakebed surface, and therefore discharge from an underlying water table, if any, would be associated with the perched water table.

- The model employs evapotranspiration boundary conditions to simulate phreatophyte transpiration along the Mojave River and evaporation from bare-soil areas in the river channel. Groundwater discharge from evapotranspiration boundary conditions varies depending on the simulated depth to water beneath and near the river. The hydraulic communication between the Harper Lake model zone and Centro subarea is limited and therefore simulated evapotranspiration from beneath and near the Mojave River likely has a negligible effect on groundwater in the Harper Lake model zone. Conversely, groundwater consumption in the Harper Lake model zone likely has a similarly negligible effect on evapotranspiration from beneath and near the Mojave River.
- The downstream end of the Mojave River basin model employs a general-head boundary condition to simulate underflow from the Mojave River and groundwater discharge from the regional basin. The characteristics of this boundary were determined by the USGS (2001), and due to its significant distance from the Centro subarea (over 40 miles), variability in discharge at this boundary is assumed relatively insignificant to groundwater conditions in the Harper Lake model zone.

Parameters

The two aquifer properties specified in the model are transmissivity and storage coefficient (specific yield and specific storage). Transmissivity is a measure of flow through a strip of aquifer of unit width under a unit hydraulic gradient. The storage coefficient is the volume of water released or added to storage per unit surface area per unit change in groundwater level. In unconfined aquifers, the storage coefficient is the specific yield, which is a measure of the water drained from the saturated aquifer material under the force of gravity. In confined aquifers, the storage coefficient is the specific storage, which is a measure of the water released from compression of the aquifer structure and expansion of the water in response to the decline in pressure. The specific storage is typically two to four orders of magnitude less than the specific yield (Todd 1980).

Transmissivity

Transmissivity is a measure of the aquifer's ability to transmit water. There is almost always uncertainty in the magnitude and distribution of transmissivity owing to the inherent uncertainty of natural heterogeneous systems. The transmissivity distribution in the model was determined by model calibration (USGS 2001). In layer 1 of the Harper Lake model zone, the transmissivity ranges from 500 ft^2/day near Harper (dry) Lake to 10,000 ft^2/day in the Hinkley Valley. In layer 2, the transmissivity is everywhere 3,500 ft^2/day (due to a local high in the underlying bedrock surface, layer 2 is inactive where Hinkley Valley groundwater exits into the Harper Lake model zone). The modeled transmissivity values are generally within the range of previously reported transmissivity values for the regional aquifer system (300 to 13,400 ft^2/day, ESH 2009f). Simulated inflow to the Harper Lake model zone during 1931-1994 averaged 1,720 acre-feet per year and is within the range of 22 to almost 3,000 acre-feet per year estimated by previous studies (CSU Fullerton, 2007); the most recent (2007) study cited by CSU Fullerton (2007) was reported by Aquifer Science and Technology and their estimate was 1,468 acre-feet per year.

Due to potential uncertainty in transmissivity, model simulations considered a range in transmissivity values. Uncertainty was considered by conducting parallel simulations that uniformly multiplied Harper Lake model zone transmissivity values by factors of 0.5 and 1.5 (a 50% change in modeled transmissivity).

Storage Coefficient

The USGS (2001) calibrated value for the specific yield of the regional aquifer was 0.12, which agrees with previously reported values (ESH 2009f). The confined storage coefficient employed by the USGS (2001) was 7.0×10^{-6}, which for the assumed 700-feet thick aquifer represented by layer 2 corresponds to a specific storage of 1×10^{-8}. This is an uncharacteristically low specific storage (typical values for California alluvial basins are on the order of 1×10^{-6}). Model tests conducted by staff indicated simulated water levels in the Harper Lake model zone are substantially more sensitive to changes to specific yield than changes to specific storage. There is uncertainty in the magnitude and distribution of specific yield and specific storage, and uncertainty was considered by conducting parallel simulations that multiply specific yield and specific storage values by factors of 0.75 and 1.25 (a 25% change in modeled storage coefficient)..

Faults

The Horizontal Flow Barrier Package is employed to simulate the hydrologic effects of internal faulting within the Mojave River groundwater system. It represents faults as thin, vertical, low-permeability geologic features located at the boundary between two adjacent model cells.

In the Harper Lake model zone, two faults are simulated (the Lockhart and Mt. General faults). These barriers are defined in the model by their hydraulic characteristic, which is the hydraulic conductivity of the fault divided by the width of the fault ($time^{-1}$); the hydraulic characteristic was determined by model calibration. Model calibration efforts concluded that the upper portion of the Lockhart Fault (layer 1) did not significantly influence horizontal groundwater movement, whereas the lower portion of the fault (layer 2) had a calibrated hydraulic characteristic of 1×10^{-4} ft^2/day (USGS 2001). The upper and lower portions of the Mt. General Fault both had calibrated hydraulic characteristics of 1×10^{-8} ft^2/day.

There likely is uncertainty in the magnitude of the hydraulic characteristic, and the effects of this uncertainty was considered by conducting parallel simulations that multiplied and divided the hydraulic characteristic by a factor of 10.0.

MODEL RESULTS

For the purposes of this assessment, staff utilized a modified version of the USGS Mojave River Basin model provided by the project applicant (EHS 2010h). Staff modified the project applicant's update to improve agreement between USGS reported simulated water levels. **Soil and Water Appendix B Table 1** below compares 1999 water levels at six well locations simulated by the USGS (2001) and simulated by the model version provided by the applicant (EHS 2010h). The water levels simulated by the applicant's version are on average about eight feet greater than simulated by the USGS. Staff corrected this discrepancy by replacing the initial water levels utilized by the applicant's model with the actual values provided by the USGS (Steven Phillips, December 29, 2009, written communication). After completing this modification, the discrepancy between the two models was corrected. Staff utilized this modified version to assess the USGS calibration for the Harper Lake model zone and project future water level and groundwater storage changes due to water use by the proposed Abengoa Mojave Solar (AMS) project.

Soil and Water Appendix B Table 1
Comparisons between Water Levels Simulated by USGS (2001) and Applicant and Staff Versions of the Model

Well ID	Cell (row, column)	1999 Water Level (stress period 138)		
		USGS (2001)	Applicant (2/2010)	Staff (2/2010)
11N/4W-19E2	24,48	1,933	1,939	1,933
11N/4W-19J1	25,51	1,930	1,936	1,930
11N/4W-28R1	29,56	1,947	1,953	1,947
11N/4W-31J3	31,51	1,955	1,969	1,955
11N/4W-32A2	29,54	1,937	1,944	1,937
11N/5W-24L1	25,47	1,933	1,940	1,933

Calibration and 1995-2008 Post Audit

Simulated and observed groundwater levels at well locations in and near the Harper Lake model zone are plotted in **Soil and Water Appendix B Figure 1**. The observed and simulated hydrographs are generally consistent with the conceptual model; since the 1950's, observed and simulated water levels decline in response to groundwater consumption by agriculture but most begin to recover starting in the 1990's as a result of the adjudication settlement and declining agricultural demand for water. There is considerable spatial variability in the absolute differences between observed and simulated water level magnitudes and trends. Because simulated recharge is small, and the simulated transmissivity distribution in the Harper Lake model zone is fairly uniform, the differences between observed and simulated water levels are likely due to the uncertainty between actual and simulated groundwater pumping. This is most evident in wells 11N/4W-19L1 and -31H1, and 11N/5W-13H1 and -24A1. Prior to the 1970's, the water levels in these wells suggest the simulated annual pumping patterns are substantially different from the longer-term average trend simulated by the model.

The Mojave River Basin groundwater-flow model was calibrated by the USGS (2001), and the model simulates generally greater Harper Lake model zone water levels than observed. In the Harper Lake model zone, the reported root mean squared error[9] (RMSE) for 1992 transient conditions was about 25 feet (USGS 2001). In the USGS' 1995-1999 post-audit, the RMSE in the Harper Lake model zone for the 1998 transient simulation increased slightly to 30.5 feet. Staff conducted their own post audit by comparing available observed Harper Lake model zone water level data. Data was

[9] The root mean squared error, or standard deviation, is the average of the squared differences between observed and simulated heads. It is a measure of the average error in the calibrated model.

compared for the 1995-2008 period, effectively extending the USGS post audit by an additional ten years. The resulting RMSE for the entire 14 year period combined is 39 feet, indicating that the average error in projected water levels relative to observed values was almost 40 feet.

Because subsurface inflow from the Hinkley Valley and across the Lockhart Fault are the primary recharge sources, simulated inflow and water levels are sensitive to the specified transmissivity and fault hydraulic characteristic. However, adjusting these inputs had only a modest impact on the RMSE. Increasing and decreasing transmissivity by 50% resulted in RMSE values of 35 and 45, respectively. Similarly, increasing and decreasing the hydraulic characteristic of the fault by 100% resulted in RMSE values of 39 and 41, respectively.

The greatest absolute differences between simulated and observed water levels occur southwest of Harper (dry) Lake, where on average simulated water levels are 40 to more than 60 feet higher than observed (the proposed power plant is located in this general southwest area). However, simulated water levels are below the drain boundary elevations representing the dry lake bed, and no other head-dependent boundaries exist in the Harper Lake model zone that can affect groundwater storage. Because staff's assessment considered relative water level changes (for example, the change in water levels between two time periods), the absolute differences noted between observed and simulated water levels is likely not important. Rather, the relative magnitudes of simulated water level changes are important and determined mostly by simulated water level trends.

Soil and Water Appendix B Table 2
Comparison between Observed and Simulated
Water Level Trends[a], 1995-2008

	Post Audit Trend (ft/yr)		
	Alpha= 0.05		
Well Number[b]	**Observed**	**Simulated**	**Obs/Sim**
10N/03W-04H2	(-0.29)[c]	(0.21)	
10N/04W-10D1	0.82	0.84	1.0
10N/04W-33D1	-0.70	-0.17	4.1
11N/03W-07D1	(-5.08)	(-0.77)	
11N/03W-16D1	(-0.41)	(-1.28)	
11N/03W-28L1	(-0.54)	0.38	
11N/03W-28R2	-1.09	-0.41	2.7
11N/03W-30G1	--[d]	--	
11N/04W-29R1	2.35	3.33	0.7
11N/04W-30N1	1.66	2.41	0.7

a) Staff employed the Mann-Kendall test to determine statistically significant trends (95% confidence level) and the Sen's nonparametric estimator of slope to determine the water level change per unit time. For each well, the test first determined the slope of water level plotted versus time, then tested whether the slope was significantly non-zero at the 95% confidence level.
b) Well locations shown in **Soil and Water Appendix B Figure 1**.
c) Slopes in (parentheses) are not significant at alpha = 0.05.
d) '—' Insufficient data for trend analysis.

Staff compared observed and simulated trends in 10 wells having water level data for the 1995-2008 post-audit period (**Soil and Water Appendix B Table 2**). Data from five of the ten wells (50%) indicate statistically significant trends; although water levels in the remaining five wells also suggest trends, they are not statistically significant. The significant trends indicate water levels are increasing at three locations and decreasing at two locations. This means Harper Lake model zone pumping declines have caused water levels and groundwater storage to increase in some areas but they continue to decrease in others. The increasing water levels are observed in wells located southwest of Harper (dry) Lake, whereas the declining water levels are located in wells near Hinkley Valley and south of the Lockhart fault

The ratio between statistically significant observed and simulated water level trends ranges from 0.7 to 4.1 (average value of 1.8); observed trends are therefore generally too steep (more positive) in the three wells where observed water levels are rising and too shallow (less negative) in the two wells where observed water levels are declining. This suggests that simulated inflows are too positive, and projected water level changes may be less than actual water level changes. A range in expected water level changes that represent the uncertainty in aquifer parameters, pumping rates, and other hydrogeologic conditions is therefore recommended to provide a margin of safety when making conclusions based on model results.

Scenarios Considered for Impact Assessment

All use of wells within a groundwater basin contributes toward a lowering of water levels at other well locations. The overlap of drawdown among two or more wells is considered significant when it changes conditions in and around an existing well affecting its yield. Staff utilized the model to simulate drawdown as a result of project groundwater use. In this analysis, drawdown is considered the change in water levels relative to the baseline (pre-project or existing) conditions. For environmental reviews conducted by the Energy Commission, the baseline is generally established as the time when the Application for Certification is submitted, which was 2009 for the AMS project. The most recent data available for staff's assessment was from 2008, and therefore staff considered 2008 as representing baseline.

Staff's impact assessment simulated changes in groundwater conditions during the period 2009-2050. Project wells are assumed to operate continuously beginning in 2011. During the two-year construction period, the wells are assumed to pump at their maximum design rate until construction is completed at the end of 2012. The project is assumed to begin operation in 2013 and continue for 30 years until project shut-down occurs at the end of 2042. Simulated annual conditions prior to project construction (2009-2010) and following project operation (2043-2050) are assumed equal to simulated 2008 conditions.

Uncertainty affects all models owing to the inherent uncertainty of natural heterogeneous systems. Staff reduced potential uncertainty effects by conducting sensitivity tests with the model. The sensitivity tests are parallel simulations that adjusted aquifer parameters, pumping rates, and river flows to bracket potential uncertainty in simulated drawdown and impact. For example, water level changes were simulated using Harper Lake model zone transmissivity values adjusted by plus and minus 50%. The transmissivity test results provided a range in drawdown and impacts owing to possible uncertainty in modeled transmissivity. Similar parallel simulations were completed to assess possible uncertainty in aquifer storage coefficients, fault conductance, pumping rates and Mojave River leakage. The sensitivity tests considered are as follows:

- Assumed 50% uncertainty in aquifer transmissivity modeled by multiplying transmissivity values by 0.5 and 1.5.
- Assumed 25% uncertainty in aquifer storage coefficient modeled by multiplying storage coefficients by 0.75 and 1.25.
- Assumed 100% uncertainty in vertical anisotropy modeled by multiplying the vertical hydraulic conductivity by 0.1 and 10.0.
- Assumed 100% uncertainty in fault permeability modeled by multiplying the hydraulic characteristic by 0.1 and 10.0.
- Assumed 10% uncertainty in future, non-project pumping (background pumping) modeled by multiplying background pumpage by 10.0.
- Assumed uncertainty in river leakage by specifying 1994 river flows rather than 1962 flows.[10]

RESULTS

Staff utilized the model to simulate projected water level changes owing to project pumping for construction and power plant cooling. The project applicant estimated that about 1,100 acre-feet of groundwater is required to complete construction, and at most approximately 64,800 acre-feet of groundwater is required for power plant operation over the 30-year life of the project. Total groundwater use over the life of the project is therefore almost 66,000 acre-feet. For the purposes of this assessment, simulated drawdown was calculated to assess potential well interferences at twenty-nine locations representing a sampling of the spatial distribution and extent of wells located in the Harper Lake model zone (**Soil and Water Appendix B Figure 1**).

Construction Pumping

Simulated project construction pumping begins in 2011 and continues through 2012. The project applicant estimated that almost 990 acre-feet of groundwater is required during the first six months of construction for grading, and 115 acre-feet is required for the remaining 18 months of construction (total groundwater use of 1,105 acre-feet over the two year construction period). However, Layne Christensen simulated an average annual construction rate of 3,780 acre-feet per year over the two-year period. The assumed higher pumping rate represents the maximum feasible pumping rate and was utilized to simulate maximum impacts to groundwater. The total simulated volume of groundwater extracted for construction is 7,560 acre-feet, which represents over seven times more water used than the applicant estimated will actually be required for construction. Simulated drawdown and well interferences owing to project construction pumping are therefore likely greater than expected actual changes.

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[10] River discharge in 1994 (about 26,500 af) was similar to the median discharge during 1930-1994 (28,800), and simulated 1994 river conditions include more recent inflows that did not exist in 1962 (i.e., wastewater inflows, imported water introduced by the Morongo pipeline, and others).

Simulated drawdown owing to project construction pumping is summarized below in **Soil and Water Appendix B Table 3**. Simulated drawdown at 29 well locations spatially distributed across the Harper Lake model zone range from -4 to 11 feet; simulated water levels at some locations are recovering even with project pumping as a result of pumping decreases in the subarea (**Soil and Water Appendix B Figure 1**), and the negative drawdown indicates simulated water levels continue to increase at some locations after 2008. The sensitivity tests help account for potential uncertainty in model results and indicate maximum drawdown range from -2 to 18 feet.

Soil and Water Appendix B Table 3
Summary of Simulated Construction Drawdown[a]

Well	Distance to Pumping Well PW-1 (miles)	Distance to Pumping Well PW-2 (miles)	Drawdown (feet)	Maximum from Sensitivity Tests	
				Drawdown (feet)	Test Name[b]
10N/03W-04H2	8.0	6.4	-4	-2	Riv(94)
10N/04W-10D1	3.0	1.6	0	3	0.1*Kv
10N/04W-33D1	6.5	5.7	1	1	10*Fault
10N/05W-03J1	3.8	4.9	1	1	1.1*W
11N/03W-7D1	6.1	5.5	1	3	0.5*T
11N/03W-16D1	7.3	6.4	1	4	0.5*T
11N/03W-28L1	7.4	6.0	-2	1	0.5*T
11N/03W-28R2	7.8	6.4	-2	1	0.5*T
11N/03W-30A1	5.5	4.1	-1	1	0.5*T
11N/03W-30G1	5.5	4.1	-1	1	0.5*T
11N/03W-34F1	8.1	6.6	-3	0	0.5*T
11N/04W-04R1	4.4	4.8	1	2	0.5*T
11N/04W-06E1	4.4	5.6	0	1	0.5*T
11N/04W-19E2	1.7	3.3	-1	3	0.1*Kv
11N/04W-19J1	1.1	2.5	3	6	0.1*Kv
11N/04W-19L1	1.5	3.0	0	4	0.1*Kv
11N/04W-19Q1	0.9	2.5	4	8	0.1*Kv
11N/04W-28R1	1.8	0.6	6	11	0.1*Kv
11N/04W-29R1	0.7	0.9	9	15	0.1*Kv
11N/04W-30N1	1.2	2.8	2	7	0.1*Kv
11N/04W-31A1	1.3	2.8	3	8	0.1*Kv
11N/04W-31H1	0.6	1.7	11	18	0.1*Kv
11N/04W-31J3	1.0	1.7	5	9	0.1*Kv
11N/04W-32A1	0.9	0.8	10	16	0.1*Kv
11N/04W-32A2	0.9	0.7	10	16	0.1*Kv
11N/04W-35G1	3.4	1.8	0	0	0.1*Kv
11N/05W-13H1	2.8	4.3	-1	1	0.1*Kv
11N/05W-24A1	2.0	3.6	-1	2	0.1*Kv
11N/05W-24L1	2.1	3.7	-2	1	0.1*Kv

a: Simulated present-day (2008) water level minus the simulated water level at the end of the project period (2042). Negative drawdown indicates water levels at the end of the project period are greater than present-day water levels.
b: Riv(94) replaces 1962 river flows with 1994 values; Kv is vertical hydraulic conductivity; Fault is the hydraulic characteristic; T is transmissivity; and, W is wells (or pumping rate).

Thirty-Year Project Pumping

Simulated project pumping begins in 2013 and continues through 2042. The simulated annual pumping rate is 2,160 acre-feet per year. The simulated water level changes include the pumping effects for power plant cooling, and therefore represent the combined impact from both construction and power plant operation.

Simulated drawdown owing to project construction and power plant pumping are summarized below in **Soil and Water Appendix B Table 4**. Simulated drawdown at 29 well locations distributed spatially across the Harper Lake model zone range from -10 to 16 feet; simulated water levels at some locations are recovering as a result of pumping decreases in the subarea (**Soil and Water Appendix B Figure 1**), and the negative drawdown indicates simulated water levels 2008 continue to increase even with project construction and operational pumping. The sensitivity tests help account for potential uncertainty in the model results and indicate maximum drawdown at the same locations range from -2 to 19 feet.

Soil and Water Appendix B Table 4
Summary of Simulated Project Pumping Drawdown[a]

Well	Distance to Pumping Well PW-1 (miles)	Distance to Pumping Well PW-2 (miles)	Drawdown (feet)	Maximum from Sensitivity Tests	
				Drawdown (feet)	Test Name[b]
10N/03W-04H2	8.0	6.4	-10	-2	0.5*T
10N/04W-10D1	3.0	1.6	6	8	0.5*T
10N/04W-33D1	6.5	5.7	6	7	0.5*T
10N/05W-03J1	3.8	4.9	5	6	0.5*T
11N/03W-07D1	6.1	5.5	5	19	0.5*T
11N/03W-16D1	7.3	6.4	1	19	0.5*T
11N/03W-28L1	7.4	6.0	-6	7	0.5*T
11N/03W-28R2	7.8	6.4	-6	6	0.5*T
11N/03W-30A1	5.5	4.1	-2	9	0.5*T
11N/03W-30G1	5.5	4.1	-2	9	0.5*T
11N/03W-34F1	8.1	6.6	-8	3	0.5*T
11N/04W-04R1	4.4	4.8	8	15	0.5*T
11N/04W-06E1	4.4	5.6	8	11	0.5*T
11N/04W-19E2	1.7	3.3	5	8	0.75*Sc
11N/04W-19J1	1.1	2.5	9	13	1.1*W
11N/04W-19L1	1.5	3.0	7	9	1.1*W
11N/04W-19Q1	0.9	2.5	10	13	1.1*W
11N/04W-28R1	1.8	0.6	11	14	0.5*T
11N/04W-29R1	0.7	0.9	15	18	1.1*W
11N/04W-30N1	1.2	2.8	8	11	0.75*Sc
11N/04W-31A1	1.3	2.8	9	12	0.75*Sc
11N/04W-31H1	0.6	1.7	16	19	0.75*Sc
11N/04W-31J3	1.0	1.7	11	14	0.75*Sc
11N/04W-32A1	0.9	0.8	15	18	0.5*T
11N/04W-32A2	0.9	0.7	16	19	1.1*W
11N/04W-35G1	3.4	1.8	4	8	0.5*T
11N/05W-13H1	2.8	4.3	5	7	1.1*W
11N/05W-24A1	2.0	3.6	4	7	0.75*Sc
11N/05W-24L1	2.1	3.7	3	6	0.75*Sc

a: Simulated present-day water level (2008) minus the simulated water level at the end of the project (2042). Negative drawdown indicates water levels at the end of the project period are greater than present-day water levels.
b: T is transmissivity; Sc is storage coefficient; and, W is wells (or pumping rate).

Groundwater Storage Changes

Soil and Water Appendix B Figure 2 shows simulated water level changes at individual wells without and with AMS project pumping. Without the project, continued pumping at 2008 rates results in water levels in Harper Lake model zone wells remaining steady or gradually increasing over the 32-year planning period. The increase in pumping introduced by the project causes simulated water levels in most Harper Lake model zone wells to decline and groundwater storage to decrease. **Soil and Water Appendix B Figure 3** shows the mapped difference between simulated 2042 water levels with and without proposed project pumping (the difference herein is referred to as the “impact”). After 32-years of project pumping (two years pumping for construction water use and 30-years operational water use), the impact propagates throughout most of the Harper Lake model zone and into the adjacent southwestern portions of the Centro subarea.

Soil and Water Appendix B Table 5 below summarizes the groundwater budget changes in the Harper Lake model zone and compares simulated inflow (subsurface flow across the Lockhart Fault and through the Hinkley Valley), groundwater storage, and pumping. Without project pumping, the negative storage change in **Soil and Water Appendix B Table 5** indicates groundwater flow is out of the dynamic groundwater-flow system and into aquifer storage (i.e., Harper Lake model zone pumping is less than total simulated inflow thereby adding water to groundwater storage and causing water levels to increase). In contrast, with project pumping the storage change is positive and indicates groundwater flow is out of storage and into the dynamic groundwater-flow system (i.e., Harper Lake model zone pumping is greater than total inflow thereby removing groundwater from storage and causing water levels to decrease).

Soil and Water Appendix B Table 5
Summary of Simulated Inflows and Storage Changes, 2011-2042 (acre-feet per year)

Scenario	Pumping	Irrigation Returns	Lockhart Fault	Hinkley Valley	Storage Change
Without Project	-5,490	1,050	1,150	3,850	-570
With Project	-7,750	1,050	1,510	3,900	1,290
Change	-2,260[a]	0	360	50	1,860

a: Two years pumping 3,780 acre-feet per year, and 30 years pumping 2,160 acre-feet per year resulting in an annual weighted average pumping rate of 2,260 acre-feet per year.

Soil and Water Appendix B Table 5 indicates that project pumping removes 1,860 acre-feet per year of groundwater from storage in the Harper Lake model zone; about 570 acre-feet per year that otherwise would have increased storage, and 1,290 acre-feet per year of water stored in place prior to the start of project construction. The remaining 400 acre-feet per year of project pumping is supplied by removing water in storage from the rest of the Centro subarea (not reported in **Soil and Water Appendix B Table 5**).

Soil and Water Appendix B Table 6 compares the simulated storage changes due to project pumping represented by the water level change mapped in **Soil and Water Appendix B Figure 3**. Simulated storage changes were compared to accessible and total groundwater storage in place within the Harper Lake zone and remaining Centro subarea.[11] Staff utilized simulated water levels and the well construction information summarized in **Soil and Water Table 5** to estimate accessible groundwater in place (the water within the saturated zone between the water table and bottom of existing wells) and total storage in place (the water within the saturated zone between the water table and base of the aquifer represented by the model). Results indicated that project pumping consumes about 3% of the accessible groundwater in place within the Harper Lake model zone, about 1% of the total storage volume in place within the Harper Lake model zone, and less than 0.1% of the total storage volume in place within the remainder of the Centro subarea.

Soil and Water Appendix B Table 6
Simulated Total Storage Volumes and Storage Reductions

	Harper Lake Model Zone (59,500 acre-feet storage reduction)		Centro Subarea[a] (12,500 acre-feet storage reduction)	
	Total storage volume (acre-feet)	Storage volume reduction as a percent of total	Total storage volume (acre-feet)	Storage volume reduction as a percent of total
Water table to average well bottom	1,740,500	3.4	---	---
Water table to aquifer bottom	4,945,550	1.2	13,533,300	0.09

a: Excludes Harper Lake model zone, which is located within the larger Centro subarea.

Soil and Water Appendix B Figure 4 compares simulated groundwater storage changes relative to the accessible storage both in terms of volume and as a percent. The simulated storage change is less than 5% (about 3%) of the groundwater currently accessible in the Harper Lake model zone, and therefore project pumping is considered to have a negligible effect on groundwater storage.

[11] Total simulated storage volume was estimated using results from the groundwater-flow model. First, the simulated saturated thickness in each model cell was calculated by subtracting the elevation of the bottom of the aquifer from the simulated water table elevation. The unsaturated and saturated aquifer thickness represented by the model is 800 feet; accordingly, the bottom of the modeled aquifer was determined for each model cell by subtracting 800 feet from land surface elevation. Land surface elevation was determined using a Digital Elevation Model (DEM) obtained from the U.S. Geological Survey geographic data distribution website (seamless.usgs.gov). The DEM used in this analysis had a cell size of 10 meters. The land surface elevation for each model cell was determined by averaging the elevation of all DEM cells within each model cell using ArcMap GIS software. The volume of groundwater was then calculated for each cell by multiplying the saturated thickness by the cell area and its modeled specific yield. The resulting water volumes for each cell were then summed to estimate total storage volume. Similarly, accessible storage in the Harper Lake model zone was estimated by subtracting the average well depth (365 feet below ground surface) from the simulated groundwater elevation in each model cell, and then multiplying this thickness by the model cell area and specific yield. Data was not available to calculate average well depth in the rest of the Centro subarea, and therefore accessible storage could not be estimated for this portion of the model area.

CONCLUSIONS

Layne Christensen Company applied numerical groundwater-flow modeling to assess potential impacts resulting from the proposed extraction and use of groundwater for construction and power plant cooling (ESH 2009f). They employed a pre-existing, three-dimensional numerical groundwater-flow model of the Mojave River Basin developed by the U.S. Geological Survey (USGS 2001) to conduct their impact assessment. The USGS version simulated groundwater conditions from 1931 through 1999 and, for the purposes of their analysis, Layne Christensen updated and extended the data sets to simulate conditions during the period 2000-2050. Their updated data sets assumed the following.

- Simulated irrigation-return flows (about 1,050 acre-feet per year) were assumed constant and equal to 1999 conditions.
- Annual simulated stream flow conditions were assumed constant and equal to historical 1962 conditions. They chose 1962 because the simulated stream inflow (62,580 acre-feet) was considered approximately the same as the average value for the 1931-1999 simulation (71,600 acre-feet).
- Spatial and temporal variability in annual pumpage during 2000-2008 was simulated using well locations and annual pumping rates reported by the Mojave Water Agency (ESH 2009f). After 2008 (i.e., 2009-2050), annual pumpage was assumed constant and equal to 2008 conditions.

Staff revised the project applicant’s update to improve agreement between simulated water levels reported by the USGS(2010). Historical Harper Lake model zone water levels simulated by the applicant’s model version are on average about eight feet greater than simulated by the USGS. Staff corrected this discrepancy by replacing the initial water levels utilized by the applicant’s model with the actual values provided by the USGS. After completing this modification, the discrepancy between the two models was corrected and staff utilized the modified version to assess the USGS calibration for the Harper Lake model zone and groundwater changes resulting from the proposed Abengoa Mojave Solar Plant.

Model construction and simulated water level trends are generally consistent with the conceptual model; since the 1950’s, water levels decline in response to groundwater consumption by agriculture but begin to recover starting in the 1990’s as a result of the adjudication settlement and declining agricultural demand for water (**Soil and Water Appendix B Figure 1**). The model simulations employed a water level closure criterion of 1-foot and have typical mass balance errors of less than 0.2%. Model tests conducted by staff indicated that simulated water levels are accurate to the nearest foot or less.

Staff compared observed and simulated water levels and trends in ten wells having water level data for the 1995-2008 period. The resulting RMSE for the 14 year period combined is 39 feet, indicating that the average error in projected water levels relative to observed values was almost 40 feet. Data from five of the ten wells indicate statistically significant trends; water levels are increasing at three locations and decreasing at two locations. The ratio between observed and simulated statistically significant trends ranges from 0.7 to 4.1 (average value of 1.8); observed trends are therefore generally too steep (more positive) in the three wells where observed water levels are rising and too shallow (less negative) in the two wells were observed water levels are declining. This suggests that simulated inflows are too positive, and projected water level changes may be less than actual water level changes. A range in expected water level changes that represent the uncertainty in aquifer parameters, pumping rates, and other hydrologic conditions was therefore implemented to provide a margin of safety regarding simulated well interferences and potential impacts to groundwater. The sensitivity tests considered were as follows.

- Assumed 50% uncertainty in aquifer transmissivity modeled by multiplying transmissivity values by 0.5 and 1.5.
- Assumed 25% uncertainty in aquifer storage coefficient modeled by multiplying storage coefficients by 0.75 and 1.25.
- Assumed 100% uncertainty in vertical anisotropy modeled by multiplying the vertical hydraulic conductivity by 0.1 and 10.0.
- Assumed 100% uncertainty in fault permeability modeled by multiplying the hydraulic characteristic by 0.1 and 10.0.
- Assumed 10% uncertainty in future, non-project pumping (background pumping) modeled by multiplying background pumpage by 10.0.
- Assumed uncertainty in river leakage by specifying 1994 river flows rather than 1962 flows.

The most recent data available for staff's assessment was from 2008, and therefore staff considered 2008 as representing baseline groundwater conditions. Staff summarized the simulated groundwater conditions regarding groundwater impacts from project pumping.

- For project construction, simulated drawdown at 29 well locations range from -4 to 11 feet; observed water levels at some locations are recovering as a result of pumping decreases in the subarea (**Soil and Water Appendix B Figure 2**), and the negative drawdown indicates simulated water levels in 2012 are greater than 2008 even with project construction pumping. Sensitivity tests to account for potential uncertainty in model input indicate maximum drawdown may range from -2 to 18 feet.
- For project pumping (combined two-years of construction pumping and 30 years of operational pumping), simulated drawdown at 29 well locations range from -10 to 16 feet; observed water levels at some locations are recovering as a result of pumping decreases in the subarea (**Soil and Water Appendix B Figure 2**), and the negative drawdown indicates simulated water levels in 2042 are greater than 2008 even with project pumping. Sensitivity tests to account for potential uncertainty in model input indicate maximum drawdown at the same locations may range from -2 to 19 feet.
- Proposed project pumping removes 1,860 acre-feet per year of groundwater from storage in the Harper Lake model zone; about 570 acre-feet per year of water that otherwise would have contributed to increased aquifer storage and 1,290 acre-feet per year from storage in place prior to the start of project construction in 2011.

Hence, by 2042 approximately 59,500 acre-feet of groundwater is removed from storage by the project (41,300 acre-feet of water stored in place and an additional 18,200 acre-feet of water that would have been added to storage). As a result, model results indicate future water levels will decline during the construction and operation period of the project (2011-2042).

- Simulated water level decline occurs in both the Harper Lake model zone and across the Lockhart Fault into other portions of the Centro subarea (**Soil and Water Appendix B Figure 3**). Simulated project pumping removes 1,860 acre-feet per year of groundwater from storage in the Harper Lake model zone and 400 acre-feet per year from the remaining portions of the Centro subarea. Over the 32-year life of project construction and operation, simulated pumping will remove 59,500 and 12,800 acre-feet of groundwater from these two areas, respectively. These simulated storage reductions represent 1% of the simulated total storage volume in place within the Harper Lake model zone and less than 0.1% of the total simulated storage volume in place within the remaining portions of the Centro subarea (**Soil and Water Appendix B Table 6**). The simulated storage change is less than 5% (about 3%) of the groundwater currently accessible for extraction from the Harper Lake model zone (**Soil and Water Appendix B Figures 4**), and therefore project pumping is considered to have a negligible effect on groundwater storage.

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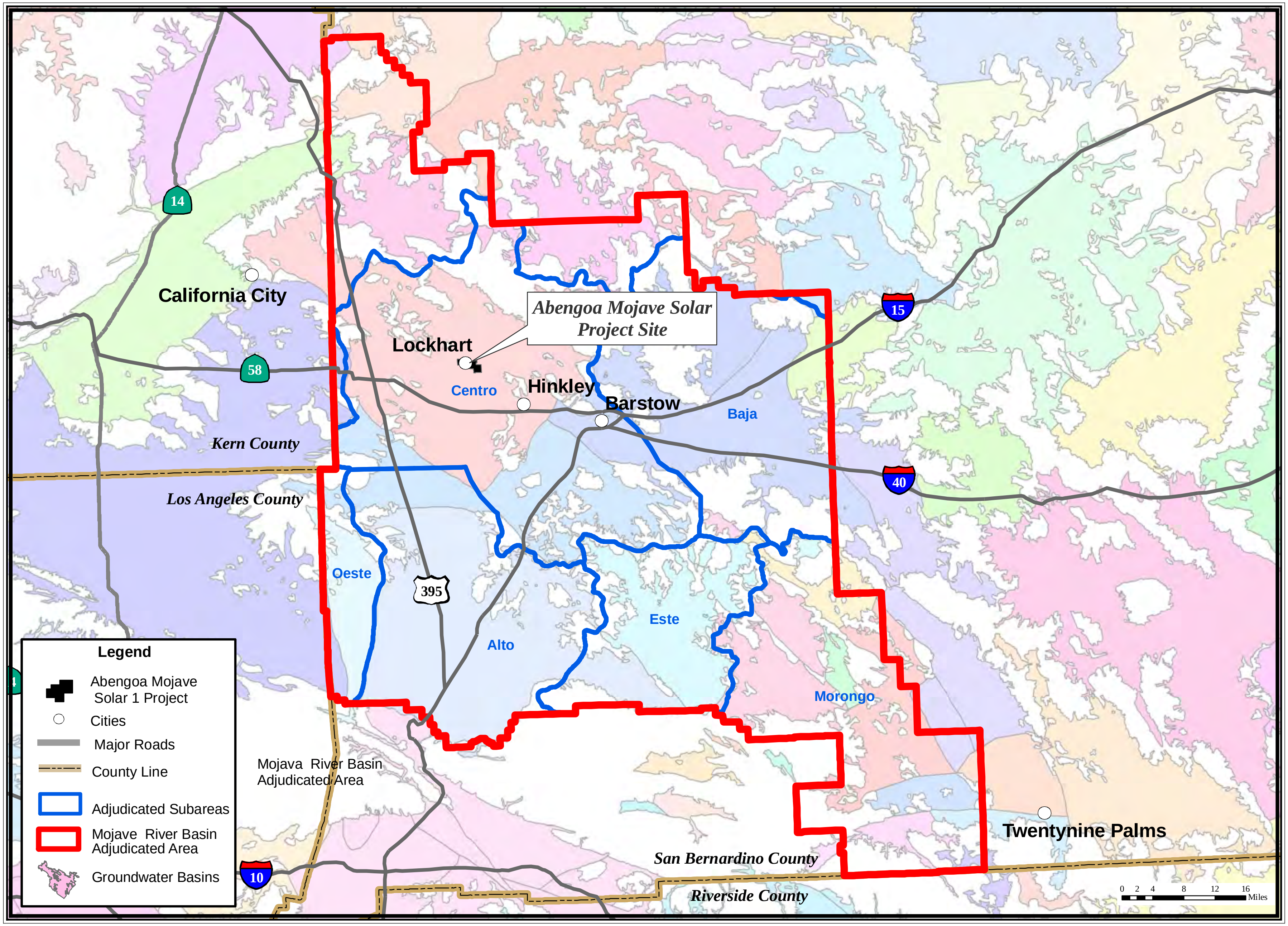
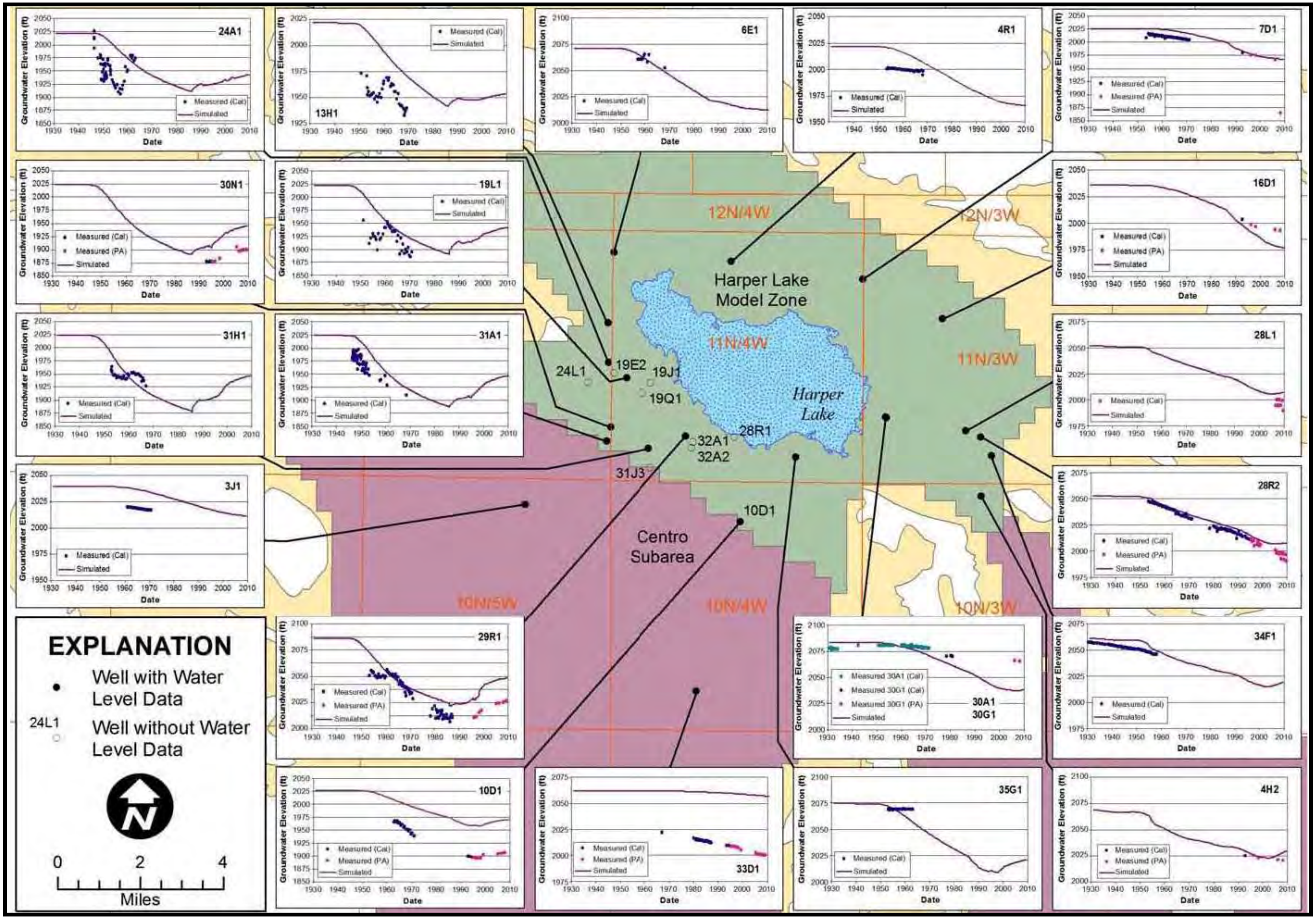
SOIL AND WATER RESOURCES - FIGURE 1
Abengoa Mojave Solar Project - Site Vicinity



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010
SOURCE: California Energy Commission, Bureau of Land Management

SOIL AND WATER RESOURCES - APPENDIX B - FIGURE 1

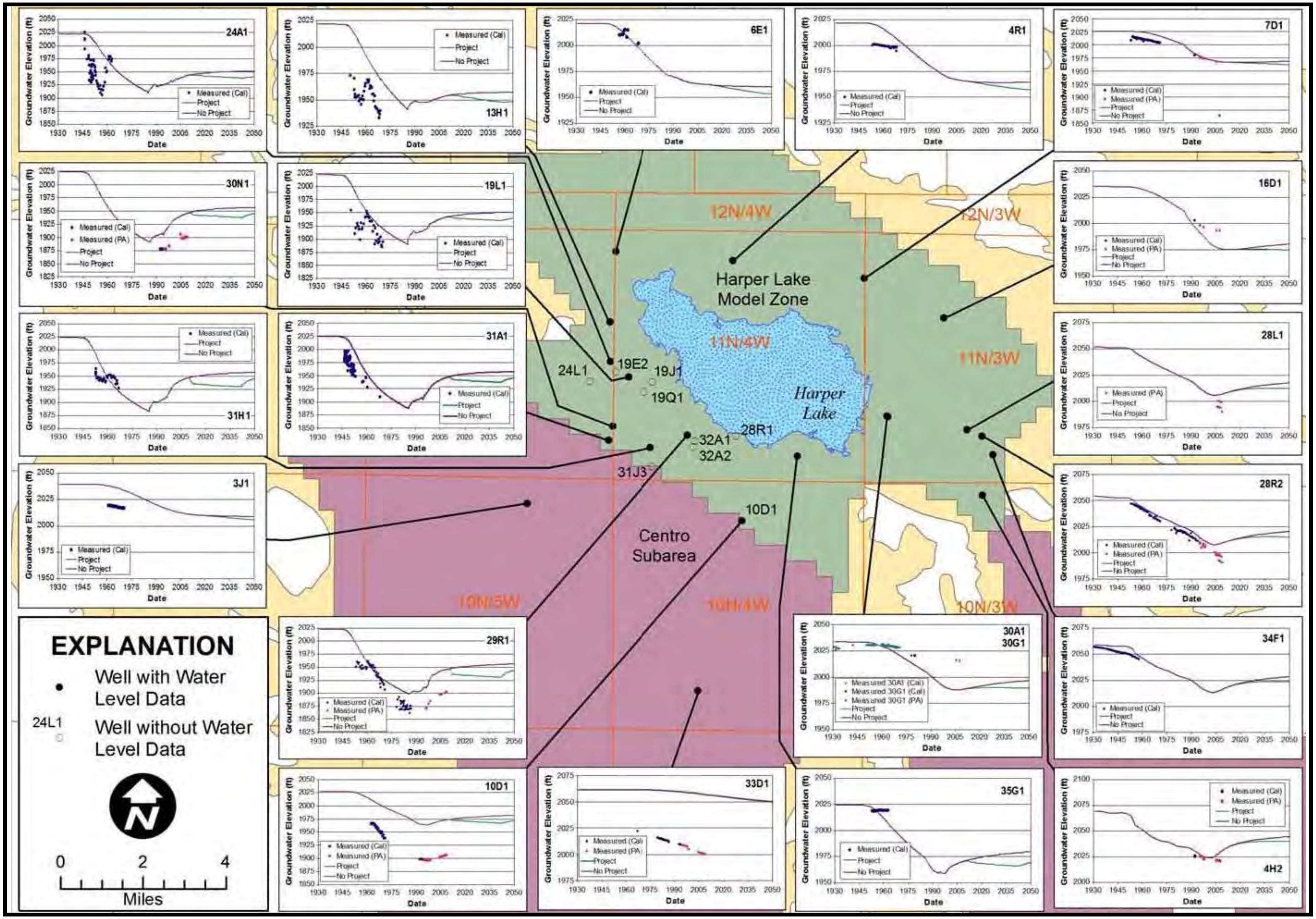
Abengoa Mojave Solar Project - Observed and Simulated Water Levels, Harper Lake Area, 1930-2008



SOURCE: California Energy Commission

SOIL AND WATER RESOURCES - APPENDIX B - FIGURE 2

Abengoa Mojave Solar Project - Simulated Water Levels Without (No Project) and With Proposed Project Pumping, Harper Lake Area, 1930-2050



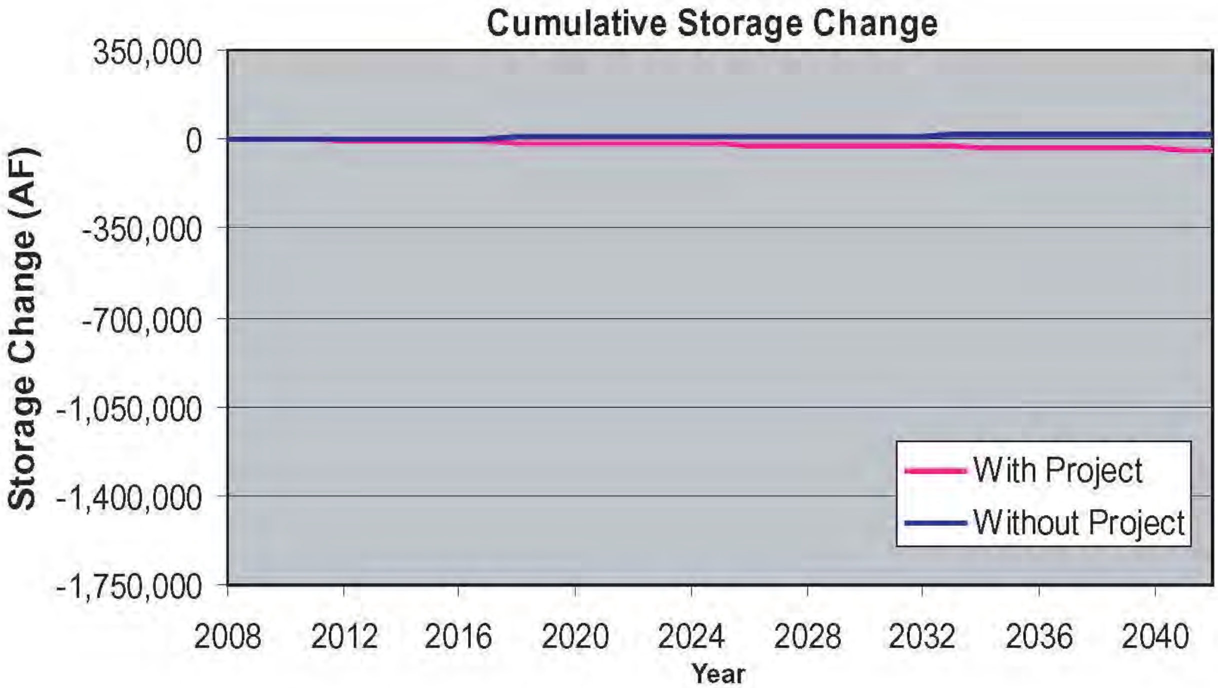
CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

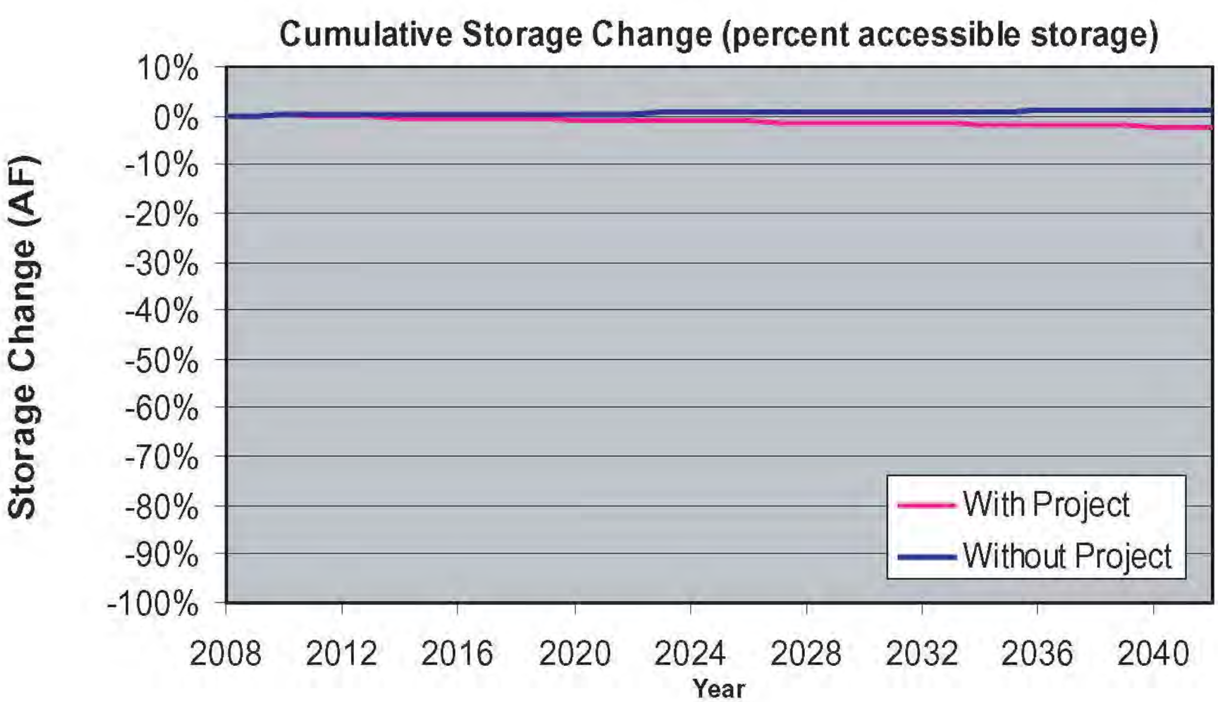
SOURCE: California Energy Commission

SOIL AND WATER RESOURCES - APPENDIX B - FIGURE 3

Abengoa Mojave Solar Project - Difference Between Simulated 2042 Water Levels With and Without (No Project) Proposed Project Pumping, Harper Lake Area

Simulated cumulative groundwater storage change in the Harper Lake model zone relative to estimated accessible groundwater in-place as of 2008 (accessible groundwater is considered as the water within the saturated zone between the water table and bottom of existing wells, which in 2008 is estimated to be 1,740,500 AF).



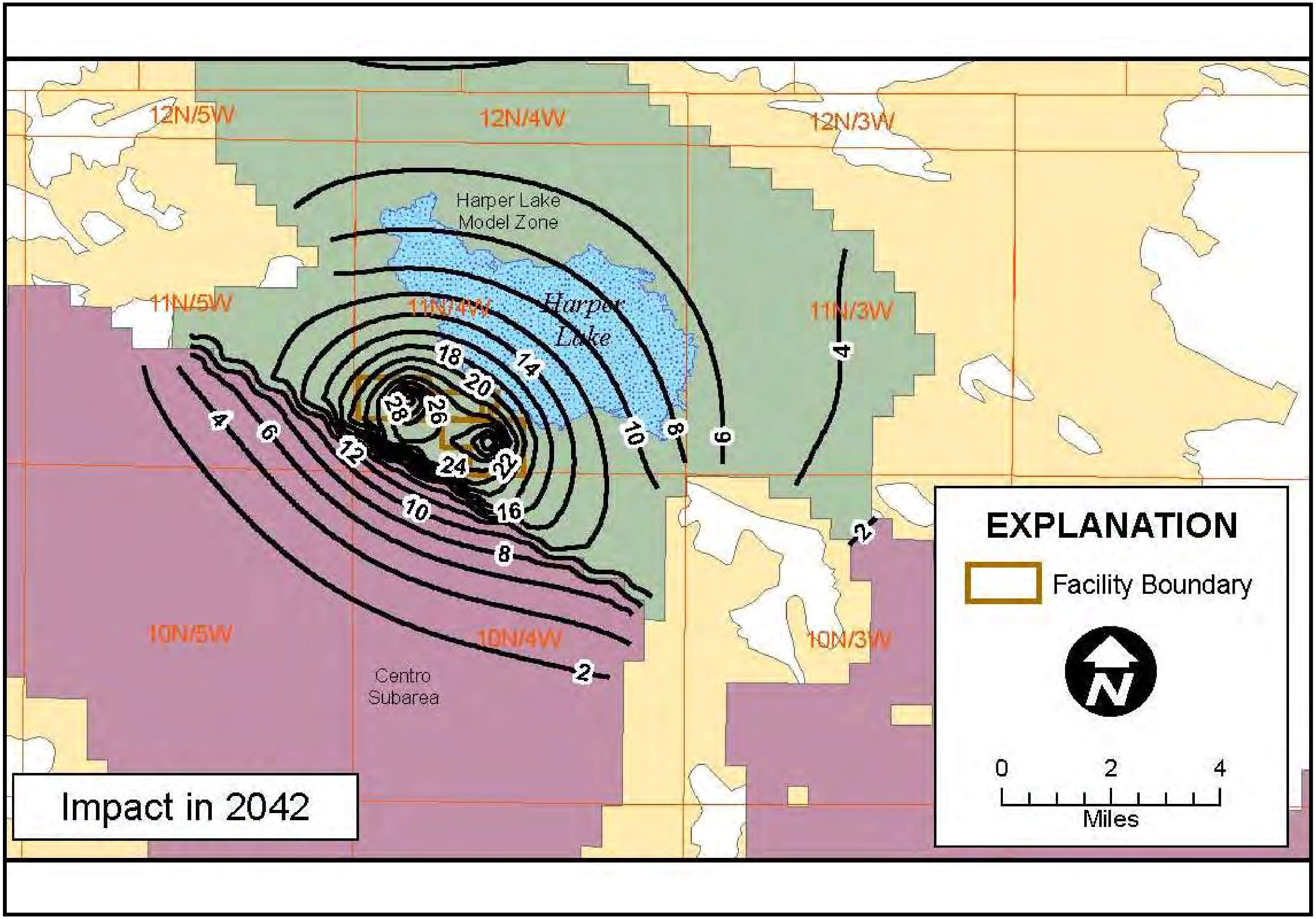


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: California Energy Commission

SOIL AND WATER RESOURCES - APPENDIX B - FIGURE 4

Abengoa Mojave Solar Project - Simulated Cumulative Storage Change Relative to Estimated Accessible Storage in the Harper Lake Model Zone



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

SOURCE: California Energy Commission

TRAFFIC AND TRANSPORTATION

Testimony of Steven J. Brown, PE

SUMMARY OF CONCLUSIONS

The Abengoa Mojave Solar project would be consistent with the Circulation and Infrastructure Element of the County of San Bernardino General Plan and all other applicable laws, ordinances, regulations, and standards (LORS) related to traffic and transportation. With implementation of the conditions of certification, Abengoa Mojave would not have a significant adverse impact on the local and regional roadway network. During the construction and operation phases, local roadway and highway demand resulting from the daily movement of workers and materials would not increase beyond significance thresholds established by the County of San Bernardino or the State of California.

Staff provides two conditions of certification to enhance the traffic-related safety and performance: 1) relocate the proposed park-and-ride facility (for construction period) from Barstow to a location west of the site, and 2) increase the length of the eastbound left-turn pocket on SR-58 at Harper Lake Road to 300 feet. Other conditions of certification address hazardous materials deliveries, glare impacts to motorists, and crossing of a rail freight line.

INTRODUCTION

The Traffic and Transportation analysis focused on the Abengoa Mojave Solar (AMS) project's affect on transportation systems in the vicinity of the site. The analysis examined the compatibility of AMS with applicable laws, ordinances, regulations, and standards (abbreviated as 'LORS' in this document). In addition, the analysis identified potential impacts related to the construction and operation of AMS on the surrounding transportation systems and roadways.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Staff uses LORS as significance criteria to determine if the proposed project would have a significant adverse impact on the environment. The federal, state, and local regulations that are applicable to the AMS project are listed in **Traffic and Transportation Table 1.**

AMS would include delivery of heat transfer material (and small quantities of diesel, water treatment chemicals, and oil) to the site. It is staffs' understanding, that the applicant intends to comply with all LORS related to the transport of hazardous materials.

Traffic and Transportation Table 1
Traffic and Transportation LORS

Applicable LORS	Description
Federal	
Code of Federal Regulations Title 49, Sections 171-177	Governs the transportation of hazardous materials and related guidelines.
Code of Federal Regulations Part 77, Federal Aviation Administration Regulations	Implements standards for determining obstructions in navigable airspace. Sets forth requirements for notice to the Federal Aviation Administration of certain proposed construction or alteration. In addition, provides for aeronautical studies of obstructions to air navigation to determine their effect on the safe and efficient use of airspace.
Code of Federal Regulations Title 49, Sections 350-399 and Appendices A-G	Includes procedures and regulations pertaining to interstate and intrastate transport (includes hazardous materials program procedures) and provides safety measures for motor carriers and motor vehicles who operate on public highways.
State	
California Vehicle Code Division 2, Chapter 2.5, Division 6, Chapter 7, Division 13, Chapter 5, Division 14.1, Chapter 1 and 2, Division 14.8, Division 15	Includes regulations pertaining to licensing, size, weight, and load of vehicles operated on highways, safe operation of vehicles, and the transportation of hazardous materials.
California Streets and Highway Code Division 1 and 2, Chapter 3 and Chapter 5.5	Includes regulations for the care and protection of State and County highways, and provisions for the issuance of written permits.
Local	
County of San Bernardino General Plan Circulation and Infrastructure Element	Requires that land use and transportation planning are coordinated to ensure adequate facilities to support development and ease congestion. In addition, the transportation system shall provide a safe, functional, and convenient mode of travel.
County of San Bernardino Traffic Impact Study Guidelines	Requires that all County roadways operate at Level of Service (LOS) D conditions or better.
San Bernardino Associated Governments Congestion Management Plan	Requires that all City roadways and intersections operate at LOS D conditions or better.
City of Barstow General Plan Circulation and Transportation Element	Requires that all City roadways and intersections operate at LOS E conditions or better.

PROJECT DESCRIPTION

The proposed project is a solar energy collection facility to be operated by Abengoa Solar Inc. AMS proposes to install two adjacent solar energy fields of 884 acres and 800 acres with an additional 81 acres between the sites to be used for collection and discharge (the two solar energy fields will be comprised of multiple solar collector arrays, each array will be 375 to 450 feet in length). The collection facility will utilize parabolic trough technology, which uses reflected solar energy to heat a transfer fluid.

The proposed AMS site is 1,765 acres of privately owned land in unincorporated San Bernardino County. The site is approximately 60 miles north of the City of San Bernardino, 17 miles northwest of the City of Barstow, and nine miles northwest of the community of Hinkley.

Construction of AMS is expected to last for 26 months with start of commercial operations planned for winter 2013. The peak construction month would occur at month 17.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

Significance criteria are based on California Environmental Quality Act (CEQA) Guidelines, the CEQA Environmental Checklist and on performance standards and thresholds established by interested agencies. A project may have a significant effect if the project would:

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system;
- Exceed an established level of service standard applicable for the designated roads or highways;
- Alters waterborne, rail, or air traffic;
- Alters existing patterns of circulation or the movement of people/goods;
- Increases traffic hazards to motor vehicles, bicyclists, or pedestrians;
- Result in inadequate emergency access;
- Result in inadequate parking capacity; or
- Conflict with adopted policies, plans, or programs.

LEVEL OF SERVICE

When evaluating AMS-related potential impacts on the local transportation system, staff used level of service (LOS) determinations as the foundation on which to base its analysis. Intersection operations were evaluated using the *Highway Capacity Manual 2000* (HCM) methodology. This methodology assesses delay at an unsignalized intersection for movements operating under traffic control. For example, at an intersection where only the side-street has a stop sign, delay was reported for movements controlled by the stop sign. The delay was then assigned a corresponding letter grade that represents the overall condition of the intersection. These grades range from LOS A (free flow) to LOS F (poor progression).

Daily roadway segments were evaluated using the corresponding HCM methodology and assigned a LOS.

In addition, ramp terminal intersection operations were evaluated using the California Department of Transportation (Caltrans) Intersection Lane Vehicles (ILV) procedure.

The LOS standards for the project are as follows:

- LOS D or better conditions on a State of California facility
- LOS E or better conditions on a City of Barstow facility
- LOS D or better conditions on a San Bernardino County facility

A significant impact would be caused if the project causes any intersection's operations to exceed the accepted LOS standards on a State, County, or City facility.

SETTING

The AMS site is at the intersection of Harper Lake Road and Lockhart Road, approximately five miles north of State Route 58 (along Harper Lake Road). Access to the site is provided by Harper Lake Road which intersects State Route 58. The site is located entirely within unincorporated San Bernardino County.

During construction of AMS, traffic will be generated at both the project site and a park-and-ride lot located off-site. The local highways and roads adjacent to both the AMS site and a park-and-ride lot are described in this section.

LOCAL HIGHWAYS AND ROADS – PROJECT SITE

The following describes the roadways in the vicinity of the AMS site:

State Route 58 (SR 58) is a primarily east-west roadway that provides access from Barstow to Bakersfield and beyond. In the vicinity of the AMS site, the roadway is a four-lane expressway (two lanes in each direction with a divided median). The roadway provides a connection to Interstate 15 (I-15) and United States Highway 395 (US 395), the two other roadways providing regional connectivity across the area.

Traffic counts conducted on SR-58 in April 2009 indicate that approximately 12,000 vehicles per day use the roadway. A large percentage of vehicles traveling on the roadway are trucks, comprising approximately 36% of the traffic flow.

Harper Lake Road is a two-lane roadway that extends from SR 58 north and primarily serves the Harper Lake Solar Electric Generating Station. The paved roadway has one uncontrolled crossing of a railroad track. Primary access to AMS is provided from Harper Lake Road. Existing traffic volumes on the roadway are low, approximately 250 vehicles per day as counted in April 2009.

Lockhart Road is an unpaved two-lane roadway which travels east-west across the lower portion of the AMS site. The roadway crosses Harper Lake Road and carries a low daily traffic volume.

Lockhart Ranch Road is an unpaved two-lane roadway which travels north-south, forming the western boundary of the AMS site. The roadway crosses Lockhart Road and carries a low daily traffic volume.

LOCAL HIGHWAYS AND ROADS – PARK-AND-RIDE SITE

The following describes the roadways in the vicinity of the AMS project's proposed park-and-ride site:

Solar Way is a short, two-lane roadway that provides access between Main Street and nearby businesses. The roadway is currently labeled as "Sundance Lane" on aerial photos.

Main Street is a four-lane undivided roadway. The roadway provides access between SR 58 and connections for I-15. Thru-sidewalks are discontinuous near the vicinity of the AMS site, and the roadway lacks bicycle facilities. The posted speed limit is 40 MPH.

Main Street through the City of Barstow is designated as Historic US Highway 66.

PUBLIC TRANSPORTATION

The project area is not serviced by transit. Barstow Area Transit is the transit service provider in the area; however, no regularly scheduled lines run near the AMS site.

BICYCLE AND PEDESTRIAN FACILITIES

There are no bicycle facilities (such as on-street lanes or off-street paths) adjacent to the AMS site or along SR 58 near Harper Lake Road. Bicycle activity in the vicinity of the AMS site is minimal-to-none.

The County of San Bernardino Non-Motorized Transportation Plan Update (from June 2001) identifies planned bicycle facilities in the County. However, no bikeways are planned for the roadways adjacent to the AMS site, including SR 58 near Harper Lake Road. Class II on-street bike lanes are indicated in the Non-Motorized Transportation Plan as a priority for Main Street adjacent to the AMS project's park-and-ride site.

There are no pedestrian facilities (such as sidewalks and walkways) adjacent to the project site, including SR 58 near Harper Lake Road. Pedestrian activity in the vicinity of the Project site is minimal-to-none.

AIRPORTS

The Federal Aviation Administration (FAA) has notification requirements for airports which are located within a 20,000 foot (3.79 miles) horizontal distance of a project such as the AMS. No airport is located within 20,000 feet of the AMS site boundary. For infor mational purposes, the following lists the airports nearest the site (all distances are based on aerial photography and should be considered approximate):

- Edwards Air Force Base at 33 miles west of the AMS site
- Barstow-Daggett Airport at 32 miles southeast of AMS site
- Southern California Logistics Airport at 26 miles south of the AMS site

AMS lies within military restricted airspace of the R-2508 Complex, used by the Air Force Flight Test Center (Edwards Air Force Base), the National Training Center (Fort Irwin Military Reservation), and the Naval Air Weapons Station China Lake (NAWS China Lake).

RAILROADS

A freight railroad line travels east-west approximately 4.5 miles south of the AMS site. This line is used on a daily basis. In the vicinity of the project site, Harper Lake Road crosses the railroad at-grade. Harper Lake Road will provide the access to the AMS site. AMS is not proposing to alter the at-grade crossing of the railroad line as part of the access to the site.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The direct and indirect impacts of AMS on the transportation system are discussed in this section. The assessment of transportation-related impacts was based on evaluations and technical analysis which compared the pre-project conditions to the post-project conditions.

STUDY INTERSECTION / ROAD SEGMENT LOCATIONS

The following locations on the surrounding roadway network were reviewed:

- SR 58/Harper Lake Road
- SR 58/Lenwood Road
- Main Street/SR 58 SB Ramps
- Main Street/SR 58 NB Ramps
- Main Street/Parking Lot Driveway
- SR 58 from Harper Lake Road to Lenwood Road
- Main Street from SR 58 to Osborne Road

DIRECT/INDIRECT IMPACTS AND MITIGATION

Two project scenarios were evaluated: construction period and standard operation. Due to the nature of AMS (with very few employees), a relatively minor amount of traffic would be generated to/from the site during standard operations. The project would generate the majority of daily traffic during the construction phases; therefore, evaluation of the construction impacts has been included.

Impacts were addressed for two separate future year scenarios: construction year (2012) and standard operation during the San Bernardino Associated Governments (SANBAG) future horizon year (2035). Existing traffic volumes were increased to account for future growth unrelated to the AMS project, based on direction from Caltrans, the County, and SANBAG. Other planned projects in the vicinity of the site were determined to contribute to year 2012 traffic levels; therefore, trips from the planned projects were included in the construction year traffic volumes.

Construction Period Impacts and Mitigation

Potential traffic impacts associated with construction of AMS were evaluated for both construction workforce traffic and construction truck traffic. Conditions were evaluated when the workforce would be at its highest. The average number of construction workers would be approximately 1,162 per day during the peak month (expected to occur at month 17 of the applicant's 26 month construction schedule). Given experience with previous projects, staff believes that the estimate of construction traffic is reasonable. The construction period project trip generation is displayed in **Traffic and Transportation Table 2.**

Traffic and Transportation Table 2
Construction Period Project Trip Generation

Assumptions	Project Trip Generation (trips per day)
Person-Trips Generated by Workers (1,162 workers x 2)	2,324
20% Carpool @ 2.0 workers/vehicle	-232
Vehicle Trips Generated by Workers	2,092
– Trips to Park & Ride (42% of workers)	*(880)*
– Trips directly to the site	*(1,212)*
Bus Trips from Park&Ride[1, 2]	52
Truck Trips to Project Site[1]	134
Total Construction Period Vehicle Trips	**2,278**

[1] In the Level of Service calculations, bus and truck trips are converted to Passenger Car Equivalents (PCE's)

[2] The 1,162 workers x 42% @ park-and-ride = 488 to be transported by bus. Therefore, 13 bus trips (40 persons/bus) each way in the morning and evening, which equates to 52 bus trips.

The applicant assumes that 20% of the workforce will carpool either to the site or to the park-and-ride lot, and these carpools will be at two workers per vehicle. Therefore, the 1,162 workers per day would be represented by 2,092 vehicle trips per day. Not all of these vehicle trips would go directly to/from the site, as 42% are assumed by the applicant to use the park-and-ride lot.

The total daily peak construction traffic (workforce and busses) would be 2,278 vehicle trips (2,092 worker vehicle trips, plus 52 bus trips, and 134 truck trips). Traffic during the AM peak hour would be nine trips leaving the site and 309 trips entering the site. Traffic during the PM peak hour would be nine trips entering the site and 178 trips leaving the site.

Intersection operations were evaluated during the morning (7:00-8:00 AM) and after-noon (4:00-5:00 PM) peak commute periods. Workers arriving for the primary shift were expected to travel during the peak hours, while workers in the second shift would travel outside of the peak hours.

Based on regional demographics and availability of skilled laborers, the applicant expects that 86% of the construction employees would originate from areas west of the AMS site and the remaining 14% would originate from areas east of the AMS site. During construction, workers would commute from nearby residences (as opposed to being housed on-site).

The project proposes to provide a park-and-ride lot within the City of Barstow. The lot is located on the northern side of Main Street, approximately one mile east of SR 58. Given that the majority of the project-related construction traffic is expected to travel from the west, the applicant is assuming that workers will pass Harper Lake Road (the site access) and continue to drive 16.5 miles further east (approximately an additional 20 minutes) to the park-and-ride lot in the City of Barstow where they would then be bussed the 16.5 miles back to the site access along Harper Lake Road. Staff believes that this behavioral assumption is unlikely and that construction workers would be most likely to park on-site, barring any site restrictions or incentives to use the park-and-ride lot. If all of the construction workers drove directly to the site, then the service level at Harper Lake Road/SR-58 intersection would be "E", which would fail to meet Caltrans standards. Furthermore, the number of left-turning vehicles from SR-48 to Harper Lake Road would be so large during the peak hour as to create an operational and safety problem.

Condition of Certification **TRANS-1** provides a condition to place the park-and-ride lot to the west of the site near SR-58. This location would also reduce vehicle-related emissions from the site by reducing vehicle-miles-travelled.

Construction of AMS would require the use and installation of heavy equipment and associated systems and structures. According to the applicant, most of the truck trips would travel between the Barstow rail yard and the AMS site, with all truck trips traveling during off-peak hours.

Federal Code Title 49 and the California Vehicle Code identify regulations related to oversized vehicles and transport of hazardous materials. Additionally, the applicant may need to temporarily close lanes or block traffic when delivering heavy equipment. Consequently, the potential exists for a significant impact to occur in the form of temporary congestion, hazardous materials spill, or blockage of emergency access due to truck traffic during construction. Therefore, Staff has required a construction traffic control plan be developed as indicated in the proposed Condition of Certification **TRANS-2.** Additionally, the significant level of truck traffic during the construction period has the potential to cause damage to the pavement services on the roadways in the vicinity of the site, which would result in both a safety impact to motorists and economic impact to the local agencies who maintain the roads. Staff has proposed Condition of Certification **TRANS-3** to require the applicant to document and repair any damage.

During construction, the AMS operator would provide bussing from the park-and-ride lot to the construction site. The number of buses provided would need to be sufficient to accommodate the peak hour construction worker random arrivals, or the arrival time of workers would need to be staggered to match the capacity of the buses.

The peak construction increase in traffic would represent a noticeable change when compared to existing conditions, particularly on Harper Lake Road between the AMS driveway and SR 58. Traffic volumes would increase from existing daily traffic volume of 250 vehicles to 1,700 vehicles during the construction year; however, the total 'with project' traffic volume would be relatively low and the LOS at the study intersections and roadway segments would remain within the LOS thresholds identified by the local jurisdictions. All study roadway segments and intersections are expected to operate at LOS D or better conditions with the AMS-related construction traffic. Therefore, impacts from AMS-related construction traffic are less than significant.

Traffic and Transportation Table 3 presents a comparison of existing and near term roadway volumes. The Year 2012 traffic estimate assumes a 2% per year general growth rate (on SR-58 and Main Street) and three specific development projects that were proposed or approved in the general vicinity of the AMS site:

- Wal-Mart Food Distribution Center (Barstow) – Lenwood Road, between Mains Street and SR-58.
- Nursery Product LLC Composting Facility (San Bernardino County) – 160 acre bio-solid and composting facility at Helendale Road and SR-58.
- Cambridge Homes (Barstow) – 426 single family homes and 43 acres of light industrial uses on Lenwood Road.

Traffic and Transportation Table 3
Peak Construction (Year 2012) Traffic on Roadway Segments

Roadway Segment	Existing ADT	Year 2012 ADT	Year 2012 With Project ADT	Percent Change Associated With Project
Harper Lake Road from SR 58 to Lockhart Road	250	250	1,700	580%
SR 58 from Harper Lake Road to Lenwood Road	12,100	13,000	14,200	9%
Main Street from SR 58 to Osborne Road	7,200	7,800	8,700	12%

Notes: ADT – average daily traffic, rounded to nearest hundred
Source: Wilson & Company, Inc. *Application for Certification Mojave Solar Project*. June 2009.

Traffic and Transportation Table 4 summarizes the level of service of the study intersections for existing conditions and for the construction year, with and without the AMS project.

Traffic and Transportation Table 4
Peak Construction (Year 2012) Intersection Performance

Study Intersection	Existing				Year 2012				Year 2012 With Project			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
SR 58/Harper Lake Road	12.4	B	16.1	C	13.0	B	17.1	C	33.3	D	31.3	D
SR 58/ Lenwood Road	3.2	A	3.1	A	4.0	A	4.3	A	4.1	A	4.6	A
Main Street/SR 58 SB Ramps	5.1	A	4.5	A	4.8	A	4.3	A	10.1	B	5.4	A
Main Street/SR 58 NB Ramps	11.3	B	11.9	B	10.9	B	11.5	B	10.9	B	11.5	B

Notes: All study intersections are unsignalized.
Average delay reported in seconds per vehicle for all way stop controlled intersections.
Delay of worst case movement reported for side street stop controlled intersections.
LOS – level of service

Source: Wilson & Company, Inc. *Application for Certification Mojave Solar Project*. June 2009.

The intersection of SR 58/Harper Lake Road is expected to operate at acceptable levels, LOS D conditions, during the AM and PM peak hour. The evaluation was completed utilizing the assumed spatial distribution of trips and usage of the applicant's proposed park-and-ride lot. While the service level meets Caltrans' standards, the expected queue of vehicles making the left-turn from SR-58 to Harper Lake Road would significantly exceed the available storage area during the peak construction period. The queuing of vehicles into the through lane of SR-58 represents a significant safety issue. Staff has proposed Condition of Certification **TRANS-4**, which calls for the lengthening of the left-turn pocket.

Although staff is recommending an alternative location for the park-and-ride lot, an evaluation was also conducted of the applicant's proposed location. Of concern is the intersection of Solar Way (currently shown as "Sundance Lane" in aerials) and Main Street in the City of Barstow. The side-street stop controlled intersection was analyzed during AM and PM peak hour under the peak construction project conditions. The intersection is projected to operate at LOS A and LOS B conditions during the AM and PM peak hour, respectively.

Traffic and Transportation Table 5 summarizes the level of service of the study roadway segments.

Traffic and Transportation Table 5
Peak Construction (Year 2012) Roadway Segment Performance

Roadway Segment	Existing		Year 2012		Year 2012 With Project	
	ADT	LOS	ADT	LOS	ADT	LOS
SR 58 from Harper Lake Road to Lenwood Road	12,100	C	13,000	C	14,200	D
Main Street from SR 58 to Osborne Road	7,200	A	7,800	A	8,700	A

Notes: ADT – average daily traffic
LOS – level of service
Source: Wilson & Company, Inc. *Application for Certification Mojave Solar Project*. June 2009.

Although traffic on Harper Lake Road would increase significantly during the construction period, the total traffic volume expected on the roadway would be relatively low. A two-lane roadway can easily accommodate the estimated daily traffic volume; therefore, detailed evaluations of Harper Lake Road were not conducted.

Ramp terminal intersections were evaluated using ILV methodology in addition to the HCM methodology, with the results shown in **Traffic and Transportation Table 6.** The AMS project would not cause any ramp terminal intersections to operate "over capacity."

Traffic and Transportation Table 6
Peak Construction (Year 2012) Ramp Performance

Study Intersection	Existing				Year 2012				Year 2012 With Project			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	ILV/ Hour	Desc.	ILV/ Hour	Desc.	ILV/ Hour	Desc.	ILV/ Hour	Desc.	ILV/ Hour	Desc.	ILV/ Hour	Desc.
Main Street/SR 58 SB Ramps	323	Under Cap.	490	Under Cap.	371	Under Cap.	547	Under Cap.	521	Under Cap.	642	Under Cap.
Main Street/SR 58 NB Ramps	416	Under Cap.	498	Under Cap.	474	Under Cap.	558	Under Cap.	556	Under Cap.	577	Under Cap.

Notes: Under Cap. – intersection operates under capacity with less than 1,200 ILV per hour.
Source: Wilson & Company, Inc. *Application for Certification Mojave Solar Project*. June 2009.

Standard Operations Impacts and Mitigation

This section considers the project's traffic impacts during standard operations. For purposes of analysis, a 20-year horizon (from the time project begins operating) was evaluated, which equates to approximately the Year 2035. The background traffic volumes for the Year 2035 were estimated by applying a 2% annual growth rate to the "through" traffic along SR-58 and Main Street.

During normal operations, the AMS project would require a labor force of 68 full-time employees. Therefore, the project would generate 250 vehicles per day with 52 vehicles in the peak hour. The AMS project is expected to generate a small amount of truck traffic during standard operation; approximately 38 truck trips per month which would occur mostly during off-peak travel times.

Operational workers are assumed to come from the local area; therefore, the routes taken to the AMS site would likely be I 15, SR 58, and Harper Lake Road. No off-site park-and-ride lot would be provided during standard operations.

Standard operation of the project would not significantly affect the LOS of the study roadways or intersections. All study roadways and intersections would operate at LOS D or better conditions with the AMS-related traffic (refer to **Traffic and Transportation Table 8** for LOS summaries of study intersections and **Traffic and Transportation Table 10** for roadway segments). Therefore, impacts from AMS-related traffic are less than significant.

Traffic and Transportation Table 7 compares the expected traffic volumes during standard operations to the base traffic volumes on the study roadway segments. As shown, all project-related traffic would use SR 58 west of Harper Lake Road; however, the percent increase of project trips is relatively low, accounting for only one percent of the horizon year with AMS traffic volumes.

Traffic and Transportation Table 7
Operations Period (Year 2035) Traffic on Study Roadways

Roadway Segment	Existing ADT	Year 2035 ADT	2035 With Project ADT	Percent Change Associated with Project
Harper Lake Road from SR 58 to Lockhart Road	250	250	500	100%
SR 58 from Harper Lake Road to Lenwood Road	12,100	18,600	18,850	1%

Notes: ADT – average daily traffic, rounded to nearest hundred
Source: Wilson & Company, Inc. *Application for Certification Mojave Solar Project*. June 2009.

Traffic and Transportation Table 8 summarizes the level of service of the study intersection for existing conditions and for future conditions, with and without AMS during standard operations. During standard operations only the SR 58/Harper Lake Road intersection would experience a significant amount of AMS–related traffic, but the resulting service level is within the Caltrans standard.

Traffic and Transportation Table 8
Operations Period (Year 2035) Intersection Performance

Study Intersection	Existing				Year 2035				Year 2035 With Project			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
SR 58/Harper Lake Road	12.4	B	16.1	C	15.2	C	25.0	C	15.7	C	31.6	D

Notes: All study intersections are unsignalized.
Delay of worst case movement reported for side street stop controlled intersections.
LOS – level of service

Source: Wilson & Company, Inc. *Application for Certification Mojave Solar Project*. June 2009.

Traffic and Transportation Table 9 summarizes the level of service of the study roadway segment during standard operations. The segment of SR 58 from Harper Lake Road to Lenwood Road would experience a significant amount of AMS-related traffic. As shown, the study roadway segment is expected to operate better than the existing conditions operations, due to future improvements to the roadway (Caltrans project) which will increase the number of lanes from two to four.

Traffic and Transportation Table 9
Operations Period (Year 2035) Roadway Segment Performance

Roadway Segment	Existing		Year 2035		Year 2035 With Project	
	ADT	LOS	ADT	LOS	ADT	LOS
SR 58 from Harper Lake Road to Lenwood Road	12,100	C	18,600	B	18,850	B

Notes: ADT – average daily traffic
LOS – level of service

Source: Wilson & Company, Inc. *Application for Certification Mojave Solar Project*. June 2009.

Emergency Services Vehicle Access

The environmental review of emergency services access considers the off-site accessibility by emergency vehicles to the site. It is staff's opinion that the regional access to the site is adequate given that an emergency vehicle can access the site directly from SR 58 from either the east or the west. Emergency vehicles can therefore approach the site from adjacent communities using different routes and would not be barred from access due a singular problem on a surrounding roadway. In addition, emergency vehicles can access the AMS site from other, non-direct roadways, such as the unpaved Santa Fe Avenue which connects to the community of Hinkley.

On-site circulation of emergency vehicles is subject to site plan review by local agencies (San Bernardino County, in this case) and the standards of the Uniform Fire Code and Uniform Building Code per conditions of certification **WORKER SAFETY-1 and WORKER SAFETY-2** in the **WORKER SAFETY AND FIRE PROTECTION** section of this document.

Water, Rail, and Air Traffic

The AMS project is not located adjacent to a navigable body of water; therefore, the AMS project is not expected to alter water-related transportation.

The AMS site is located near a trunk line of the Burlington Northern Santa Fe (BNSF) that parallels SR-58 and connects to the main yard in Barstow. While the project would not physically alter the at-grade crossing on Harper Lake Road, it would generate additional vehicular and truck crossings of the tracks, particularly during construction. No LORS directly apply to an increase in vehicle crossings of a railroad; however, there is the potential for collisions between vehicles and trains. Although a remote possibility, given the severity of the result of any collision, staff has identified this as a significant impact. This potential problem is relevant during the construction period due to the volume of vehicular traffic and occasional transport of hazardous materials. Condition of Certification **TRANS-5** provides a condition to reduce this potential problem during construction.

No airport is located within 20,000 feet of the AMS site boundary; therefore, notification of airports is not required. It is staff's opinion that AMS would not be a hazard to air navigation. Similar projects have (during the application process) triggered concern regarding reflection of the sun off the solar panels which could potentially cause disturbing glare to passing aircraft pilots. To investigate this prospective issue, previous projects have initiated multiple studies to explore the concern, including:

- Flights over an existing solar array near Barstow, California.
- Review of photographs taken of the Harper Lake Solar Energy Generating Systems at 4,000 feet above ground level.
- Flights by Caltrans Aeronautics and Energy Commission around the Kramer Junction and Harper Lake solar array facilities at 1,500 feet above ground level.
- Consultation from staff with the National Renewable Energy Laboratory (that indicated there would be a very low level of reflection from a parabolic mirror tracking the sun's movement).

Previous studies reviewed by staff involved solar arrays that were installed within 8,000 feet of an airport (within the landing and take-off pattern); the current AMS site is located greater than 20 miles from the nearest airport. In all studies reviewed by staff, it was determined that the glare would not be a significant issue to the pilots of passing aircraft given that the panels are designed to reduce glare. Therefore, it is staff's opinion that AMS, which is similar to those in the aforementioned studies, would not cause a hazard to air navigation.

AMS is within military restricted airspace and must be compatible with military overflights and safety requirements. The Department of the Navy has concluded that this project would not result in any significant problems for the Navy and no mitigation is required[1].

[1] Correspondence with Tony Parisi, Head of the Sustainability Office, NAVAIR Ranges. 2/25/10

Hazards to Motor Vehicles, Bicyclists, or Pedestrians

The AMS-related vehicle trips are anticipated to act in a manner similar to existing roadway traffic; therefore, additional hazards to other motor vehicles, bicyclists, or pedestrians are not expected.

Due to the location of the AMS site, construction and operation would not interfere with existing or planned bicycle or pedestrian facilities.

The potential exists for the solar panels to reflect concentrated sunlight towards the adjacent roadways. This is most likely to occur when the mirrored panels transition from stow position to tracking position in the morning and the reverse in the late afternoon. The potential exists for motorists to be distracted by the potentially hazardous brightness and the "bright spots" which occur at the lower edges of the panels and appear to "follow" the observer. A condition of certification, **VIS-4,** from the **VISUAL** section of this document will provide a visual screen to mitigate this potential hazard.

Hazardous Materials

Both the construction and operation of the proposed AMS would involve the transport of hazardous materials to the site. The transport vehicles are required to follow federal regulations governing the proper containment vessels and vehicles, including appropriate identification of the nature of the contents.

AMS is expected to require transport of hazardous materials, including small quantities of diesel, water treatment chemicals, and oil. The main hazardous material used on-site would be heat transfer fluid for the solar arrays. The materials are expected to arrive to the site via truck with the likely origin being the Barstow rail yard.

Condition of Certification **TRANS-5** includes a condition that precludes delivery of hazardous materials during non-daylight hours, as this will enhance the safety at the rail crossing near the site. In addition to the governing federal regulations, Condition of Certification **HAZ-3** requires the applicant to develop and implement a Safety Management Plan for the delivery of hazardous materials. Please see the **HAZARDOUS MATERIALS MANAGEMENT** section of this document.

Water Vapor Plumes

Appendix VR-2 provides an analysis of visible water vapor plumes. The conclusion from that analysis is "The ground fogging plume analysis indicates that the cooling tower will only create minimal hours of the ground fogging plume that would not impact any major public roads. Therefore, there would be no impact on ground traffic safety."

Parking Capacity

The applicant assumes that the off-site park-and-ride lot would provide parking for 42% of the construction worker trips. This would equate to 440 vehicles. Staff recommends that the park-and-ride lot (see condition of certification **TRANS-1**) be sized to accommodate 500 vehicles. This would allow for some deviance from the 42% estimate, while recognizing that not all of the workers would be parked in the lot at the same time, based on the multiple construction shifts per day.

On-site parking for standard operations would be accommodated by paved parking lots. The lots would be located near the steam turbine generator and the solar steam generator areas. For each 20 acre area, approximately 1.75 acres would be paved. This area should be adequate for the standard operations parking demand.

Conflicting Policies, Plans, or Programs

At this time, staff is unaware of any formal policies, plans, or programs which run contrary to the transportation aspects of the AMS project.

Cumulative Impacts

The analysis of traffic conditions during construction of the AMS project (Year 2012) were evaluated in the context of other known development projects in the area. The Year 2012 traffic estimate assumes a 2% per year general growth rate (on SR-58 and Main Street) and three specific development projects that were proposed or approved in the general vicinity of the AMS site:

- Wal-Mart Food Distribution Center (Barstow) – Lenwood Road, between Mains Street and SR-58.
- Nursery Product LLC Composting Facility (San Bernardino County) – 160 acre bio-solid and composting facility at Helendale Road and SR-58.
- Cambridge Homes (Barstow) – 426 single family homes and 43 acres of light industrial uses on Lenwood Road.

The construction period analysis (2010) found no significant impacts with respect to traffic service levels or parking.

The other proposed solar-generating facilities in the Western Mojave region are widely-spread, such that traffic generation is dispersed. More importantly, these facilities generate a negligible amount of traffic during standard operations. Therefore, the cumulative impact of these projects is less than significant.

Condition of Certification **TRANS-4** requires the AMS applicant to extend the left-turn pocket on westbound SR-58 approaching Harper Lake Road. If the proposed “Desert Onyx” solar project (Optisolar Inc) gains its construction access via Harper Lake Road and its peak construction period overlaps with AMS, then the length of turn pocket may need to be greater than estimated in condition of certification **TRANS-4**. The final design of this will be subject to Caltrans approval and can be adjusted accordingly.

COMPLIANCE WITH LORS

AMS is intending to comply with all federal, state, and local LORS. Development and operation of AMS as planned would not conflict with the LORS as described in this section. **Traffic and Transportation Table 10** summarizes the AMS project’s conformance with all applicable LORS.

Traffic and Transportation Table 10
Project Compliance with Adopted Traffic and Transportation LORS

Applicable LORS	Description
Federal	
Code of Federal Regulations Title 49, Sections 171-177	Governs the transportation of hazardous materials and related guidelines. Consistent: The AMS project is indicating that the main hazardous material used on-site would be heat transfer fluid (small quantities of diesel, water treatment chemicals, and oil would be used as well). The materials would arrive to the site via truck and it is staffs' understanding that the applicant will adhere to all required regulations.
Code of Federal Regulations Part 77, Federal Aviation Administration Regulations	Implements standards for determining obstructions in navigable airspace. Sets forth requirements for notice to the FAA of certain proposed construction or alteration. In addition, provides for aeronautical studies of obstructions to air navigation to determine their effect on the safe and efficient use of airspace. Notification is required for airports within 20,000 feet of the project site. Consistent: The AMS project is not located within 20,000 feet of an airport.
Code of Federal Regulations Title 49, Sections 350-399 and Appendices A-G	Includes procedures and regulations pertaining to interstate and intrastate transport (includes hazardous materials program procedures) and provides safety measures for motor carriers and motor vehicles who operate on public highways. Consistent: Enforcement is conducted by state and local law enforcement agencies (California Highway Patrol Hazardous Material Transportation License), through state agency licensing and ministerial permitting (e.g., California Department of Motor Vehicles licensing, Caltrans permits), and/or local agency permitting. **HAZ-3** Requires the owner to develop and implement a Safety Management Plan related to hazardous materials.
California Vehicle Code Division 2, Chapter 2.5, Division 6, Chapter 7, Division 13, Chapter 5, Division 14.1, Chapter 1 and 2, Division 14.8, Division 15	Includes regulations pertaining to licensing, size, weight, and load of vehicles operated on highways, safe operation of vehicles, and the transportation of hazardous materials. Consistent: Enforcement is provided by state and local law enforcement agencies, and through ministerial state agency licensing and permitting, and/or local agency permitting.
California Streets and Highway Code Division 1 and 2, Chapter 3 and Chapter 5.5	Includes regulations for the care and protection of State and County highways, and provisions for the issuance of written permits. Consistent: Enforcement is provided by state and local law enforcement, and through ministerial state agency licensing and permitting, and/or local agency permitting.

Applicable LORS	Description
Local	
County of San Bernardino General Plan Circulation and Infrastructure Element	Requires that land use and transportation planning are coordinated to ensure adequate facilities to support development and ease congestion. In addition, the transportation system shall provide a safe, functional, and convenient mode of travel. Consistent: The AMS project is consistent because its land use is projected to develop in a manner that would be supported by the planned transportation facilities. Construction and operation of AMS is not expected to result in abnormal traffic characteristics.
County of San Bernardino Traffic Impact Study Guidelines	Requires that all County roadways operate at LOS D conditions or better. Consistent: The AMS project is consistent because it would ensure LOS D conditions or better on the applicable local roads.
San Bernardino Associated Governments Congestion Management Plan	Requires that all City roadways and intersections operate at LOS D conditions or better. Consistent: The AMS project is consistent because it would ensure LOS D conditions or better on the applicable local roads and intersections.
City of Barstow General Plan Circulation and Transportation Element	Requires that all City roadways and intersections operate at LOS E conditions or better. Consistent: The AMS project is consistent because it would ensure LOS E conditions or better on the applicable local roads and intersections.

CONCLUSIONS

Provided that the applicant follows all LORS for the handling of hazardous materials and that the applicant follows all proposed conditions of certification, the AMS project would result in less than significant impacts to the traffic and transportation system. There are no significant direct or cumulative traffic and transportation impacts, and therefore, no environmental justice issues.

The AMS project as proposed would comply with all applicable LORS related to traffic and transportation. It would result in less than significant impacts to the traffic and transportation system.

Because of the AMS's distance from the nearest airport, no impact on the regional airports would occur, and the project would not impact aviation safety.

The AMS project as proposed would cause no significant direct or cumulative traffic and transportation impacts, and therefore, no environmental justice issues.

Staff is proposing Condition of Certification **TRANS-1** which would require an alternative park-and-ride location. The intent is make the park-and-ride more effective based upon the location of the construction workforce.

Staff is proposing Condition of Certification **TRANS-2** which would require a construction traffic control plan to be developed and implemented prior to earth moving activities.

Staff is proposing Condition of Certification **TRANS-3** to require the applicant to document and repair pavement damage during the construction period.

Staff is proposing Condition of Certification **TRANS-4** to ensure that the left-turn pocket from SR-58 to Harper Lake Road is lengthened to support the project construction traffic.

Staff is proposing Condition of Certification **TRANS-5** to provide enhanced traffic control during construction for the at-grade railroad crossing near the site.

PROPOSED CONDITIONS OF CERTIFICATION

TRANS-1 Prior to site mobilization activities, the applicant shall find or construct a suitable 500-space park-and-ride lot to the west of the project site near SR-58.

Verification: At least 90 days prior to start of site mobilization, the project owner shall propose a new park-and-ride lot to the County of San Bernardino for review and comment and the Compliance Project Manager (CPM) for review and approval. At least 30 days prior to site mobilization, the project owner shall notify the County of San Bernardino and the CPM that the park-and-ride lot is ready for usage and available for inspection.

TRANS-2 The project owner shall, in coordination with the County of San Bernardino, develop and implement a construction traffic control plan prior to earth moving activities. Specifically, the overall traffic control plan shall include the following:

- Schedule delivery of heavy equipment and building material deliveries, as well as the movement of hazardous materials to the site, including the adjacent lay-down area;
- Coordinate with the County of San Bernardino to mitigate any potential adverse traffic impacts from other proposed construction projects that may occur during the construction phase of AMS; and
- Ensure there is adequate access for emergency vehicles at the AMS site.

The construction traffic control plan shall also include the following for activities of substantial stature:

- Signing, lighting, and traffic control device placement; and
- Temporary travel lane closures and potential need for flaggers.

Verification: At least 60 days prior to start of site mobilization, the applicant shall provide to the County of San Bernardino for review and comment and the CPM for review and approval a copy of the construction traffic control plan. The plan must document consultation with Caltrans.

TRANS-3 Prior to construction, the project owner shall document the existing condition of the primary roadways that will be used by the construction workers and heavy vehicle deliveries along Harper Lake Road to SR-58 and SR-58 for 1000' in each direction from Harper Lake Road. Subsequent to construction, the project owner shall document the condition of these same roadways and either directly reconstruct or reimburse the County of San Bernardino and/or Caltrans for needed repairs.

Verification: At least three months prior to the start of site mobilization, the project owner shall submit a review of existing roadway pavement conditions to San Bernardino County and Caltrans for review and comment and the CPM for review and approval. This review will include photographs and the analysis of pavement and sub-surface conditions. The CPM will need to approve the summary of existing pavement conditions prior to the commencement of construction.

No later than two months after the end of construction activities, the applicant shall submit an analysis of the roadway pavement conditions to San Bernardino County and Caltrans for review and comment and to the CPM for review and approval. The review will include photographs, the analysis of pavement and sub-surface conditions, and a schedule for repair.

After the repairs are completed, the applicant shall submit a letter to San Bernardino County, Caltrans, and the CPM indicating such repairs are finished and ready for inspection.

TRANS-4 Prior to commencing construction activities, the project owner shall lengthen the left-turn pocket on SR-58 at Harper Lake Road to approximately 300 feet (or an alternative length as approved by Caltrans). This condition is necessary to safely accommodate the number of vehicles expected to access the site during peak construction period and will require coordination with, and plan approval by, Caltrans.

Verification: At least six months prior to the start of site mobilization, the project owner shall submit plans to Caltrans for approval and obtain encroachment permit. A copy of the plans and all correspondence to Caltrans shall be simultaneously submitted to the CPM. At least 30 days prior to site mobilization, the improvement shall be completed and subject to inspection by Caltrans. Prior to site mobilization, a copy of Caltrans' approval shall be provided to the CPM.

TRANS-5 During construction, the project owner shall provide flag-men at the approaches to the BNSF rail crossing of Harper Lake Road. These flag-men shall stop vehicles in advance of approaching trains during shift changes and during the transport of hazardous materials. The placement and method for "flagging" approaching vehicles shall be subject to input by BNSF. Additionally, the project owner shall not allow hazardous materials deliveries during non-daylight periods (during both construction and operation) to enhance safety at the rail crossing.

<u>Verification:</u> At least three months prior to site mobilization, the applicant shall inform BNSF of its intent to provide flag-men during the construction period and the hours/duration of their use. The applicant shall take direction from BNSF regarding the proper placement and method to "flag" approaching vehicles. All correspondence to/from BNSF shall be provided to the CPM.

REFERENCES

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California Code. Streets and Highways Code. 2008.

California Energy Commission. *Victorville 2 Hybrid Power Project, Application For Certification (07-AFC-1) San Bernardino County*. March 19, 2008.

Caltrans (California Department of Transportation). *2007 Traffic Volumes*. 2008.

City of Barstow. Circulation and Transportation Element of the General Plan. 1997.

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TRANSMISSION LINE SAFETY AND NUISANCE

Testimony of Obed Odoemelam, Ph.D.

SUMMARY OF CONCLUSIONS

The applicant, Mojave Solar LLC proposes to transmit the power from the proposed Abengoa Mojave Solar (AMS) project to the Sothern California Edison's (SCE's) transmission grid through SCE's 230-kilovolt (kV) Kramer-Cool Water # 1 transmission line located adjacent to the southern border of the project. This connection would be via the existing SCE Kramer Junction Substation. The project would be built in two phases, which would constitute the two solar units that could be operated independently. Each would generate 125 megawatts (MW) of electricity for a total of 250 MW. The overhead tie-in lines for the two units would be located within the project's boundaries. Connecting the project to the existing SCE Kramer-Cool Water 230-kV grid line would require a new on-site substation that would be located at the southwest corner of the second-phase unit approximately 13 transmission line miles east from the Kramer Junction Substation. A total of 16,450 feet of transmission line would be used to independently connect each solar unit to the new on-site substation. The routes of the project lines would traverse Mojave Desert land with existing transmission lines and no nearby residences meaning that there would not be the residential electric and magnetic field exposures that in recent years have raised concern about human health effects. Since the proposed project lines and related switchyard would be operated in the SCE service area, their design, erection, and maintenance would be according to standard SCE practices, which conform to applicable laws, ordinances, regulations and standards (LORS). With the five proposed conditions of certification, any line-related safety and nuisance impacts would be less than significant.

INTRODUCTION

The purpose of this analysis is to assess the proposed lines' design and operational plan to determine whether their related field and non-field impacts would constitute a significant environmental hazard in the area around the proposed routes. All related health and safety LORS are currently aimed at minimizing such hazards. 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.

The following federal, state, and local laws and policies apply to the control of the field and non-field impacts of electric power lines. Staff's analysis examines the project's compliance with these requirements.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

Transmission Line Safety and Nuisance (TLSN) 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 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.
Audible Noise	
Local	
San Bernardino County Development Code.	Sets noise limits for specific land uses.
San Bernardino County Noise Ordinance.	Sets sound level limits at residences and outdoor activity areas.

Applicable LORS	Description
Hazardous and Nuisance Shocks	
State	
CPUC GO-95, “Rules for Overhead Electric Line Construction”	Governs clearance requirements to prevent hazardous shocks, grounding techniques to minimize nuisance shocks, and maintenance and inspection requirements.
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.

SETTING

According to the applicant (AS 2009a, pp.2.0-1, 2.0-30, 2.0-31, and 5.7-1),the proposed ASM would be constructed on 1,765 acres of land approximately six miles north of State Highway 58 and nine miles northwest of Hinkley, San Bernardino County, California. The site is located entirely on privately owned land which was formerly used for agricultural activities and is adjacent to the existing Solar Electric Generating Stations (SEGS) VII and IX. The facility would be a 250 megawatt (MW) power generating project that would be constructed in two phases. Phase one, known as the Alpha Phase, would be a 125 MW facility to be built on 884 acres in the northwest portion of the property. Phase two, or the Beta Phase, would also be a 125 MW facility constructed on the remaining 800 acres. The power would be generated with the parabolic trough and heat transfer fluid technology as more fully presented in the Project Description section.

Transmitting the generated power would require a new 230-kV substation located at the southwest corner of the Beta Unit field and would be approximately 13 transmission miles east from the existing Kramer Substation. The total length of the two proposed transmission lines (one from the new on-site substation to each of the two solar units) is 16,450 feet and entirely within the project’s boundaries. Most of line from the Beta Unit would be routed adjacent to the area’s existing major corridor and its right-of-way should have the location of maximum interaction between the fields from the new project lines and the lines within this existing corridor (AS 2009a, pp. 2.0-31 and 2.0-32). The AMS site is in the Mojave Desert in an area with no residences in the immediate vicinity of the facility or its proposed tie-in lines. This existing area corridor is the location for most of the area’s existing transmission lines of 500 kV, 230 kV and 115 kV. Many sections of these existing lines are scheduled for upgrade by SCE (under the jurisdiction of the CPUC) to accommodate the power from the proposed AMS and other area power generators. The proposed AMS lines would thus be contributing fields to an area with fields from several existing transmission facilities.

PROJECT DESCRIPTION

According to information from the applicant (AS 2009a, pp. 2.0-30 through 2-0-34, and 5.14-10) the proposed AMS transmission project would consist of the components listed below:

- Two new overhead 230-kV lines that would separately connect each constituent unit to the new connection switchyard at the site;
- The new on-site 230-kV switchyard from which the conductors would extend to the adjacent SCE power grid; and
- Project-related upgrade of the area’s SCE transmission grid under the jurisdiction of the CPUC.

The proposed lines would be supported on 23 new steel/concrete mono poles from the Alpha Unit site and approximately nine poles from the Beta Unit site. The poles are expected to average approximately 80 feet in height with a maximum of 110 feet. The span length is expected to average approximately 500 feet. Since the proposed lines would be connected to the power grid of the area’s main service utility, SCE, their conductors would be standard low-corona aluminum alloy cables typical of similar SCE lines. The conductor configuration would be in keeping with SCE's guidelines that ensure line safety and efficiency together with reliability, and maintainability. The applicant has provided the details of the proposed line supports as related to EMF management, safety, efficiency and maintainability (AS 2009a, Figure 2-11).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

The potential magnitude of the line impacts of concern in this staff analysis depends on compliance with the listed LORS. These LORS 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.

DIRECT IMPACTS AND MITIGATION

Aviation Safety

Any potential hazard to area aircraft would relate to the potential for collision in the navigable airspace and the need to file a "Notice of Proposed Construction or Alteration" (Form 7640) with the FAA as noted in the LORS section. The need for such a notice depends on factors related to the height of the structure, the slope of an imaginary surface from the end of nearby runways to the top of the structure, and the length of the runway involved.

As noted by the applicant (AS 2009a, p. 5.14-10), there are no airports or runways in the area around AMS. The nearest airport is the Edwards Air Force Base approximately 12 miles to the southwest. The project or related lines are thus not within any restricted air space. Furthermore the proposed line supports would at a maximum height of 110 feet be much less than the FAA threshold height of 200 feet that triggers the concern over aviation safety. Therefore, staff does not recommend any related condition 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 proposed project lines 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 the 230 kV lines proposed. The proposed low-corona designs are used for all SCE lines of similar voltage ratings to reduce surface-field strengths and the related potential for corona effects. Staff does not expect any corona-related radio-frequency interference or related complaints in the general project area with no residences. However, staff recommends Condition of Certification **TLSN-2** to ensure mitigation as required by the FCC in the unlikely event of complaints.

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 AMS. 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 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 AND VIBRATION** 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 for the proposed project lines (AS 2009a, p.5.14-15). The applicant's intention to ensure compliance with the clearance-related aspects of GO-95 would be an important part of this mitigation approach. Moreover, the line would traverse a mostly agricultural or commercial area with no trees of sufficient size to pose a contact-related fire hazard. Condition of Certification **TLSN-4** is recommended to ensure compliance with important aspects of the fire prevention measures.

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.

The applicant’s stated intention to implement the GO-95-related measures against direct contact with the energized line (AS 2009a, p.5.14-15) would serve to minimize the risk of hazardous shocks. Staff’s recommended 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 project lines, 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 lines would be minimized through standard industry grounding practices (AS 2009a, p.5.14-11 and 5.14-12). Staff recommends Condition of Certification **TLSN-5** to ensure such grounding.

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, hence the general practice of describing exposure to them together 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 reduction of such fields as feasible 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 high-voltage lines) 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 applicant 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 one 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 each new line in California is currently required by the CPUC to be designed according to the EMF-reducing guidelines of the electric utility in the service area involved, its fields are required under this CPUC policy to be similar to fields from similar lines in that service area. Designing the proposed project line according to existing TID field strength-reducing guidelines would constitute compliance with the CPUC requirements for line field management.

The CPUC recently 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 D.06-1-42 of January 26, 2006, did not identify a need for significant changes to existing field management policies. Since there are no residences in the immediate vicinity of the proposed project lines, there would not be the long-term human residential EMF exposures mostly responsible for the health concern of recent years. The only project-related EMF exposures of potential significance are the short-term exposures of plant workers, regulatory inspectors, maintenance personnel, visitors, or individuals in the immediate 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 Applicant's Approach to Reducing Field Exposures

The present focus is on the magnetic field because only it can penetrate the soil, buildings and other materials to potentially produce the types of health impacts at the root of the health concern of recent years. As one focuses on the strong magnetic fields from the more visible overhead transmission and other 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 (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 exposure 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 design of the proposed lines 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.

The applicant has calculated the maximum field strengths at representative points along the proposed routes to determine whether operating the proposed project lines would cause any significant increases in area fields above existing lines. Maximum field intensities would be expected at the locations of maximum interaction between the AMS fields and the fields from the area's major line corridor (of 574 feet) in which are located the Kramer-Cool Water #1 and # 2 230-kV lines, the Kramer-Cool Water 115-kV line, and the Mead-Adelanto 500-kV line. Field intensities were calculated before and during AMF line operation and in ways that reflect the interactive effects of fields from all contributing conductors (AS 2009a, pp5.14-13, through 5.14-16)). Staff has verified the accuracy of the modeling approach used in the applicant's calculations with regard to parameters bearing on field strength dissipation and exposure assessment.

As shown in Figures 5.15-1 and 5.14-2, the maximum magnetic field intensity at the edge of the rights-of-way for the existing corridor lines was calculated as 24.8 mG without the fields from the proposed AMS lines. This maximum intensity would then increase slightly to 25.5 mG with addition of fields the AMS lines. This would be an increase of 0.7 mG above existing levels. These field intensities could be compared with a right-of-way limit of 200 mG for the few states with regulatory limits. The maximum electric field strength was calculated as 0.52 kV/m at the edge of the right-of-way and would not change with introduction of electric fields from ASM operation. These field strengths reflect (a) the effectiveness of SCE's field-reducing designs to be applied and (b) the adequacy of the dimensions of the available right-of-way in serving to distance the lines from areas of potentially long-term human exposures. Since these field strengths are as staff would expect for similar SCE lines, we regard further mitigation to be unnecessary, but would seek to validate the applicant's assumed reduction efficiency from the field strength measurements recommended in Condition of Certification **TLSN-3**.

CUMULATIVE IMPACTS AND MITIGATION

When field intensities are measured or estimated for a specific location, they reflect the interactive, and therefore, cumulative effects of fields from all contributing conductors. This interaction could be additive or subtractive depending on prevailing conditions. Since (a) the proposed 230-kV project lines and switchyard would be designed according to applicable field-reducing SCE guidelines as currently required by the CPUC for effective field management, any contribution to cumulative area exposures 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 on EMF management. The applicant's calculations have identified the proposed line design and operational plan as adequate to minimize the fields from the proposed project lines. However, the actual field strengths and contribution levels for the proposed line designs would be assessed from the results of the field strength measurements specified in Condition of Certification **TLSN-3**.

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 lines would be built and operated according to the respective requirements of GO-95, GO-52, GO-131-D, and Title 8, Section 2700 et seq. of the California Code of Regulations, staff considers the presented design and operational plan to be in compliance with the health and safety LORS of concern in this analysis. The actual contribution to the area's field levels would be assessed from results of the field strength measurements required in Condition of Certification **TLSN-3**.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received no public or agency comments on the transmission line nuisance and safety aspects of the proposed AMS.

CONCLUSIONS

Since the proposed AMS lines would not pose an aviation hazard according to current FAA criteria, staff does not consider it necessary to recommend 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 to 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 and related complaints especially in the traversed area with no residences. The potential for hazardous shocks would be minimized through compliance with the height and clearance requirements of PUC's General Order 95. Compliance with Title 14, California Code of Regulations, Section 1250, would minimize fire hazards while the use of low-corona line design, together with appropriate corona-minimizing construction practices, would minimize the potential for corona noise and its related interference with radio-frequency communication in the area around the proposed routes.

Since electric or magnetic field health effects have neither been established nor ruled out for the proposed 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 lines' 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 information. The long-term, mostly residential magnetic exposure of health concern in recent years would be insignificant for the proposed lines given the absence of residences along the proposed 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 project lines would be operated to minimize the health, safety, and nuisance impacts of concern to staff, and would be located along a route without nearby residences, staff considers the proposed design, maintenance, and construction plan as complying with the applicable laws. With the conditions of certification proposed below, any such impacts would be less than significant.

PROPOSED CONDITIONS OF CERTIFICATION

TLSN-1 The project owner shall construct the proposed overhead 230-kV project lines according to the requirements of California Public Utility Commission's GO-95, GO-52, GO-131-D, Title 8, and Group 2, High Voltage Electrical Safety Orders, Sections 2700 through 2974 of the California Code of Regulations, and SCE's EMF-reduction guidelines.

<u>Verification:</u> At least thirty days before starting construction of the transmission lines 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 ensure that every reasonable effort will be made to identify and correct, on a case-specific basis, any complaints of interference with radio or television signals from operation of the project-related lines and associated switchyards. The project owner shall maintain written records for a period of five years, of all complaints of radio or television interference attributable to line operation together with the corrective action taken in response to each complaint. This record shall be submitted in an Annual Report to the Compliance Project Manager on transmission line safety and nuisance-related requirements.

<u>Verification:</u> All reports of line-related complaints shall be summarized for the project-related lines and included during the first five years of plant operation in the Annual Compliance Report.

TLSN-3 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 at the edge the AMS lines' rights-of-way as identified by the applicant on page 5.14-14, and in Figures 5.14-1 and 5.14-2. 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 not 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-4 The project owner shall ensure that the rights-of-way of the proposed transmission lines are 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 operation, the project owner shall provide a summary of inspection results and any fire prevention activities carried out along the rights-of-way and provide such summaries in the Annual Compliance Report for transmission line safety and nuisance-related requirements.

TLSN-5 The project owner shall ensure that all permanent metallic objects within the right-of-way of the project-related lines are grounded according to industry standards regardless of ownership.

Verification: At least 30 days before the lines are energized, the project owner shall transmit to the CPM a letter confirming compliance with this condition.

REFERENCES

Electric Power Research Institute (EPRI) 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.

AS 2009a-Abengoa Solar Inc. /E Garcia (TN 52813). Application for Certification of the Mojave Solar Project, Volumes I and II submitted to the California Energy Commission on September 10, 2009.

VISUAL RESOURCES

Testimony of Thomas Packard, William Kanemoto, and James Jewell

SUMMARY OF CONCLUSIONS

The proposed Abengoa Mojave Solar (AMS) project would be seen from the sparsely developed area adjacent to the proposed project site which includes the existing Solar Electric Generating Systems (SEGS VIII and IX) projects, about ten private residences in the immediate area, and the Harper Dry Lake Watchable Wildlife Area maintained by the Bureau of Land Management (BLM) near the northeaster corner of the proposed project site. The project would be virtually unseen from State Route 58, which is five-plus miles south of the project. The proposed transmission line would be visible among three existing transmission lines along the southern boundary of the project site. The project would change the existing character of the 1,765-acre project site from a primarily open, partially abandoned agricultural landscape to a highly human-altered, industrial landscape very similar to the adjacent SEGS VIII and IX developments. The change in character would be evident to the few people who live in the immediate area, to employees at the SEGS VIII and IX facilities, and to those who visit the Harper Dry Lake Watchable Wildlife Area. Due to its visual isolation from substantial numbers of the public, overall visual effects of the project would be very limited.

Staff concludes that the project, with all recommended Conditions of Certification, would introduce a less-than-significant “Aesthetic” Impact under the California Environmental Quality Act (CEQA). Aesthetic Impacts are discussed under sections **VISUAL CHARACTER OR QUALITY**, **LIGHT AND GLARE,** and **PUBLICLY VISIBLE WATER VAPOR PLUMES.** The project would be consistent with federal, state, and local **LORS** pertaining to visual resources.

Due to its very restricted viewshed, staff also concludes that potential cumulative impacts of the project would be limited and less-than-significant.

If the Energy Commission approves the project with staff’s recommended conditions of certification, the project’s impacts would be less than significant under CEQA and the project would comply with applicable LORS pertaining to aesthetics and preservation and protection of sensitive visual resources.

INTRODUCTION

Visual resources are made up of viewable natural and man-made features of the environment. In this section, staff evaluates the proposed project’s construction and operation using criteria in the “Aesthetics” section of Appendix G of the California Environmental Quality Act (CEQA) Guidelines (*see* Cal. Code Regs., tit. 14, Section 15063) to determine whether the project would result a significant impact under CEQA. Staff also determines whether the project would comply with applicable laws, ordinances, regulations or standards (LORS).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Visual Resources Table 1 provides a general description of identified adopted federal state and local LORS pertaining to aesthetics, lighting, and protection of visual resources relevant to the proposed project.

Visual Resources Table 1
Applicable Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
	The project site does not include federal managed lands, a recognized National Scenic Byway or All-American Road.
	The BLM manages the Harper Dry Lake Watchable Wildlife Area adjoining the project site to the northeast. The area consists of a small parking lot, rest room, and gravel trails leading to observation decks at the western edge of Harper Dry Lake. The area is adjacent to the northeastern portion of the project site. See discussion under **REGIONAL LANDSCAPE.**
State	
	There are no state-designated scenic highways within the vicinity of the project. State Route 58 between Mojave and Barstow has been listed as eligible for designation as a state scenic highway since 1963 when the state scenic highway system was originally established. The highway has never been nominated for designation as a state scenic highway.
Local	
San Bernardino County General Plan, adopted March, 2007	
Conservation Element	***Countywide Policy CO 1.2:*** The preservation of some natural resources requires the establishment of a buffer area between the resource and developed areas. The County will continue the review of the Land Use Designations for unincorporated areas within one mile of any state or federally designated scenic area, national forest, national monument, or similar area, to ensure that sufficiently low development densities and building controls are applied to protect the visual and natural qualities of these areas.
	Desert Region Policy D/CO 1.2: Require future land development practices to be compatible with the existing topography and scenic vistas, and protect the natural vegetation.

Applicable LORS	Description
	Desert Region Policy D/CO 1.3: Require retention of existing native vegetation for new development Projects, particularly Joshua trees, Mojave yuccas and creosote rings, and other species protected by the Development Code and other regulations.
	Desert Region Policy D/CO 3.1: Protect the Night Sky by providing information about and enforcing existing ordinances: b. Review exterior lighting as part of the design review process.
	Desert Region Policy D/CO 3.2: All outdoor lighting, including street lighting, shall be provided in accordance with the Night Sky Protection Ordinance and shall only be provided as necessary to meet safety standards.
Open Space Element	***Countywide Policy OS 5.3:*** The County desires to retain the scenic character of visually important roadways throughout the County. A "scenic route" is a roadway that has scenic vistas and other scenic and aesthetic qualities that over time have been found to add beauty to the County.
San Bernardino County Development Code	The San Bernardino Development Code implements the San Bernardino General Plan. Section 83.02 of the Code, Development and Use Standards, contains standards for screening and buffering while Section 83.10 contains Landscaping Standards. Section 84.29.50 specifies fencing standards for renewable projects.

SETTING

REGIONAL LANDSCAPE

The regional landscape in the project area is formed by north-south-trending mountain ranges separated by broad valleys and is characterized by native low, shrubby Mojave creosote scrub vegetation and an absence of trees. The project site is a part of an expansive flat plain that has a gentle downward slope toward Harper Dry Lake, a dry alkaline lakebed northeast of the Abengoa Mojave Solar site. Black Mountain, a wilderness area managed by the USDI Bureau of Land Management is located to the northeast beyond the dry lakebed approximately eight miles from the Project site. Four miles east-southeast of the project site is Lynx Cat Mountain. There is an unnamed butte south of SR-58. These landforms are collectively known as the Hinkley Divide. SR-58 was included in the State Scenic Highway System at the time the system was established in 1963. It is therefore eligible for designation as a State Scenic Highway although it has never been nominated for designation. Although unmarred vistas of the natural landscape still occur in some places, it is unlikely that SR-58 would meet the scenic highway designation criteria if nominated today, due to the number and types of man-made visual intrusions that now exist within the viewshed of the highway. Regionally, such visual intrusions include the U.S. Borax mine and processing plant at

Boron, numerous high voltage electric transmission lines of various sizes and configurations, electric substations, the SEGS III, IV, V, VI, and VII Kramer Junction solar facilities, and commercial development at Kramer Junction and other places along the highway.

There are no distinctive geographic features on the Project site. Open land and large electrical transmission lines dominate the Harper Lake Valley landscape. The flat-to-gently rolling character of the land and absence of trees provide for open and expansive viewing within the foreground (0-0.5 mi.), middle ground (0.5-3 mi.), and background (3+ mi.) distance zones. Distant views are sometimes limited due to atmospheric haze or pollution. While the openness of this landscape provides visual relief from urban development, the prominence of large power lines and industrial style developments diminish its attractiveness.

PROJECT SITE AND SETTING

The Abengoa Mojave Solar site is in unincorporated San Bernardino County in the Harper Lake Valley of the western Mojave Desert. The proposed Project site is approximately nine miles northwest of the unincorporated community of Hinkley, approximately 20 miles west-northwest of Barstow, and approximately 11 miles east-northeast of Kramer Junction, which is at the intersection of SR-58 (the Barstow-Bakersfield Highway) and US-395. SR-58 lies five miles south of the project site, at background viewing distance. Harper Dry Lake is approximately 1,000 feet east of the project site. A wildlife viewing area at the southwest edge of the dry lake is managed and maintained by the BLM. Public access to the Watchable Wildlife Area is via Harper Lake Road and Lockhart Road. The project would occupy 1,765 acres of previously disturbed and now mostly abandoned agricultural lands including lands along the east and west sides of Harper Lake Road and the north and south sides of Lockhart Road. The site is generally flat with elevations ranging from approximately 2025 feet to 2105 feet.

The project vicinity is very sparsely populated. Approximately a dozen residential structures are located within one mile of the project site, some of which are abandoned. There are no other residences within a five-mile radius of the project (AS 2009a). **Visual Resources Figure 1** depicts the location of these residences (Data Response Set 1B, # 62)(ESH 2009g). Other old, abandoned structures exist within a mile of the project site giving the area a somewhat blighted appearance. The SEGS VIII and IX solar facilities are immediately adjacent to and northwest of the proposed Abengoa Mojave Solar site and occupy the area north of Hoffman Road and west of Harper Lake Road. There are no other developed land uses in the area. The SEGS projects utilize similar technology and hardware as that being planned for the Mojave Solar Project. The proposed project would have the same visual character as the SEGS VIII and IX but would be nearly twice as large in area.

The project site offers distant views to Black Mountain, a BLM Wilderness Area that is approximately eight miles to the northeast. Overall, visibility of the plant site is limited by the surface topography of the surrounding lands, in particular by small undulations in the Mojave Desert plain. According to computer-generated viewshed analyses contained in the AFC, including profiles of the ground surface from the project site to SR-58, the site is not visible from the highway, except for a very short section of

Highway 58 east of Harper Lake Road, and equally short segment of Highway 395 south of Kramer Junction, both at background distance (AFC Figure 5.15-1a)(AFC 2009a-).

PROJECT CONSTRUCTION

If approved, the applicant expects that construction of the generating facility, from site preparation and grading to commercial operation, would take place from the third quarter of 2010 to the third quarter of 2012 (24 months total). If approved, the applicant anticipates that the project would be on line and in commercial service by the fourth quarter of 2012.

The construction workforce would consist of laborers, craftsmen, supervisory personnel, support personnel and construction management personnel. The project's predicted peak and average construction employment levels are 1,162 and 830, respectively.

PROJECT OPERATION

The project would utilize solar parabolic trough technology to activate a heat transfer fluid. The proposed collector fields of parabolic trough solar collectors are modular in nature and comprise many parallel rows of solar collector arrays (SCAs) aligned on a north-south axis. Each solar collector has a linear, parabolic-shaped reflector and a heat collection element (HCE). As heat transfer fluid is circulated through the solar field, light from the sun reflects off the solar collector's parabolic troughs and is concentrated on the heat collection elements. This heat transfer fluid provides a high-temperature energy source which is used to generate steam in steam generators. As this steam expands through the steam turbine generators, electrical power is generated.

The project would have a combined nominal electrical output of 250 megawatts (MW) from twin, independently-operable solar fields, each feeding a 125-MW power island. The plant sites, identified as Alpha (the northwest portion of the project area) and Beta (the southeast portion of the project area), would be 884 acres and 800 acres, respectively, or 2.6 square miles total. An on-site transmission line interconnection substation would provide one full-output transmission interconnection. The applicant proposes that an additional 81 acres shared between the plant sites will be utilized for receiving and discharging offsite drainage improvements.

Each power island would have its own warehouse and control/administration building. Solar collector array assembly buildings would be installed in the northeast portion of the Alpha solar field, which would be later converted to warehouses. The total square footage of the various proposed project buildings and pre-engineered enclosures (e.g., control/admin building, warehouse, electrical equipment enclosures, etc.) would be approximately 185,000 square feet for the entire project.

The sun would provide 100% of the power supplied to the project through solar-thermal collectors; no supplementary fossil-based energy source (e.g., natural gas) is proposed for electrical power production. However, natural gas for the AMS project's ancillary purposes, such as firing the auxiliary boilers and space heating, would be supplied by an existing natural gas pipeline that runs to the project boundary; no offsite pipeline facilities are proposed as a part of the project. Each power island would also have a diesel powered firewater pump for fire protection and a diesel fired backup generator for power plant essentials.

Transmission Line

The AMS project proposes to connect to the existing Southern California Edison Company's (SCE) Kramer-Cool Water 230-kV transmission line, which is located along the southern border of the proposed project site. All AMS project-related transmission facilities would be within the project boundaries, except the connection within the existing transmission right-of-way adjacent to the site.

The existing Kramer-Cool Water 230 kV line is located on the north side of the transmission line corridor. The Mead-Adelanto 500 kV transmission line operated by the Los Angeles Department of Water and Power (LADWP) is on the south side. A lower voltage transmission line exists between the two. The transmission corridor's northern boundary is adjacent to the project's southern boundary.

To interconnect the project into the existing Kramer-Cool Water No.1 230 kV transmission line, a new substation would be needed. The new substation would be located at the southwest corner of the Beta solar field. It would be approximately 13 transmission-miles east of the existing Kramer Substation and approximately 32 transmission-miles west of the existing Cool Water Substation.

Plant Night Lighting

Nighttime lighting levels and water vapor plumes at the existing SEGS VIII and IX plants are similar to those expected at the Abengoa Mojave Solar site. The project's lighting system would provide operations and maintenance personnel with illumination in both normal and emergency conditions. The system would consist primarily of AC lighting, but would include DC lighting for activities or emergency egress required during an outage of the plant's AC electrical system. The lighting system would also provide AC convenience outlets for portable lamps and tools. Lighting would be designed to provide the minimum illumination needed to achieve safety and security objectives and would be shielded and oriented to focus illumination on the desired areas and minimize additional nighttime illumination in the site vicinity.

Visual Resources Table 2 below provides design characteristics of the visually prominent project features considered in the visual assessment of the project.

Visual Resources Table 2
Design Characteristics of Visually Prominent Project Features (AS 2009a)

Quantity	**Project Feature**	**Height** (ft)	**Length** (ft)	**Width** (ft)
22,500	Solar Collector Arrays	21.1	39.4	18.9
32	Transmission Line Monopoles	80 - 110	25-in. base diameter	9-in. tip diameter
2	Steam Turbine Generator Building	72.5	42.1	107.8
2	Steam Generation	50	198	70
2	Cooling Towers	44	324	54
2	Mirror Modules Assembly Factory	44	295.3	262.5
2	Central E&C and Operations Building	32	163	109
2	Power Plant E&C Buildings	32	110	25
2	Heat Transfer Fluid Pump House	23	81.5	70
2	Auxiliary Boiler Building	30	50	28.6
2	Diesel Generator Building	30	40	12
2	Closed Cycle Cooling Buildings	30	39.7	18.9
2	Cooling Tower Electrical Buildings	16.5	57	20
2	Heat Transfer Fluid Electrical Buildings	16.5	49.2	26.2
2	Water Treatment Building	16.5	50.4	36.4
2	Warehouse	16.5	170	80

According to the AFC, project features would be painted with colors sympathetic to the desert environment. Also, non-reflective materials would be used for project components other than the solar trough mirrors, and all light sources would be shielded.

Specific design features would include the following:

- The surfaces of all aboveground structures (except the solar collectors) including the control building, administration building, warehouse, water treatment building, solar collector array assembly buildings, enclosures for mechanical and electrical equipment, substation building, and water storage tanks would be given low reflectivity finishes with neutral desert tan colors sympathetic to the surrounding desert environment to minimize the contrast of the structures with their backdrops.
- All substation equipment would be specified with low reflectivity, neutral finishes. All insulators at the substations and on the takeoff equipment would be non-reflective and non-refractive. Chain-link fences surrounding the substation and the Project site would have a dulled finish to reduce contrast with the desert surroundings.
- Tubular steel poles (TSPs) used for overhead transmission lines would be painted light-gray colors or will be dulled galvanized steel. If concrete monopoles are used,

they would be natural concrete with light-gray colors. All insulators specified would be made of materials that do not reflect or refract light. All conductors specified for the project would be non-specular (treated at the factory to dull their surfaces to reduce their potential to reflect light).

- All construction-related operations at the construction laydown area would be kept clean and orderly. Construction debris would be removed promptly at regular intervals, not to exceed two weeks at any one location.
- All outdoor lighting would be the minimum required to meet safety and security standards and all light fixtures would be hooded to prevent light from spilling off the site or up into the sky. All outdoor lights would have sensors and switches to permit them to be turned off at times when lighting is not required.
- The Applicant will voluntarily consult with residential property owners within one-half (0.5) mile of the proposed project site boundary to suggest offsite-planting on adjacent residential properties (if landowner is interested) in order to assist with visual screening of the project as seen from these single- family residential locations.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

To determine whether there is a potentially significant visual resources impact generated by a project, Energy Commission staff reviews the project using the CEQA Guidelines Appendix G Environmental Checklist pertaining to "Aesthetics." The checklist questions include the following:

A. Would the project have a substantial adverse effect on a scenic vista?

B. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

C. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

D. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Water Vapor Plumes

In addition to the four CEQA questions above, another visual issue pertaining to aesthetics addressed by staff in this report is the visual impact associated with water vapor plumes emitted from the cooling towers. Visual impacts of vapor plumes are more difficult to evaluate than structures because they vary in both size and duration depending upon operating and meteorological conditions. Vapor plumes are generally associated in the public's mind with heavy industry and pollution, and thus tend to be regarded negatively by visually sensitive observers. Vapor plumes may attain a very large size and thus affect considerably larger areas than a power plant's structures.

The frequency and size of predicted vapor plumes was determined by Energy Commission air quality staff (**APPENDIX VR-3**). Staff's visual impact assessment is based on the results of a "visible plume modeling analysis" using the Combustion Stack Visible Plume (CSVP) model. According to impact thresholds established by Energy Commission staff and applied to the evaluation of all plume-producing projects, visual impacts could potentially occur if the modeling analysis shows vapor plumes to occur for 20% or more of seasonal daytime clear hours, during the period of November through April (when plumes are most prevalent in the project setting). Nighttime hours without fog are also considered in cases where night illumination could result in potential visual impacts from plumes.

The 20% criterion recognizes that plumes occurring less frequently than 20% of the seasonal period would be sufficiently infrequent as to represent a less-than-significant impact regardless of size. The seasonal criterion reflects the tendency of visible plumes to be concentrated in certain seasonal periods and not in others. The clear criterion reflects the fact that plumes may often form in conditions that are also conducive to fog, rain and overcast weather, but are less likely to be highly visible or perceived as substantially adverse under such conditions, since visibility and contrast of plumes is lower under such conditions.

When modeling results indicate that a project exceeds the 20% impact criteria threshold, plume dimensions are calculated (**APPENDIX VR-3**). Staff considers the 20th percentile plume dimension to be the reasonable worst case on which to base its visual impact analysis. The 20th percentile plume is the smallest of the plumes that are predicted to occur zero to 20% of the time. Eighty (80) percent of the time the dimensions of the clear hour plumes would be smaller than the 20th percentile plume dimensions. A one--percentile clear hour plume would be extremely large (physical size) and very noticeable to a wide area, but would occur very infrequently. The visual impact of the expected plume dimension is assessed in terms of contrast, scale, and view disruption from each of the KOPs.

<u>Key Observation Points (KOPs)</u>

Staff evaluates the existing visible physical environmental setting from representative fixed vantage points, called *key observation points* (KOP). Staff uses a KOP[1] to represent a location(s) from which to conduct detailed analyses of the proposed project and to obtain existing condition photographs and prepare photo simulations. KOPs are selected to be representative of the most critical viewshed locations from which the project would be seen. Because it is not feasible to analyze every view in which a proposed project could be seen, it is necessary to select KOPs that would most clearly represent the major visual effects of the proposed project as they would be experienced by key sensitive viewing groups. **Visual Resources Figures 2a and 2b** (Data Adequacy Supplement Attachment F, Figures 5.15-2a, 2b) shows the location of the eight KOPs used in this analysis (note that North is oriented to the right in the figure)(AS 2009B):

- KOP 1 – View from Harper Lake Road near Phoenix Road;
- KOP 2 – View from Harper Lake Road south of Roy Road;

[1]The use of KOPs or similar view locations is common in visual resource analysis. The U.S. Bureau of Land Management (USDI BLM 1986a, 1986b, 1984) and the U.S. Forest Service (USDA Forest Service 1995) use such an approach.

- KOP 3 – View from Roy Road east of Edie Road;
- KOP 4 – View from Edie Road south of Lockhart Ranch Road;
- KOP 5 – View from Lockhart Ranch Road east of Edie Road;
- KOP 6 – View from BLM Watchable Wildlife Area looking south;
- KOP 7 – View from BLM Watchable Wildlife Area looking west;
- KOP 8 – View from Fossil Bed Road near Black Canyon Road.

Staff's analysis of the project's effect on each KOP is presented under "Operation Impacts". Significant impacts are identified by staff if the level of visual change as a result of the project would exceed acceptable levels in the context of a KOP's overall visual sensitivity, a measure that reflects the anticipated sensitivity of the viewing public to the visual effects of the proposed project. Please refer to **APPENDIX VR-1** for a description of staff's visual resources evaluation process. **APPENDIX VR-2** provides visual resource terms for the purposes of this analysis.

DIRECT/INDIRECT IMPACTS AND MITIGATION

The impact discussion is presented under the following topics as listed in the CEQA Guidelines Appendix G: scenic vistas, scenic resources, visual character or quality, and light and glare.

Visual Resources Table 3
CEQA Environmental Checklist Form—Aesthetics

	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact
AESTHETICS —Would the project:				
A. Have a substantial adverse effect on a scenic vista?				X
B. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, historic buildings within a state scenic highway, or part of a river, stream, or estuary ?			X	
C. Substantially degrade the existing visual character or quality of the site and its surroundings?		X		
D. Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?		X		

A. Scenic Vistas

CEQA aesthetics checklist question A: “Would the project have a substantial adverse effect on a scenic vista?”

A scenic vista for the purpose of this analysis is defined as a distant view through or along a corridor or opening that exhibits a high level of visual quality, particularly including viewpoints identified as having scenic value in public documents.

There are no specific scenic vista points of notable importance in the project viewshed. None of the KOPs would experience substantial view intrusion or obstruction as a result of the project, as discussed further under each individual KOP in the section, “Operation Impacts,” below.

B. Scenic Resources

CEQA aesthetics checklist question B: “Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway corridor?”

Scenic resources for the purpose of this analysis 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 visual/historical importance to a community (a tree linked to a famous event or person, an ancient old growth tree); historic building; or a designated federal scenic byway or state scenic highway corridor.

There are no historic buildings or other potential scenic resources that would be affected by the project. There are no designated federal scenic byways or designated state scenic highway corridors in the vicinity of the project.

C. Visual Character or Quality

CEQA aesthetics checklist question C: “Would the project substantially degrade the existing visual character or quality of the site and its surroundings?”

The project’s visual setting is described in terms of existing visual character and quality. Visual character refers to attributes of the visual setting and is descriptive. Visual quality is an evaluative measure that reflects a judgment of the landscape’s attractiveness as determined by characteristics broadly recognized as valued and preferred by most viewers. These include the presence of undisturbed natural features, particularly vegetation and water, and visual attributes typically identified as preferred or valued in various professionally accepted assessment methodologies, such as vividness, unity and intactness (see Appendix VR-2 for definitions for visual analysis terms). Visual quality is rated in the context of the project’s broad regional landscape setting. That is, landscapes that are visually degraded compared to those common within the region are assigned a low visual quality rating. Landscapes that are common within the region are assigned a moderate visual quality rating. Landscapes that are unusually scenic and vivid within the region are given a high visual quality rating.

The project impacts evaluated under this criterion are broken down into three categories: (1) Construction Impacts; (2) Operation Impacts – Analysis from Key Observation Points; and, (3) Publicly Visible Vapor Plumes – Analysis from Key Observation Points.

Construction Impacts

According to the AFC, temporary construction laydown and parking areas will be located at on the project site as needed. An area in the northeast portion of the Alpha solar field will be used to assemble the SCAs in buildings. The construction sequence for power plant construction includes the following general steps:

Site Preparation: This includes detailed construction surveys, mobilization of construction staff, demolition of existing onsite structures, grading, and preparation of drainage features. Grading for the solar field and power island will be completed during the first six months of the construction schedule. Finish grading and repairs will occur during the remaining construction period as portions of the project are completed.

Foundations: This includes excavations for large equipment (Steam Turbine Generators (STGs), Solar Steam Generators (SSGs), Generator Set-Up (GSU), cooling tower, etc.), footings for the solar field, and ancillary foundations in the power island.

- Major Equipment Installation: Once the foundations are complete, the larger equipment will be installed. The solar field components will be assembled in the onsite Solar Collector Array (SCA) assembly buildings and installed on their foundations.
- Balance of Plant: With the major equipment in place, the remaining field work will be piping, electrical, and smaller component installations.
- Testing and Commissioning: Testing of subsystems will be done as they are completed. Major equipment will be tested once all supporting subsystems are installed and tested.

Equipment and materials will be delivered to the plant site by truck; large components (e.g., STG) and bulk deliveries will be received in Barstow by rail, transferred to truck and then delivered to the site.

Project construction activities would be evident in ground level views occurring from within approximately one mile of the project site. Construction traffic associated with work force and equipment deliveries would be noticeable to travelers on Harper Lake Road.
Project construction would cause moderate to high levels of visual disturbance, but would be seen by few people due to the due the remote location of the project site. Staff concludes that the visual impact of construction activities would be less than significant.

Operational Impacts – Key Observation Points Analysis

Operational impacts to the setting's existing visual character and quality are assessed from the eight KOPs identified by the applicant and CEC staff (AS 2009a).

KOP 1 – View from Harper Lake Road near Phoenix Road

KOP 1 **(Visual Resources Figure 3a)** (AFC Figure 5.15-3(a)) is located on Harper Lake Road just north of the intersection with Phoenix Road (AS 2009a). Harper Lake Road is the primary north-south road leading to the general area of the project site. It also provides access to the rural residences in the area and provides public access to the Harper Dry Lake Watchable Wildlife Area. The location of KOP 1 is from 2 to 2.75 miles south of the nearest project site boundaries. The view looking toward the project from KOP 1 is to the north and northeast. While open and expansive views to the north generally occur, the gently undulating surface topography in this area influences what ground surfaces can actually be seen.

Visual Sensitivity

The overall visual sensitivity of KOP 1 is rated as *Low.* Visual sensitivity is the composite evaluation of existing visual quality, anticipated viewer concern for visual resources, and viewer exposure, each of which is discussed below.

Visual Quality

The existing visual quality of the view from KOP 1 is *Moderate*. Views toward the project site from KOP 1 are characteristic of the Western Mojave Desert landscape. It is predominantly undeveloped and provides visual open space. Foreground and middle ground views are of native Mojave Desert creosote scrub. Utility poles paralleling Harper Lake Road leading from the immediate foreground and multiple, large transmission line towers in the middle ground of the view are among the most noticeable built features seen in KOP 1 and contrast moderately against the dominant horizontal lines of the landscape. Background views are of distant mountains.

The landscape is moderately vivid, intact, and unified. The view from KOP 1 exhibits a panoramic open space character and limited development, but lacks complexity and variety of landscape features. Landscape intactness is moderate: it exhibits intactness as a desert landscape, but clearly lacks a pristine quality due to the presence of discordant elements: the road, utility lines, and large transmission lines. The landscape has a moderate level of unity since the expanse of desert vegetation contributes to a harmonious, unified character.

Viewer Concern

Viewer concern from KOP 1 is considered to be *Moderate.* Motorists are considered to have moderate visual sensitivity.

Viewer Exposure

Viewer exposure from KOP 1 is *Low.* Factors that determine viewer exposure are number of viewers, duration of view, and visibility of the project. The number of viewers at KOP 1 is low while the duration of the view is relatively short. Visibility of the project is low at this distance. The project site is only partially seen due to topography and distance. The project site is seen in the context of an open, expansive view of intact foreground landscape that dwarfs the portion of the view occupied by the site.

Visual Change

Visual Resources Figure 3b (AFC Figure 5.15-3(b)) contains a photo simulation of the proposed project as it would appear from KOP 1 (AS 2009a). Some portions of most project features would be seen from KOP 1, but at a distance of two to three miles. The SCA fields would be at least partially within view and would appear to extend over a wide area left to right within the view. At this distance, project features would not appear distinct and their details would be difficult to discern. Facilities at the power block area would appear as a concentration of forms of varying heights and widths.

As seen from KOP 1, the overall visual change to the scene as a result of the project is *Low*. Visual change is a composite evaluation of visual contrast, project dominance, and view disruption, each of which is discussed below.

Visual Contrast

The visual contrast introduced by the project features overall would be *Low.* This is due to the distance of the project from KOP 1. Contrasts associated with the power block facilities would be moderate due to their geometric forms and the light shades of beige and brown proposed for the facilities. The facilities would be seen in the middle ground distance zone against a backdrop of desert and distant hills. In the photo simulation from KOP 1, the buildings in the power block are lighter in color than the backdrop. Contrast could thus be lowered with staff-recommended Condition of Certification **VIS-1**, calling for surface treatment in colors that would blend with the background.

Project Dominance

Project dominance as seen from KOP 1 would be *Low*. As seen from KOP 1, the project would be noticeable but would not attract attention more than other man-made elements within view. None of the project features would protrude into the skyline, mountains or hills of the background distance zone. Although the project covers a large area, it is viewed in the context of a very open and expansive scene in which both the intact, natural foreground and distant mountain ridgelines visually dominate.

View Disruption

View disruption would be *Low.* The project would not disrupt any scenic views or vistas from KOP 1. Although the project would cover a large area of land, the apparent height of most features would be low, except for the power block, which remains very visually subordinate at this distance.

Impact Significance

Staff concludes that the introduction of the project into the landscape of the KOP 1 viewshed would result in a less-than-significant impact to visual resources. The *Low* overall visual sensitivity and *Low* overall visual change would result in a less-than-significant visual impact. However, since the proposed color shades for many of the project features in the power block are key to reducing the visual effect of the project, staff recommends Condition of Certification **VIS-1** to ensure that all project facilities, including the non-mirror portions of the SCAs, are maintained with a color palette that minimizes visual contrasts to the greatest extent practicable.

KOP 2 – View from Harper Lake Road South of Roy Road

KOP 2 **(Visual Resources Figure 4a)** (AFC Figure 5.15-4(a)) is located on Harper Lake Road just south of Roy Road and near two private residences west of Harper Lake Road (AS 2009a). KOP 2 is from 0.75 to 1.0 mile south of the nearest project site boundaries. The view looking toward the project from KOP 2 is to the north.

Visual Sensitivity

The overall visual sensitivity of KOP 2 is rated as *Moderate.* Visual sensitivity is the composite evaluation of existing visual quality, anticipated viewer concern for visual resources, and viewer exposure, each of which is discussed below.

Visual Quality

The existing visual quality of the view from KOP 2 is *Moderate*. Views toward the project site from KOP 2 include a variety of features. Foreground and middle ground views are of native desert vegetation and rural residential development along the west (left) side of Harper Lake Road. Utility poles and overhead lines paralleling Harper Lake Road are prominent. Background views are of distant mountains.

The view is not highly vivid, and the landscape is not intact. Unity is somewhat impaired by the presence of foreground development. The view from KOP 2 exhibits a general open space character, but has a limited diversity of landforms, and contains discordant development.

Viewer Concern

Viewer concern from KOP 2 is considered to be *Moderate.* Motorists are considered to have moderate visual sensitivity while residents are generally considered to have high visual sensitivity.

Viewer Exposure

Viewer exposure from KOP 2 is *Moderately Low.* The number of viewers at KOP 2 is very low. Visibility of the project site is moderate at this distance. The project site is seen in the context of an open, expansive view and other existing development.

Visual Change

Visual Resources Figure 4b (AFC Figure 5.15-4(b)) shows a photo simulation of the proposed project as it would appear from KOP 2 (AS 2009a). Most project features would be seen from KOP 2. They would be at distances of from 0.75 to 2 miles. The SCA fields would be at least partially within view and would extend over a wide area. Project features would begin to appear distinct and some details would be evident. The power block seen off the east side of Harper Lake Road would appear as a concentration of blocky vertical, geometric forms of varying heights and widths. The project transmission line would be apparent in this view.

As seen from KOP 2, the overall visual change to the scene as a result of the project is *Moderate*. Visual change is a composite evaluation of visual contrast, project dominance, and view disruption, each of which is discussed below.

Visual Contrast

The visual contrast introduced by the project features overall would be *Moderate.* Contrasts associated with the power block facilities would be moderate due to their vertical, geometric line and form and the contrasting, relatively light shade of colors as shown in the photo simulation. The facilities would be seen in the near middle ground distance against a backdrop of darker-colored desert and distant hills. The SCA fields would be readily apparent. Their contrast is anticipated to be amplified by bright glare under many typical conditions.

Project Dominance

Project dominance as seen from KOP 2 would be *Moderate*. As seen from KOP 2, project features would attract about the same amount of attention as other man-made elements within view. Project features would not protrude into the skyline or mountain ridge in the background distance zone. The project covers a large area. However, even at this relatively close distance, it occupies a small, very narrow portion of the overall field of view due to the level terrain relationship to the viewer and the relatively low height of the mirror rows. In the context of a very open and expansive scene, the project remains very subordinate to the dominant foreground landscape and background ridges.

View Disruption

View disruption would be *Low.* The project would not disrupt any scenic views or vistas from KOP 2. Although the project would cover a large area of land, the apparent height of the SCA fields would be low. Power block facilities would appear tall but do not substantially interfere with views of the mountains in the distance.

Impact Significance

Staff concludes that in the context of moderate overall visual sensitivity of the scene, the moderate overall visual change of the project would result in a less-than-significant visual impact.

KOP 3 – View from Roy Road East of Edie Road

KOP 3 **(Visual Resources Figure 5a)** (AFC Figure 5.15-5(a)) represents the most un-obscured view of the project site as seen by residents of the area (AS 2009a). Roy Road is an unpaved road that provides access to a few private residences. KOP 3 is located on Roy Road near the west boundary of the Beta solar field. The closest project boundary would be about 500 feet away. The Beta field power block and project transmission line would be about 0.8 mile away.

Visual Sensitivity

The overall visual sensitivity of KOP 3 is *Moderate.* Visual sensitivity is the composite evaluation of the existing visual quality, viewer concern and viewer exposure. Each factor is discussed below.

Visual Quality

The existing visual quality is *Low* to *Moderate*. The landscape seen from KOP 3 is largely disturbed agricultural land, some currently in production and some that has been abandoned. A swath of desert vegetation exists in the near foreground, beyond which the flat, non-descript agricultural fields extend from the foreground distance zone through the middle ground up to about two miles. Distant hills form the backdrop to the east but are not highly vivid or dominant due to distance. Existing transmission lines can be seen near the right edge of the view.

Viewer Concern

Viewer concern from KOP 3 is considered to be *Moderate* to *High* since the view is from a public access road but primarily represents local residents*.* Roy Road joins Edie Road but is not a through street.

Viewer Exposure

Viewer exposure at KOP 3 is *Low to Moderate* due to very low viewer numbers. Visibility to the project is unrestricted, and the leading edge of the project is in the foreground zone. The duration of views from residential properties would be long. However, the number of viewers at KOP 3 is very low (under 12).

Visual Change

Visual Resources Figure 5b (AFC Figure 5.15-5(b)) is a photo simulation of the project site from KOP 3 (AS 2009a). It shows how the character of the view would change and how the project would affect views of the distant hills and mountains. The SCA mirrors would be highly reflective which, under certain conditions, would cause a high level of contrast. The project would extend across the entire scene.

As seen from KOP 3, the overall visual change is *High*. Visual change is a composite rating of visual contrast, project dominance, and view disruption as discussed below.

Visual Contrast

The visual contrast introduced by the project as seen from KOP 3 would be *High* since there would be open views to the site. The highly industrial character of the SCAs, power block, and transmission line would cause obvious visual contrasts in form, line, colors and textures with the open surrounding desert. The extent and continuity of the SCA field would somewhat mimic the horizontal, planer quality of the agricultural land it would replace at a distance, but in the foreground the incongruous, contrasting character would be highly evident.

Project Dominance

Project dominance from KOP 3 would be *High*. The project would occupy an extensive area of land and would alter the character from agricultural open space to a developed site of mirrored structures, some of which would be seen in the foreground from KOP 3.

View Disruption

View disruption would be *Moderate*. The project would disrupt or block views of the lower portions of the distant hills and mountains that can be seen to the east in the background distance zone from KOP 3.

Impact Significance

Staff concludes that in the context of relatively moderately existing visual quality, and moderately low viewer exposure due to very low viewer numbers, the high visual change of the project would nevertheless represent a less-than-significant adverse visual impact. However, staff recognizes that the few residents experiencing this view would be strongly affected. In an effort to provide relief from permanent views of the project from the few residences located within 0.5 mile of the project, staff recommends Condition of Certification **VIS-2** (Offsite Landscape Screening). This measure would also help substantially reduce potential glare impacts as discussed further, below.

KOP 4 – View from Edie Road South of Lockhart Ranch Road

KOP 4 **(Visual Resources Figure 6a)** (AFC Figure 5.15-6(a)) has un-obscured views of the project site that would be seen by residents of the area (AS 2009a). Edie Road is an unpaved road that connects Lockhart Ranch Road with Roy Road. It provides access to a few private residences. KOP 4 is located approximately 500 feet south of Lockhart Ranch Road. SCAs would be located on both sides of Lockhart Ranch Road. The SCAs south of Lockhart Ranch Road would be about 1,200 feet away from KOP 4 to the east.

Visual Sensitivity

The overall visual sensitivity of KOP 4 is *Moderate.* Visual sensitivity is the composite evaluation of the existing visual quality, viewer concern and viewer exposure. Each factor is discussed below.

Visual Quality

The existing visual quality is *Low* to *Moderate*. Similar to KOP 3, the landscape seen from KOP 4 is a mixture of disturbed agricultural land and desert scrub vegetation in the near foreground. Hills form the backdrop but are not prominent due to their great distance. Overhead utilities are seen in the immediate area.

Viewer Concern

Viewer concern from KOP 4 is considered to be *Moderate* to *High*. The view is from a public access road but primarily represents local residents.

Viewer Exposure

Viewer exposure at KOP 4 is *Low to Moderate.* Visibility to the project is mostly unrestricted, and parts of the project would be seen in the foreground zone. The duration of views from residential properties would be long. However, the number of viewers at KOP 4 is very low.

Visual Change

Visual Resources Figure 6b (AFC Figure 5.15-6(b)) is a photo simulation of the project site from KOP 4 showing how the character of the view would change and how project would affect views of the distant hills and mountains (AS 2009a). The SCA mirrors would be highly reflective creating a high level of contrast. The project would extend past the left edge of the photo image and beyond since it would also occupy the north side Lockhart Ranch Road.

As seen from KOP 4, the overall visual change is *High*. Visual change is a composite rating of visual contrast, project dominance, and view disruption as discussed below.

Visual Contrast

The visual contrast introduced by the project as seen from KOP 4 would be *High* since there would be open views to the site. The industrial character of the SCAs would cause obvious visual contrasts in form, line, colors and textures with the surrounding desert landscape. The power block of the Beta field is not in view from KOP 4 but the Alpha field power block likely would be. The extent of the SCA fields and continuity of their form would somewhat mimic the horizontal, planer quality of the agricultural lands they would replace, but at foreground distance would present strong overall contrast. As depicted in the simulation, the light-colored project features contrast with the darker foreground and background, amplifying the level of contrast.

Project Dominance

Project dominance from KOP 4 would be *High*. The project would occupy an extensive area of land and would alter the character from agricultural open space to a developed site of mirrored structures, some of which would be seen in the foreground from KOP 4.

View Disruption

View disruption would be *High*. The project would disrupt or block views of the mountains seen to the east in the background distance zone.

Impact Significance

As at KOP 3, staff concludes that the introduction of the project in the view from KOP 4 would result in an adverse visual impact, but that the impact would be less than significant since the existing visual quality of the project site is low and there are very few viewers at this location. However, staff recognizes that the few residents experiencing this view would be strongly affected. In an effort to provide relief from permanent views of the project from the few residences located within 0.5 mile of the project, staff recommends Condition of Certification **VIS-2** (Offsite Landscape Screening). This measure would also substantially reduce potential glare impacts as discussed further, below.

KOP 5 – View Lockhart Ranch Road East of Edie Road

KOP 5 **(Visual Resources Figure 7a)** (AFC Figure 5.15-7(a)) is on Lockhart Ranch Road east of Edie Road (AS 2009a). KOP 5 is along the south edge of the Alpha solar field and about 400 feet west of the Beta solar field. The view is looking east.

Visual Sensitivity

Again, viewing conditions from KOP 5 are essentially similar to those of KOPs 3 and 4. The overall visual sensitivity of KOP 5 is rated as *Moderate.* Visual sensitivity is the composite evaluation of existing visual quality, anticipated viewer concern for visual resources, and viewer exposure, each of which is discussed below.

Visual Quality

The existing visual quality of the view from KOP 5 is *Low to Moderate*. Although the foreground of the photograph depicts native desert scrub, views toward the project site in the vicinity are predominantly of active and abandoned agricultural fields. Foreground views also include rural residential and farm development along the north side of Lockhart Ranch Road, some of which appears abandoned. Utility poles and overhead lines run along the south side of Lockhart Ranch Road. Background views of distant mountains to the east lack vividness and prominence due to distance. . Some of the ornamental landscape trees in the vicinity appear dead or in poor condition, detracting from visual intactness.

Viewer Concern

Viewer concern from KOP 5 is considered to be *Moderate.* Persons using this part of Lockhart Ranch Road would primarily be traveling to and from the Harper Dry Lake Watchable Wildlife Area. Motorists are considered to have moderate visual sensitivity. One residence was identified in the vicinity of the KOP, although it appeared to be abandoned.

Viewer Exposure

Viewer exposure to the project from KOP 5 is *Low.* Factors that determine viewer exposure are number of viewers, duration of view, and visibility of the project. Visibility of the project site is very high since viewers are in the midst of the SCA fields. However, as at the other KOPs in this area, the number of viewers at KOP 5 is very low. The home in the view appeared to be abandoned.

Visual Change

Visual Resources Figure 7b (AFC Figure 5.15-7(b)) shows a photo simulation of the proposed project as it would appear from KOP 5 (AS 2009a). The primary project features seen from KOP 5 would be the SCA fields which would occupy both sides of Lockhart Road although the Alpha field on the north side would be set back at least 300 feet behind a proposed drainage channel that would run parallel and adjacent to the road. Project features would be in the foreground. The project transmission line would be apparent in this view. The power blocks would be visible from Lockhart Ranch Road although they are not within the view depicted from KOP 5.

The overall visual change from KOP 5 is *High*. Visual change is a composite rating of visual contrast, project dominance, and view disruption as discussed below.

Visual Contrast

The visual contrast introduced by the project as seen from KOP 5 would be *High.* There would be open views of the project at foreground distance. The SCAs, power blocks, and transmission line would create obvious visual contrasts, especially in form and textures with the existing setting. The perimeter fencing would become a prominent feature at this close distance.

Project Dominance

Project dominance from KOP 5 would be *High*. The project would occupy an extensive area of land and would be seen in the foreground from KOP 5, strongly dominating the entire field of view.

View Disruption

View disruption would be *Moderate to High*. The project would disrupt or block views of the lower portions of distant hills and mountains seen to the east and southeast in the background distance zone, and mountains to the northwest in their entirety, due to the proximity of the perimeter fencing to the roadway as depicted

Impact Significance

Staff concludes that the introduction of the project in the view from the KOP 5 would result in an adverse but less-than-significant impact to visual resources. Although the overall level of visual change would be *High*, it would result in a less than significant visual impact because the Visual Sensitivity of this KOP is *Low.* Sensitivity is low because existing visual quality is moderately low and there are very few viewers that would see the project from KOP 5.

KOP 6 and KOP 7 – Views from Harper Lake Watchable Wildlife Area

KOP 6 **(Visual Resources Figure 8a)** (AFC Figure 5.15-8(a)) depicts the view from the Harper Dry Lake Watchable Wildlife Area looking south, while KOP 7 **(Visual Resources Figure 9a)** (AFC Figure 5.15-9(a)) depicts the view from the same location looking west (AS 2009a). The Watchable Wildlife Area consists of a gravel access road and parking area with gravel footpaths leading to observation decks near the edge of the dry lake and the marsh. These public facilities are on the west side of the dry lake. Views from the observation decks are oriented to the east and north. As visitors observe wildlife they look to the east and north, in the opposite direction from the project site. Visitors would not see the project when engaged in wildlife viewing since the project would be behind them. They would see the project when returning to the parking area. In the view to the south from KOP 6 the SCAs of the Beta field would be about 650 feet away. The power block facilities would be about 0.6 mile away. In the view to the west from KOP 7 the Alpha field SCAs would be about 2000 feet away and the power block would be about 1.6 miles away.

Visual Sensitivity

The overall visual sensitivity of KOP 6 and 7 is *Moderate to Low.* Visual sensitivity is the composite evaluation of the existing visual quality, viewer concern and viewer exposure. Each factor is discussed below.

Visual Quality

The existing visual quality is *Low* in the southward view from KOP 6 and *Moderate* from KOP 7. The view from KOP 6 is nondescript. It is comprised of some abandoned agricultural land with desert vegetation disturbed by the parking area in the foreground. Utility lines and poles along Lockhart Ranch Road are in view. Large transmission lines are seen on the horizon and against the sky at a distance of just over one mile. Due to topography, the view does not extend beyond these transmission lines and there is no distant backdrop of mountains. The view to the west from KOP 7 extends for many miles to some far distant hills. Desert is seen in the foreground backed by some trees.

Viewer Concern

Viewer concern from KOP 6 and KOP 7 is considered to be *Moderate.* The views of interest to persons visiting this area are in the opposite direction from the project site. The number of viewers at this site is very low, and the focus of viewers is on observation of wildlife in the wetlands to the east of the site. The focus of concern of these viewers is not primarily scenery, but wildlife, and these are observed in views away from the project site.

Viewer Exposure

Viewer exposure at KOP 6 and KOP 7 is *Low.* Although visibility to the project is unrestricted, the duration of views of the project would be short since they would occur primarily as visitors are returning to the parking lot from the observation decks. Further, the number of viewers at KOP 6 and KOP 7 is assumed by the BLM to be very low although no official counts or formal estimates of visitors to the area have been made.

Visual Change

Visual Resources Figures 8b and 9b (AFC Figure 5.15-8(b)) (AFC Figure 5.15-9(b)) present photo simulations of the project site from KOP 6 and KOP 7 (AS 2009a). They show how the character of the view would change. The SCA mirrors would be highly reflective which, under certain conditions, would cause a high level of contrast. The project would extend across the entire scene in both views.

As seen from KOP 6, the overall visual change is *High*. From KOP 7 the change is *Moderate*. Visual change is a composite rating of visual contrast, project dominance, and view disruption as discussed below.

Visual Contrast

The visual contrast introduced by the project as seen from KOP 6 and KOP 7 would be *High.* The SCAs, power block facilities, and transmission line would cause obvious visual contrasts in form, line, colors and textures with the surrounding landscape. The extent and continuity of the SCA fields would somewhat mimic the horizontal, planer quality of the landscape they would replace from KOP 7. As depicted in the simulation, the light, greenish-colored SCAs contrast with the darker colored background mountain ridges, and the yellow-tan color of dry grasses, and the darker color of scrub vegetation.

Project Dominance

Project dominance from KOP 6 would be *High* while in KOP 7 it would be *Moderate*. The project would occupy a vast area and would have a distinctly different character than the agricultural open space and surrounding desert. It would become an industrial site made up of rows of mirrored structures, some of which would be seen in the near middle ground from KOP 6. Spatial dominance of both views is considered *moderately low* due to the orientation of visitors at this destination in the opposite direction, westward and northward toward Harper Dry Lake.

View Disruption

View disruption from KOP 6 would be *Low* since views do not extend beyond the project site*.* From KOP 7 it would be *Moderate*. The project would replace or block views of some existing trees and would block the portions of the distant hills and mountains that can now be seen to the west in the background distance zone from KOP 7. However, overall view orientation of visitors at this destination is generally toward Harper Dry Lake.

Impact Significance

Due to the Moderate to Low viewer sensitivity of these KOPs, the project visual changes would result in an adverse visual impact, but these would remain less-than-significant. Existing visual quality in this location is already compromised by the existing SEGS VIII and IX facilities and lacking in vivid, scenic features. Observation of wildlife in the wetlands to the east of the site is the principal reason for visitors to come to this location and not its scenic quality. In addition, the number of viewers at this location is extremely low, and the focus of their concern is not the previously disturbed areas to the west and south. For these reasons, viewer concern with scenic quality is not considered to be primary, and the change in visual character due to the project, though adverse, would not substantially affect the activity, wildlife observation, of viewers. For these reasons, project impacts to views are considered less-than-significant at KOPs 6 and 7.

KOP 8 – View from Fossil Bed Road near Black Canyon Road

KOP 8 **(Visual Resources Figure 10a)** (AFC Figure 5.15-10(a)) is located at the intersection of Fossil Bed Road and Black Canyon Road. Black Canyon Road provides access to recreation areas on land managed by the BLM including the Black Mountain Wilderness (AS 2009a). It provides very long distance, un-obstructed views in the direction of the project site. The view is characterized by the flat plain of the Mojave Desert. The project would be at least 5.7 miles away. Viewers at this location include persons seeking recreation. The Black Mountain Wilderness Area is northeast of this location.

Visual Sensitivity

The overall visual sensitivity of KOP 8 is *Moderate.* Visual sensitivity is the composite evaluation of the existing visual quality, viewer concern and viewer exposure. Each factor is discussed below.

Visual Quality

The existing visual quality is *Moderate to High*. The landscape seen from KOP 8 appears as intact, undisturbed desert. Harper Dry Lake is vaguely recognizable as a thin, light-colored line at a distance of about three miles beyond the desert scrub that extends from the foreground. Very distant hills form the backdrop. Vividness of the scene is low to moderate while intactness and unity of the landscape are both high.

Viewer Concern

Viewer concern from KOP 8 is considered *High* since most viewers are people engaged in recreation.

Viewer Exposure

Viewer exposure at KOP 8 is *Low.* Although visibility toward the project is unrestricted, the project is at least 5.7 miles away, well into the background distance zone. The duration of views from KOP 8 would be fairly short since viewers would pass this location on their way to some destination. The number of viewers at KOP 8 is very low.

Visual Change

Visual Resources Figure 10b (AFC Figure 5.15-10(b)) is a photo simulation of the project site from KOP 8 (AS 2009a). While the project is within view, it is seen at such a distance that it appears indistinct. The photo simulation shows how little change there would be and how little the project would affect the desert scene and views of the very distant hills. Under certain conditions the mirrors could be highly reflective. This might make the project more conspicuous than shown in the simulated image.

As seen from KOP 8, the overall visual change is *Low*. Visual change is a composite rating of visual contrast, project dominance, and view disruption as discussed below.

Visual Contrast

The visual contrast introduced by the project as seen from KOP 8 would be *Low* due to the great distance at which it would be seen. The facilities at the power blocks would cause subtle and visual contrasts in form with the surrounding desert. The extent and continuity of the SCA field would somewhat mimic the horizontal, planer quality of Harper Dry Lake and the flat desert.

Project Dominance

Project dominance from KOP 8 would be *Low*. Although the project would occupy an extensive area of land, most of which would be covered by structures with a mirrored surface, it would be seen in the background from KOP 8.

View Disruption

View disruption would be *Low*. The project would not disrupt or block views due to the flat topography and the distance of the project from KOP 8.

Impact Significance

Staff concludes that the introduction of the project into the viewshed of KOP 8 would result in a less-than-significant visual impact. The visual sensitivity of KOP 8 is moderate while the visual change brought about by the project would be low. The impact is therefore considered less-than-significant.

Publicly Visible Water Vapor Plumes

Staff conducted an assessment of the Abengoa Mojave Solar Project's (Mojave) cooling tower exhaust stack visible plumes. Staff completed a modeling analysis for the applicant's proposed unabated cooling tower design.

The proposed project is a thermal solar design that requires cooling to condense the steam that is recycled. The applicant has proposed two six-cell mechanical-draft cooling towers for project cooling. The applicant has not proposed to use any methods to abate visible plumes from the cooling towers.

The applicant has also proposed two small (21.5 MMBtu/hr) boilers that would be used for daily start-up and for freeze protection. During cold weather periods, these boilers are likely to have visible plumes. However, due to their very small size the boiler plumes are not believed to create a potentially significant visual impact and are not assessed further in this analysis.

Visible water vapor plumes from the Abengoa Mojave Solar cooling tower exhaust stacks would occur 21.32% of seasonal daylight clear hours during the seasonal period (November through April) based on design data and operating parameters provided by the applicant.

Because the predicted water vapor plume frequency would exceed staff's 20% impact criteria threshold, plume dimensions were calculated (**APPENDIX VR-3**). The visual impact of the expected plume is assessed in terms of contrast, scale, and view disruption from each of the KOPs.

Staff considers the 20^{th} percentile plume to be the reasonable worst-case plume dimensions on which to base its visual impact analysis. The 20^{th} percentile plume is the smallest of the plumes that are predicted to occur zero to 20% of the time. Eighty (80) percent of the time the dimensions of the clear hour plumes would be smaller than the 20^{th} percentile plume dimensions. A one percentile clear hour plume would be extremely large (physical size) and very noticeable to a wide area but would occur very infrequently.

The 20^{th} percentile plume dimensions from the proposed Mojave Solar Project's (Mojave) cooling tower exhaust stacks are approximately 56 feet high, 70 feet wide, and 27 feet long. Since the proposed exhaust stacks are 44 feet tall (**Visual Resources Table 2**), the effective plume height above the ground would be 100 feet.

The severity of the impacts created by the project's visible water vapor plumes depends on several factors, including the duration, and physical size of the plumes, the sensitivity of the viewers who will see the plumes, the distance between the plumes and the viewers, the visual quality of the existing viewshed, and whether any scenic landscape features would be blocked by the plumes. Potential impacts from visible plumes are discussed below for each KOP.

Visibility of Water Vapor Plumes from KOP 1 through 8

KOP 1 and 2 are located on Harper Lake Road south of the project. They represent views of motorists as they approach the project from SR-58. Viewing distances to the project are about one to two miles (middle ground distance). KOP 3, 4, and 5 represent close range views of the project that residents living within a half-mile of the project or travelers on Lockhart Road would experience (foreground distance). KOP 6 and 7 are located at the Harper Dry Lake Watchable Wildlife Area at distances of about 0.75 and 1.75 miles from the two power blocks (middle ground distance). KOP 8 is northeast of Harper Dry Lake at the intersection of Fossil Bed Road and Black Canyon Road. It is roughly 6.5 miles from either of the two power blocks (background distance).

Based on the height of the cooling tower exhaust stacks (44 feet), the predicted plume (56 feet in height) would appear roughly twice the height of the stacks. The effective plume height above the ground would be 100 feet which would be about 27 feet higher than the tallest building in the power block complex (73 feet). As seen from KOP 1 and 2, the plumes would extend into the area of the distant backdrop of desert or mountains. The plumes would be concentrated in the immediate area of the respective source.

Given the open nature of the view from any of the KOPs, the plumes would encompass a narrow portion of the view. The whitish color of the plume and its cloud-like appearance rising into the air would have a moderate to high level of contrast against the predominantly beige and brown backdrop of land, and against the blue sky. The plumes may be seen as contributing to the industrial character of the project. During nighttime hours the plumes would be noticeable but less visually evident than during daylight hours. While there would be ambient light in the power block area, the plumes would be emitted into the sky above the height of the light fixtures. Although plumes could be seen during nighttime hours they would not result in strong visual contrasts at night.

Impact Significance

The predicted 20th percentile plumes would contribute to the contrast of the facility as a whole, adding a contrasting vertical element of light color, but would not strongly or qualitatively increase the overall level of visual change. By comparison to the vast scale of the mirror fields themselves, the 96-foot plumes would not dominate the view but would be visually subordinate to the rest of the facility. At middle ground distances, the contrast of a plume of this size would remain moderate. At foreground distances, it would contribute further to the already high levels of visual change. The 20th percentile plume would thus not qualitatively change the anticipated levels of impact from various KOPs as described in the impact discussions above.

D. LIGHT AND GLARE

This section responds to CEQA checklist question: “Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?”

Light

Existing sources of night lighting near the project come from the nearby SEGS VIII and IX facilities and local rural residences and farm operations. Minor sources come from local traffic on Harper Lake Road and Lockhart Road. The remainder of the area is primarily dark since it is mostly undeveloped desert.

According to the AFC, the Project's lighting system would provide operations and maintenance personnel with illumination in both normal and emergency conditions. The system will consist primarily of AC lighting, but will include DC lighting for activities or emergency egress required during an outage of the plant's AC electrical system. The lighting system will also provide AC convenience outlets for portable lamps and tools. Lighting will be designed to provide the minimum illumination needed to achieve safety and security objectives and will be shielded and oriented to focus illumination on the desired areas and minimize additional nighttime illumination in the site vicinity.

Based on this information, the project would likely add a noticeable amount of night lighting, but would not result in a significant effect due to the remote location of the project and very low number of sensitive receptors.

Although the AFC states that night lighting for the power block would be designed to be consistent with San Bernardino County Building Code 83.07.040 Glare and Outdoor Lighting -Mountain and Desert Regions as well as San Bernardino County Ordinance 3900 which addresses light pollution and night sky issues, staff recommends Condition of Certification **VIS-3 (**Temporary and Permanent Exterior Lighting Measures) to ensure shielding of all project lighting, including construction lighting, and to prevent upward-directed illumination and compliance with San Bernardino County Ordinance 3900.

Glare

Glare from mirror reflection is an issue of concern with the project due to its proximity to Harper Lake Road, Lockhart Road, 12 or fewer private residences, all located within 0.5 mile, and the Harper Dry Lake Watchable Wildlife Area. Potentially affected receptors would include motorists, residents, and persons visiting the Watchable Wildlife Area.

The visual resources section of the AFC concluded that impacts from glare are not expected to become a factor with the proposed project. Below is a brief discussion of the issues and potential mitigations.

The primary source of potential glare from the project is the mirrored surfaces of the SCAs. The bright mirrors and bright spots reflecting off the mirrors are intrusive nuisances and may be a distraction, but generally do not pose a visual hazard except for persons within 60 feet of the plant perimeter fence. However, staff finds that the level of beam intensity at 60 feet (20 meters) from the east or west plant boundaries may be 4 kW/m^2 during the transition between stow and tracking position of the mirror units (SJS 2009). Pedestrians within that zone may be exposed to beam intensity levels in excess of 4.5 kW/m$^{2.}$ This level of exposure may cause epithelial or retinal damage.

In addition, reflective mirror glare at lower, non-hazardous intensity levels has the potential to be an intrusive nuisance or source of discomfort to viewers. **Visual Resources Figure 11a** depicts a typical project reflection as seen by the author of this Staff Assessment at the nearby Kramer Junction SEGS in mid-morning**. Visual Resources Figure 11b** depicts a view of a trough project in Nevada at middle ground distance. When looking toward the mirrors, the bright spots that typically appear are images of the sun. They would be seen by nearby observers on the ground. The bright spots move as one's relationship to the sun changes, following the viewer, in effect. Direct observations by staff of reflected glare from SCAs at the Kramer Junction solar facilities along US-395 support this. Staff observations confirm that during certain times of day the SCAs can produce substantial glare and that such glare can be experienced by the public from locations in the vicinity of the SCAs, in this case from US-395. At a minimum, the glare observed by staff was considered a nuisance, and felt to be a discomfort if directly observed for more than a few moments.

Harper Lake Road and Lockhart Road

Staff is concerned that there is a potential for motorists on Harper Lake Road and Lockhart Road to be exposed to and be affected by glare or brightness from the SCA mirrors. This would be most likely to occur when the SCA mirrors are rotated beyond horizontal and especially when rotated to catch morning and afternoon sun. There is the potential for a general bright appearance of the SCAs. Motorists passing by the solar fields will see a succession of mirrors. Persons on Harper Lake Road would be traveling parallel to the mirrors. Those on Lockhart Road would be perpendicular to the mirrors.

Residences Located West of the Project Site

Staff is also concerned about the potential for glare affecting persons who reside in homes west of the project site. Persons looking out east-facing windows or who are outdoors would have views of the SCAs. They may be subject to the very bright nuisance glare effects observed by staff at the Kramer Junction facilities.

Harper Dry Lake Watchable Wildlife Area

There may be a potential for glare to affect visitors to the Watchable Wildlife Area when they are facing the project. The SCAs would be farther away from the Watchable Wildlife Area than from some of the private residences and local roads. The effects in this area are expected to be no more than a nuisance or distraction.

Impact Significance

The applicant proposes a six to eight-foot high perimeter fence consisting of chain-link material. Under these conditions visibility of the SCAs would be essentially unobstructed and the potential for glare would exist. In the case of nearby residents who could be exposed to high levels of nuisance glare for extended periods in and around their homes, this could represent a potentially significant impact.

In addition, based on available information staff finds that the potential level of beam intensity at 60 feet (20 meters) from the east or west plant boundaries may be as high as 4 kW/m^2. Pedestrians within that zone may be exposed to beam intensity levels in excess of 4.5 kW/m^2, representing a potential hazard (SJS 2009). Staff therefore recommends Condition of Certification **VIS-4** (Perimeter Screening) which calls for the applicant to install 10-foot high slatted fencing in certain areas. The height requirement is based on an assumed mirror pedestal height of up to 12 feet, and is intended in part to prevent potential hazardous glare within 60 feet of the plant boundaries during periods of transition between stow and tracking position of the mirror units. The slatted fencing would serve as a reasonable grating to break up direct views of the potentially bright mirrors and thus reduce the effects of glare, including potentially hazardous glare. Condition of Certification **VIS-2** (Offsite Landscape Screening) would complement the effectiveness of the fencing, reducing or eliminating exposure to bright glare within and around residents' homes. The staff recommendation for 10-foot-tall screening under Condition of Certification **VIS-4** would be inconsistent with maximum fence height requirements for renewable projects under County of San Bernardino Development Code Section 84.29.50. However, the County has stated that it would grant a Major Variance for this and similar instances of non-conformance with existing development standards if the project were under County jurisdiction. In addition, Section 83.06.020 states that provisions for fences, hedges and walls do not apply to fences or walls required by a State or Federal agency, or by the County for safety reasons.

CUMULATIVE IMPACT ANALYSIS

Section 15355 of the CEQA Guidelines (California Code of Regulations, Title 14) defines a cumulative impact as the result of a combination of projects under consideration together with other existing or reasonably foreseeable projects causing related impacts. Cumulative impacts can result from individually minor but collectively significant impacts taking place over a period or time. The significance of a cumulative visual impact would depend on the degree to which the geographic area that includes the project is visually exposed and (1) the viewshed is altered; (2) views of a scenic resource are impaired; or (3) visual quality is diminished.

GEOGRAPHIC EXTENT

The geographic extent for cumulative impacts to visual resources is represented by the viewshed of the proposed Abengoa Mojave Solar Project. The proposed project would be located in the Harper Lake region, a visually remote area of San Bernardino County, near two existing solar electric generating facilities (SEGS VIII and IX). These projects occupy a total of just under 1,000 acres. Topography and distance are prime factors that determine the project's viewshed. While the topography of the valley is mostly flat, the surface of the land is undulating and drops slowly in elevation from south to north. Over a distance of several miles these conditions cause the project area to be unseen from SR-58 which is about five miles to the south of the project site, except for a very short segment east of Harper Lake Road, and for a similarly short distance on U.S. 395 south of Kramer Junction, both at background distances. SR-58 and U.S. 395 are the only places in the general vicinity where there are large numbers of potential viewers. At these distances the project would be little noticed or inevident to the typical observer.

EXISTING CUMULATIVE CONDITIONS

The project viewshed is comprised mostly of undeveloped western Mojave Desert with a few dispersed dwellings, Harper Dry Lake, some abandoned agricultural fields, and the existing SEGS VIII and IX plant facilities. Several electric power transmission lines traverse the area. The Abengoa Mojave Solar would convert 1,765 acres of former agricultural fields to solar collection fields and industrial structures. There are no identified scenic resources in the viewsheds of any of the KOPs that provide visibility of the project site. The project would contribute to the presence of solar electric generating facilities in the area but with little visual effect since the area is out of view to most people. The solar collection fields of the existing SEGS facilities and the proposed Abengoa Mojave Solar would cover more that 2,500 total acres. Even so, the SCAs form a flat, almost continuous surface that can be visually subordinate from ground level at middle ground distances, and are virtually unseen from the two nearest highways. As a result, the true extent of the solar fields is difficult to perceive, except by moving through the area and traveling along or around the facilities.

FUTURE FORESEEABLE PROJECTS

There is a potential future solar electric generating project in the Harper Lake region. The BLM received an application for this solar photovoltaic project in 2007, which would occupy 5,033 acres of federal land adjacent to the Harper Lake ACEC. The Abengoa Mojave Solar combined with this future foreseeable photovoltaic project would clearly contribute to the presence of solar electric generating facilities in the area and conversion of the desert landscape to an industrial setting.

CUMULATIVE IMPACT SIGNIFICANCE

In the Harper Lake region, existing solar electric generating projects in combination with the proposed Abengoa Mojave Solar and a potential future photovoltaic project would create approximately 7,700 acres (about 12 square miles) of industrial land use on land that was formerly desert or agricultural fields. The cumulative visual impacts associated with such a change would be less-than-significant however because the area is visually remote and the industrial character of the combined projects would be seen by a very small number of people.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Visual Resources Table 4 provides an analysis of the applicable LORS pertaining to the aesthetics or preservation and protection of sensitive visual resources relevant to the proposed project.

Visual Resources Table 4
Proposed Project Consistency with Local LORS Applicable to Visual Resources

LORS Source	LORS Policy and Strategy Descriptions	Consistency Determination	Basis of Consistency
Local			
San Bernardino County			
San Bernardino County General Plan, Conservation Element, Countywide Policy CO 1.2	The preservation of some natural resources requires the establishment of a buffer area between the resource and developed areas. The County will continue the review of the Land Use Designations for unincorporated areas within one mile of any state or federally designated scenic area, national forest, national monument, or similar area, to ensure that sufficiently low development densities and building controls are applied to protect the visual and natural qualities of these areas.	YES	There is no state or federally designated scenic area, national forest, national monument, or similar area within one mile of the project site.
San Bernardino County General Plan, Conservation Element, Desert Region Policy D/CO 1.2	Require future land development practices to be compatible with the existing topography and scenic vistas, and protect the natural vegetation.	YES	The project site is flat. It is mostly fallow farmland and does not have native desert vegetation.
San Bernardino County General Plan, Conservation Element, Desert Region Policy D/CO 1.3	Require retention of existing native vegetation for new development Projects, particularly Joshua trees, Mojave yuccas and creosote rings, and other species protected by the Development Code and other regulations.	YES	The project site has no Joshua trees, Mojave yuccas and creosote rings, and other species protected by the Development Code and other regulations.
San Bernardino County General Plan, Conservation Element, Desert Region Policy D/CO 3.1	Protect the Night Sky by providing information about and enforcing existing ordinances: b. Review exterior lighting as part of the design review process.	YES	Plans for exterior lighting will be provided to San Bernardino County for design review.
San Bernardino County General Plan, Conservation Element, Desert Region Policy D/CO 3.2	All outdoor lighting, including street lighting, shall be provided in accordance with the Night Sky Protection Ordinance and shall only be provided as necessary to meet safety standards.	YES	All project-related outdoor lighting will be designed in accordance with the Night Sky Protection Ordinance and will be provided only as necessary to meet the needs for safe operation of the project.
San Bernardino County General Plan, Open Space Element, Countywide Policy OS 5.3	The County desires to retain the scenic character of visually important roadways throughout the County. A “scenic route” is a roadway that has scenic vistas and other scenic and aesthetic qualities that over time have been found to add beauty to the County.	YES	The project would not be visible from any routes designated by the County as a scenic highway.

LORS Source	LORS Policy and Strategy Descriptions	Consistency Determination	Basis of Consistency
San Bernardino County Development Code	The San Bernardino Development Code implements the San Bernardino General Plan. Section 83.02 of the Code, Development and Use Standards, and Section 84.29.50, contain standards for screening and buffering while Section 83.10 contains Landscaping Standards. Section 83.02.060 requires screening between industrial and residential land uses. Screening walls are required to be architecturally treated or landscaped to avoid the appearance of precision block. Section 84.29.50 specifies fencing standards for renewable projects, including a maximum 8-foot height for perimeter fencing.	YES	Per Section 83.02.060, Condition of Certification VIS-2 requires off-site landscape screening to reduce visibility and glare of the project on residents. Condition of Certification VIS-4 recommends slatted (opaque) perimeter chain-link fencing to screen the project and, particularly, to minimize glare. The project would not utilize concrete block walls. Fencing would be required to blend in color with the visual background to minimize visual contrast and conspicuousness. Landscaping standards of Section 83.10 appear to apply primarily to urban settings and not rural ones like the project site. Similarly, Section 83.10.080 (c) 2, Desert Region, appears primarily focused on intact desert landscapes. The project site however is a disturbed former agricultural area. Staff's Condition of Certification VIS-4 recommends perimeter fencing of 10-foot height in certain areas for safety reasons, exceeding the maximum height specified in Section 84.29.50. However, as discussed in greater detail in the Land Use section of this Staff Assessment, the County has stated that it would grant a Major Variance for this and similar instances of non-conformance with existing development standards if the project were under County jurisdiction. In addition, Section 83.06.020 states that provisions for fences, hedges and walls do not apply to fences or walls required by a State or Federal agency, or by the County for safety reasons.

NOTEWORTHY PUBLIC BENEFITS

From a visual resource perspective, noteworthy visual benefits of the proposed project were not identified. Some members of the public could feel that the project would provide a unique chance to observe a solar electric generating project first-hand. While such an opportunity may not be considered a visual benefit in the same sense as observing natural scenery, some people may find such an experience interesting and educational.

CONCLUSIONS

The proposed Abengoa Mojave Solar (AMS) project would be seen from the sparsely developed area adjacent to the proposed project site which includes the existing Solar Electric Generating Systems (SEGS VIII and IX) projects, about ten private residences in the immediate area, and the Harper Dry Lake Watchable Wildlife Area maintained by the Bureau of Land Management (BLM) near the northeaster corner of the proposed project site. The project would be virtually unseen from State Route 58, which is five-plus miles south of the project. The proposed transmission line would be visible among three existing transmission lines along the southern boundary of the project site. The project would change the existing character of the 1,765-acre project site from a primarily open, partially abandoned agricultural landscape to a highly human-altered, industrial landscape very similar to the adjacent SEGS VIII and IX developments. The change in character would be evident to the few people who live in the immediate area, to employees at the SEGS VIII and IX facilities, and to those who visit the Harper Dry Lake Watchable Wildlife Area. Due to its visual isolation from substantial numbers of the public, overall visual effects of the project would be very limited.

Staff concludes that the project would introduce a less-than-significant “Aesthetic” Impact under the California Environmental Quality Act and Guidelines. Aesthetic Impacts are discussed under sections **VISUAL CHARACTER OR QUALITY**, **LIGHT AND GLARE,** and **PUBLICLY VISIBLE WATER VAPOR PLUMES.** The project would be consistent with federal, state, and local **LORS** pertaining to visual resources.

With implementation of staff recommended conditions of certification, aesthetic, light and glare impacts from the project would be less-than-significant in the short and long term.

Due to its very restricted viewshed, staff also concludes that potential cumulative impacts of the project would be limited and less-than-significant.

If the Energy Commission approves the project, staff recommended conditions of certification for the project would minimize impacts under the California Environmental Quality Act and Guidelines to the greatest extent possible, and would comply with applicable ordinances pertaining to aesthetics and preservation and protection of sensitive visual resources.

PROPOSED CONDITIONS OF CERTIFICATION

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 so that their colors minimize visual intrusion and contrast by blending with the rural landscape in both color and value and their colors and finishes do not create excessive glare.

The project owner shall submit to the Compliance Project Manager (CPM) for 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;

B. A list of each major project structure, building, tank, pipe, wall, and fencing, specifying the color(s) and finish proposed for each. Colors must be identified by vendor, name, and 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 written 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.

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 one set of electronic color photographs from key observation points (KOPs) 1, 2, 3, 4, 5, 6, 7, and 8 analyzed in the Staff Assessment.

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.

OFF-SITE LANDSCAPE SCREENING

VIS-2 The project owner shall develop and implement a plan to reduce permanent views of the project from residential properties located within 0.5 mile of the project boundary by installing off-site landscape planting on the residential properties if the landowner so desires. The landscape planting shall reduce views of the project and exposure to glare to a reasonable level.

The project owner shall submit to the CPM for review and approval a screening plan providing proper implementation that will satisfy these requirements. The plan shall include:

A. A detailed plan at a reasonable scale such that all information is legible, and elevations and/or section drawings showing the relationship of the screening to the project site. The plan, elevations and/or sections shall clearly demonstrate how the view-reducing reducing requirements stated above shall be met. The plan shall provide a detailed plant list including quantities and sizes of materials to be used and an installation schedule demonstrating installation of as much of the screening as early in the construction process as is feasible in coordination with project construction;

B. Plant establishment procedures, including a plan for routine care and monitoring of plant materials and replacement of installed plants that fail to thrive for a period of five years from installation; and

C. Documentation that a landowner declines to have landscape screening installed on his property in the event they choose not to participate in the screening program.

D. The plan shall not be implemented until the project owner receives final approval from the CPM.

Verification: The screening plan shall be submitted to the CPM for review and approval at least 90 days prior to installation.

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 notify the CPM within seven days after completing the screening installation that the screening is ready for inspection.

The project owner shall report maintenance activities, including replacement of plants that fail to thrive for the previous year of operation for a period of five years, in each Annual Compliance Report.

TEMPORARY AND PERMANENT EXTERIOR LIGHTING

VIS-3 To the extent feasible and consistent with safety and security considerations, the project owner shall design and install all temporary and permanent exterior lighting so that: a) lighting does not cause excessive reflected glare; b) direct lighting does not illuminate the nighttime sky; c) illumination of the project and its immediate vicinity is minimized, and; d) lighting on the exhaust stacks shall be the minimum needed to satisfy safety and security concerns. Permanent night lighting shall comply with the following requirements:

A. Lighting shall incorporate fixture hoods/shielding, with light directed downward or toward the area to be illuminated;

B. All lighting shall be of minimum necessary brightness consistent with operational safety and security; and

C. 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 exterior lighting, the project owner shall contact the CPM to discuss compliance with requirements A, B and C above. The project owner shall not order any exterior lighting until receiving CPM approval that the applicant has complied with requirements A, B and C above.

Prior to construction and prior to commercial operation, the project owner shall notify the CPM that the temporary and permanent 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 and included in the Annual Report.

PERIMETER SCREENING

VIS-4 The project owner shall develop and implement a screening plan that reduces direct visibility of the SCA mirrors to traffic on Harper Lake Road north of Lockhart Road, to traffic on Lockhart Road from Harper Lake Road to the eastern boundary of the Beta solar field, to residents living within one mile of the west boundary of the Beta solar field, and to visitors of the Harper Dry Lake Watchable Wildlife Area. The plan shall utilize sufficient setbacks of the SCAs from roads and 10-foot high slatted fencing to eliminate public exposure to hazardous levels of reflection, and to minimize public exposure to nuisance glare. The screening shall be designed to minimize glare from the project as seen by motorists and local residents during all times of year and periods of the day. Fence slats shall be of a non-reflective tan or other color designed to blend with the visual background in order to minimize color contrast of the fence.

The project owner shall submit to the CPM for review and approval a screening plan providing proper implementation that will satisfy these requirements. The plan shall include:

A. A detailed plan at a reasonable scale such that all information is legible, and elevations and/or section drawings showing the relationship of the screening to the road and SCAs from locations on Lockhart Road. The plan, elevations and/or sections shall clearly demonstrate how the glare-reducing requirements stated above shall be met. The plan shall provide a detailed installation schedule demonstrating installation of as much of the screening as early in the construction process as is feasible in coordination with project construction;

B. Maintenance procedures, including a plan for routine annual or semi-annual debris removal and repair of slatted fencing for the life of the project;

C. A procedure for monitoring and replacement of damaged screening for the life of the project; and

D. The plan shall not be implemented until the project owner receives final approval from the CPM.

Verification: The screening plan shall be submitted to the CPM for review and approval at least 90 days prior to installation.

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 notify the CPM within seven days after completing the screening installation that the screening is ready for inspection.
The project owner shall report maintenance activities, including replacement of damaged or destroyed screening for the previous year of operation in each Annual Compliance Report.

REFERENCES

AS 2009a- Abengoa Solar Inc. / E. Garcia (TN 52813). Application for Certification for Abengoa Mojave Solar (09-AFC-5), dated 7/2009. Submitted to CEC on 8/10/2009.

AS 2009b - Abengoa Solar Inc. / E. Garcia (TN 53375). Data Adequacy Supplement for Abengoa Mojave Solar (09-AFC-5), dated 9/24/2009. Submitted to CEC on 9/24/2009.

ESH 2009g- Ellison, Schneider and Harris / C. Ellison (TN 54581). Supplemental Written Responses to Data Request Set 1B (nos. 1-86), dated 12/23/09. Submitted to CEC on 12/23/2009.

San Bernardino County, 2007. General Plan.

SJS 2009. San Joaquin Solar Projects 1&2 Application for Certification – Volume 2. Dated 12/8/2009. Appendix L – Glint and Glare Study.

APPENDIX VR-1

STAFF'S VISUAL RESOURCES EVALUATION METHODOLOGY

Staff evaluates the visual characteristics of the existing physical setting, the proposed project, the circumstances affecting the viewer, and the degree of visual change that a proposed project may introduce using the elements generally accepted criteria for determining substantial environment impact significance identified below.

ELEMENTS OF THE METHODOLOGY

KEY OBSERVATION POINTS

Staff evaluates the existing visible physical environmental setting from a fixed vantage point, called a *key observation point* (KOP) that provides a view of the visual change introduced by the proposed project to the view from that KOP. The view as seen from the KOP is referred to as the *viewshed*. Staff uses a KOP[2] to represent a location(s) from which to conduct detailed analyses of the proposed project and to obtain existing condition photographs and prepare photo simulations. KOPs are selected to be representative of the most critical viewshed locations from which the project would be seen. Because it is not feasible to analyze all the views in which a proposed project would be seen, it is necessary to select a KOP that would most clearly display the visual effects of the proposed project. A KOP may also represent primary viewer groups that would potentially be affected by the project. In addition to KOP photo(s), staff reviews landscape character photos that help provide a visual overview of a project site, its vicinity, and the selected KOP area, as appropriate. Prior to application submittal, staff participates in the selection of appropriate KOP(s) for the analysis.

LORS CONSISTENCY

Energy Commission staff considers federal, state, and local laws, ordinances, regulations, and standards (LORS) relevant to aesthetics or protection and preservation of visual sensitive resources. Conflicts with such LORS can constitute significant visual impacts. For example, visual staff examines land use planning documents, such as a local government's General Plan, Specific Plan, and zoning ordinances applicable to the project site and surrounding area to gain insight as to the type of land uses intended for the area, and the guidelines given for aesthetics, or protection and preservation of visual sensitive resources.

CALIFORNIA ENVIRONMENTAL QUALITY ACT GUIDELINES

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" (California Code of Regulations, Title 14, section 15382).

[2] The use of KOPs or similar view locations is common in visual resource analysis. The U.S. Bureau of Land Management (USDI BLM 1986a, 1986b, 1984) and the U.S. Forest Service (USDA Forest Service 1995) use such an approach.

Appendix G Environmental Checklist Form of the CEQA Guidelines, under "Aesthetics," lists the following four questions to be addressed regarding whether the potential impacts of a project are significant:

A. Would the project have a substantial adverse effect on a scenic vista?

B. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

C. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

D. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Staff answers each of the four checklist questions for the proposed project, including any related facility such as a transmission line or gas pipeline, for both construction and operation phases.

VISIBLE WATER VAPOR PLUME FREQUENCY

When a proposed power plant is operated at times of low temperature and high humidity, the potential exists for the exhaust from its cooling towers to condense and form visible water vapor plumes (steam plume). The formed plume potentially could have an adverse effect on visual sensitive resources in the vicinity of the project. The severity of the visual impacts created by a project's visible plumes depends on five factors: 1) the frequency of the plumes, 2) the physical size of the plumes (dimensions), 3) the sensitivity of the viewers who would see the plumes, 4) the distance between the plumes and the viewers, 5) the visual quality of the existing viewshed; and, 6) whether a scenic resource or vista would be blocked by the plumes.

Staff completes water vapor plume modeling of the proposed project's cooling towers using design parameters provided by the applicant. Staff models the estimated plume frequency and dimensions for the cooling tower and turbine exhaust using the Combustion Stack Visible Plume (CSVP) model, and a multi-year meteorological data set obtained for the area where the project is proposed.

Staff considers the 20th percentile plume to be the reasonable worst case plume dimensions on which to base its visual impact analysis. The 20th percentile plume is the smallest of the plumes that are predicted to occur zero to 20% of the time. Eighty (80) percent of the time the dimensions of the clear hour plumes would be smaller than the 20th percentile plume dimensions. A one percentile clear hour plume would be extremely large, very noticeable to a wide area, but would occur very infrequently.

Staff focuses its frequency of the plumes analysis on the portion of the year when the ambient conditions (i.e., cool/cold temperatures and high relative humidity) are such that plumes are most likely to occur (typically from November through April) and when "clear" sky conditions exist because this is when the plumes would cause the most visual contrast with the sky and have the greatest potential to cause adverse visual impacts. Staff eliminates from consideration plumes that occur at night or during rain or fog conditions because plume visibility, and overall visual quality, is typically low during those conditions. In addition, plumes that occur during specific cloudy conditions are also eliminated because under these conditions, plumes have less contrast with the background sky. A plume frequency of 20% of seasonal daylight no rain/fog high visual contrast (i.e. “clear”) hours is used to determine potential plume impact significance. If it is determined that the seasonal daylight clear hour plume frequency is greater than 20%, then plume dimensions are determined and a significance analysis is included in the Visual Resources section of the Staff Assessment for the proposed project.

Plume frequencies of less than 20% have been determined to generally have a less than significant impact. If the modeling predicts seasonal daylight clear plume frequencies greater than 20%, staff calculates the dimensions of the clear hour plumes and then conduct an assessment of the visual change (in terms of contrast, dominance and view blockage) that would be caused by the 20th percentile plume dimensions. Staff also analyzes the predicted plume’s potential luminescence (light refraction resulting in a glare or glow) and color contrast, and opacity (the degree to which light is prevented from passing through an emission plume) that may be introduced to the KOP viewsheds. Considering the visual sensitivity of the existing landscape and viewing characteristics, the degree of visual change caused by the plumes may result in a significant visual impact.

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APPENDIX VR-2

ENERGY COMMISSION STAFF - VISUAL ANALYSIS TERMS

For the purpose of this visual analysis, Energy Commission staff has defined the following visual related terms.

Duration of View - ranges from *high* (extended), a view of the project site that is reached across an extended distance or amount of time, to *low* (brief), a view of the project site that is reached in a short amount of distance or time. The range of view duration generally differs depending on the type of activity in which the viewer is engaged.

Intactness – referring to a landscape character and quality that appears untouched or unaltered by human actions that harm or diminish landscape character or quality.

Scenic Resource - 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 visual/historical importance to a community (a tree linked to a famous event or person, an ancient old growth tree); historic building; or a designated federal scenic byway or state scenic highway corridor.

Scenic Vista - a distant view through and along a corridor or opening that exhibits a high degree of pictorial quality.

Viewer Concern - estimated level of a viewer's anticipated interest in preserving and protecting the existing physical environment. Viewer attitudes and expectations are often correlated with viewer activity type (e.g., viewers engaged in certain activities, such as recreation, are considered to have high levels of concern for scenic quality, while those engaged in other activities, such as work, are generally considered to have lower levels of concern). Residences are generally considered to have high viewer concern.

Existing landscape character may temper viewer concern on some state and locally designated scenic highways and corridors. Similarly, travelers on other highways and roads, including those in agricultural areas, may have moderate viewer concern depending on viewer expectations as conditioned by regional and local landscape features. Commercial uses, including business parks, typically have low-to-moderate viewer concern, though some commercial developments have specific requirements related to visual quality with respect to landscaping, building height limitations, building design, and prohibition of above-ground utility lines, thus indicating a higher level of viewer concern. Industrial uses typically have the lowest viewer concern because workers are focused on their work and generally are working in surroundings with relatively low visual value.

Viewer Exposure – the primary factors affecting viewer susceptibility to impacts, including visibility of a landscape feature, the number of viewers, distance, and the duration of the view.

Viewshed – an area visible to an observer from a fixed vantage point, called a *key observation point* (KOP). Staff uses a 35mm camera with a focal length of 50mm which encompasses an approximate image angle of 46^0. The staff uses a field of view that is not to be confused with a panoramic (180^0) or cycloramic (360^0) view. These are broad horizontal composition with no apparent limits to the view.

Visibility - the level to which the proposed project site is visually obstructed by natural and/or man-made surface features (development, vegetation, hills) from the key observation point.

Visual Contrast - the conspicuousness or prominence of a project and its compatibility with its setting. Visual contrast is described in terms of formal attributes of form, line, color, and texture of the project in comparison to those of the setting. Staff considers the proposed project's introduction of form (shape and mass), line (changes in edge types and interruption or introduction of edges, bands, and silhouette lines), color (surface color, reflectivity, and glare), and texture (noticeable differences in the grain or irregularity and directional patterns) to the existing physical environment to determine the degree of contrast**.** Degree of contrast: *none* – the element contrast is not visible or perceived; *weak* – the element contrast can be seen but does not attract attention; *moderate* – the element contrast begins to attract attention and begins to dominate the characteristic landscape; *strong* – the element contrast demands attention, will not be overlooked, and is dominant in the landscape.

Visual Disruption - the extent to which a previously visible scenic resource or scenic vista in the existing physical environment is blocked from view by the proposed project. The view disruption is assigned greater weight according to the quality and importance of the blocked view.

Visual Quality – the estimated visual impression and appeal of the existing physical environmental setting and the associated public value attributed to it. An outstanding visual quality is a rating reserved for landscapes that would be what a viewer might think of as "picture postcard" landscapes. Low visual quality describes landscapes that are often dominated by visually discordant human alterations and do not provide views that people would find inviting or interesting (Buhyoff et al. 1994).

Visual Scale - the proposed project's apparent size relationship with other components in the existing physical environment relative to the total field-of-view as viewed by the human eye, or the lens of a 35mm camera with a focal length of 50mm.

Visual Sensitivity - the overall level of sensitivity of a viewshed due to visual change that is a function of visual quality, viewer concern, and viewer exposure.

Vividness - referring to landscape character and quality that is visually distinctive with visual elements that are extraordinary and special. Landscape character and quality that is attractive and stands out from common landscapes.

Unity – referring to a landscape character and quality of wholeness such that the combination and arrangement of landscape features creates a unified whole. A landscape that appears to be in a condition of accord and harmony.

APPENDIX VR-3
VISIBLE PLUME MODELING ANALYSIS

Testimony of William Walters

INTRODUCTION

The following provides the assessment of the Abengoa Mojave Solar Project's (AMS) cooling tower exhaust stack visible plumes. Staff completed a modeling analysis for the applicant's proposed unabated cooling tower design.

PROJECT DESCRIPTION

The proposed project is a thermal solar design that requires cooling to condense the steam that is recycled. The applicant has proposed two six-cell mechanical-draft cooling towers for project cooling. The applicant has not proposed to use any methods to abate visible plumes from the cooling towers.

The applicant has also proposed two small (21.5 MMBtu/hr) boilers that will be used for daily start-up and for freeze protection. These boilers will be operated for a maximum of 4,380 hours per year. During cold weather periods, such as their use during start-up and for freeze protection in winter these boilers are likely to have visible plumes. However, due to their very small size the boiler plumes are not believed to create a potentially significant visual impact and are not assessed further in this analysis.

VISIBLE PLUME MODELING METHODS

PLUME FREQUENCY AND DIMENSION MODELING

The Combustion Stack Visible Plume (CSVP) model was used to estimate plume frequency and plume dimensions for the cooling tower exhaust. This model provides conservative estimates of both plume frequency and plume size. This model uses hourly cooling tower exhaust parameters and hourly ambient condition data to determine the plume frequency. This model is based on the algorithms of the Industrial Source Complex model (Version 2), that determine temperatures at the plume centerline, but this model does not incorporate building downwash.

The modeling method combines the cooling tower cell exhausts into an equivalent single stack. This method may overestimate cooling tower plume size (particularly height) during plume hours with higher winds perpendicular to the length of the tower due to little cell interaction and the potential for building downwash, but will be more accurate during low wind and calm periods when the exhausts from the cooling tower cells will combine into one coherent body. Wind speeds are set to 1 m/s during calm hours in the modeling analysis.

CLOUD COVER DATA ANALYSIS METHOD

A plume frequency of 20% of seasonal (November through April) daylight high visual contrast (i.e. "clear") hours is used to determine potential plume impact significance. The methodology used to determine high visual contrast hours is provided below:

> The Energy Commission staff has identified a "clear" sky category during which visible plumes have the greatest potential to cause adverse visual impacts. For this project the meteorological data set[3] used in the analysis categorizes sky cover in 10% increments. Staff has included in the "Clear" category a) all hours with sky cover equal to or less than 10% plus b) half of the hours with total sky cover 20-90%. The rationale for including these two components in this category is as follows: a) visible plumes typically contrast most with sky under clear conditions and, when total sky cover is equal to or less than 10%, clouds either do not exist or they make up such a small proportion of the sky that conditions appear to be virtually clear; and b) for a substantial portion of the time when total sky cover is 20-90% the opacity of sky cover is relatively low (equal to or less than 50%), so this sky cover does not always substantially reduce contrast with visible plumes; staff has estimated that approximately half of the hours meeting the latter sky cover criteria can be considered high visual contrast hours and are included in the "clear" sky definition.

If it is determined that the seasonal daylight clear hour plume frequency is greater than 20% then plume dimensions are calculated, and a significance analysis of the plumes is included in the Visual Resources section of the Staff Assessment.

COOLING TOWER VISIBLE PLUME MODELING ANALYSIS

COOLING TOWER DESIGN AND OPERATING PARAMETERS

The cooling tower design characteristics were determined through a review of the applicant's AFC (AS 2009a), the air quality and visible plume modeling files (AS 2009a), and additional data provided by the applicant to estimate daily and seasonal cooling tower operations (ESH 2009d, ESH 2010b). The applicant's cooling tower physical design parameters are presented in **Visible Plume Table 1**.

[3] This analysis uses meteorological data provided by the applicant. Three years of meteorological data (1988-1990) are collected from the Daggett monitoring station. Hours with missing data were excluded.

Visible Plume Table 1
Cooling Tower Physical Design Parameters

Parameter	Cooling Tower Design Parameters		
Number of Cells per Tower	6 Cells (Linear Design)		
Cell Height	51 feet (15.55 meters)		
Cell Stack Diameter	30 feet (9.14 meters)		
Tower Housing Length	324 feet (98.75 meters)		
Tower Housing Width	54 feet (16.5 meters)		
Ambient Condition	**Heat Rejection Rate (MW/hr)**	**Exhaust Flow Rate (klbs/hr)**	**Exhaust Temperature (°F)**
30°F, 90% RH [a]	124.6	14,876	76.3
50°F, 85% RH	191.1	26,851	80.0
65°F, 40% RH	211.6	32,135	80.9
100°F, 15% RH	250.6	34,774	83.8

Source: AS 2009a and ESH 2009d; where staff's review of the heat balance required staff to reduce the exhaust temperature during the cold weather condition from 80°F to 76.3°F.
Note: a – Only three cells operate under this condition

The applicant provided estimated average heat load data for each hour of each month (ESH 2010d), as shown in **Visible Plume Table 2**. All hours not shown in this table are assumed to have zero cooling load throughout the year. The applicant provided assumptions on the numbers of cells in operation based on percentage of full heat load (ESH 2009d). Using this data staff estimated the number of cells in operation for each hour of each month, as shown in **Visible Plume Table 3**.

Visible Plume Table 2
Cooling Tower Average Heat Load per Hour for Each Month

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7:00	0%	0%	0%	0%	35%	54%	39%	3%	0%	0%	0%	0%
8:00	0%	0%	21%	60%	93%	100%	93%	94%	73%	20%	0%	0%
9:00	3%	25%	81%	89%	98%	100%	97%	100%	100%	69%	31%	3%
10:00	43%	57%	85%	91%	100%	100%	97%	100%	100%	82%	55%	45%
11:00	42%	51%	85%	97%	100%	100%	99%	100%	97%	72%	48%	36%
12:00	36%	48%	81%	94%	100%	100%	100%	100%	93%	70%	45%	32%
13:00	32%	45%	80%	91%	99%	100%	99%	100%	87%	67%	45%	36%
14:00	43%	51%	80%	89%	98%	100%	97%	99%	88%	76%	48%	45%
15:00	40%	54%	81%	90%	97%	100%	94%	95%	88%	84%	55%	44%
16:00	51%	62%	74%	89%	90%	100%	94%	95%	94%	85%	44%	42%
17:00	0%	30%	65%	77%	84%	98%	82%	87%	72%	21%	0%	0%
18:00	0%	0%	1%	14%	44%	73%	62%	46%	2%	0%	0%	0%

Source: ESH 2010b

Visible Plume Table 3
Number of Operating Cooling Tower Cells

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7:00	0	0	0	0	3	4	3	1	0	0	0	0
8:00	0	0	2	2	6	6	6	6	5	2	0	0
9:00	1	2	5	5	6	6	6	6	6	5	2	1
10:00	3	4	6	6	6	6	6	6	6	5	4	3
11:00	3	4	6	6	6	6	6	6	6	5	3	3
12:00	3	3	5	5	6	6	6	6	6	5	3	2
13:00	2	3	5	5	6	6	6	6	6	4	3	3
14:00	3	4	5	5	6	6	6	6	6	5	3	3
15:00	3	4	5	5	6	6	6	6	6	6	4	3
16:00	4	4	5	5	6	6	6	6	6	6	3	3
17:00	0	2	4	4	6	6	5	6	5	2	0	0
18:00	0	0	1	1	3	5	4	3	1	0	0	0

Source: Staff Interpolation based on cooling tower average heat load per hour of each month (ESH 2010b) and the number of cells in operation corresponding to the percentage of heat load, provided by the applicant (ESH 2009d).

The cooling tower operation for this solar project is dependent on the sun angle (time of day and year) that impacts the total power production capacity and cooling tower load. Therefore, the cooling tower operation starts at low heat rejection loads each morning after a warming up period that builds until the afternoon when the heat rejection load drops as the sun sets. Staff has attempted to mimic, in a simple and conservative way, the complex operating profile of the cooling tower exhaust modeling inputs. Additionally, the hourly cooling tower exhaust conditions are interpolated for the hourly ambient conditions (temperature and relative humidity) based on the assumed heat rejection for each operating cooling tower cell.

COOLING TOWER VISIBLE PLUME MODELING RESULTS

Visible Plume Table 4 provides the CSVP model visible plume frequency results for daytime operations using a three-year (1988 to 1990) meteorological data set compiled from the Daggett monitoring station.

Visible Plume Table 4
Predicted Hours with Cooling Tower Visible Plumes
Daggett 1988-1990 Meteorological Data

Case	Available (hr)	Plume (hr)	Percent
All Hours	26,279	2,340	8.90%
Daylight Hours	13,271	1,522	11.47%
Seasonal Daytime	6,001	1,380	23.00%
Seasonal Daytime Clear	4,446	948	21.32%

*Seasonal conditions occur during November through April.
Clear hours may include rainy or foggy hours with low sky cover since precipitation data were not available in the meteorological data file used for modeling.

The results noted above are based on the data and assumptions shown in **Visible Plume Tables 1** through **3**, and do not include night time operation as the heat load for the cooling tower is a function of the solar radiation.

Since the plume frequencies remain over 20% of the seasonal daylight clear hours the corresponding plume dimensions were estimated. The plume dimensions are estimated by the CSVP model and presented in **Visible Plume Table 5**.

Visible Plume Table 5
Predicted Cooling Tower Visible Plume Dimensions

	Cooling Tower Seasonal "Clear" Hours Plume Dimensions in Meters (feet)		
Percentile	**Length**	**Height**	**Width**
1%	28.74 (94.27)	72.44 (237.59)	28.67 (94.05)
5%	23.08 (75.71)	28.59 (93.79)	26.19 (85.91)
10%	18.15 (59.53)	22.25 (72.97)	24.52 (80.43)
15%	13.86 (45.48)	19.39 (63.59)	23.23 (76.20)
20%	**8.29 (27.18)**	**17.00 (55.75)**	**21.47 (70.42)**

Results include the cooling tower stack height of 15.55 meters (51 feet), see **Visible Plume Table 1**.

The plume dimension results shown in **Visible Plume Table 5** correspond only to the defined daylight "clear" weather conditions. In general the results presented above are conservative as staff rounded up when determining the number of cooling tower cells operating at full load. However, there is a potential that the cooling tower plumes can be larger than those indicated in the table on occasion, particularly if it is cold, the relative humidity is high, and the winds are low or dead calm during periods of relatively high sun energy.

APPLICANT'S PLUME ANALYSIS

The applicant prepared a plume modeling analysis using the Seasonal/Annual Cooling Tower Impact (SACTI) model. Due to the way the SACTI model over simplifies the modeling by only allowing one operating case to be modeled at a time and its grouping of the hourly meteorological data into a couple dozen cases, among a few other significant issues, staff does not use this model for plume frequency and size prediction. This is particularly true for solar projects where the cooling tower load is a function of hourly solar intensity.

In general the applicant's SACTI modeling results are similar to staff's results. Staff has reviewed the applicant's plume modeling files and found one input issue that could impact the ground fogging direction and frequency results. The applicant did not orient the wind direction axis inputs and the wind equivalence number inputs consistently, which likely caused an underestimation of the potential plume ground fogging. The north/south cooling tower axis and predominant westerly winds increase the potential for plume fogging to the east of the towers. Staff's modeling using consistent cooling tower orientation inputs captured this greater ground fogging potential to the east while the applicant's modeling did not.

GROUND FOGGING ANALYSIS

Staff also reviewed the applicant's ground fogging modeling analysis and separately modeled the plumes using the Seasonal/Annual Cooling Tower Impact (SACTI) model. Ground fogging was predicted about three hours for the three years modeled within 100 meters away from the site. Ground fogging was predicted to occur up to 1,100 meters due east of each cooling tower, but for only 0.5 hour every three years. Therefore, the predicted hours of ground fogging were minimal and the SACTI modeling input assumptions were very conservative. In addition, there are no major roads within a 10,000 meter-radius of the project site. Therefore, staff believes there is no potential for ground based traffic safety impacts due to the cooling tower operation.

CONCLUSIONS

Visible water vapor plumes from the proposed Mojave Solar cooling tower could occur more than 20% of seasonal daylight clear hours depending on facility operation. Therefore, further visual impact analysis of worst-case plume frequencies and plume sizes has been completed.

The ground fogging plume analysis indicates that the cooling tower would only create minimal hours of the ground fogging plume that would not impact any major public roads. Therefore, there would be no impact on ground traffic safety.

Due to the small size and limited operation significant visible water vapor plumes are not expected from the two small Mojave boilers.

REFERENCES

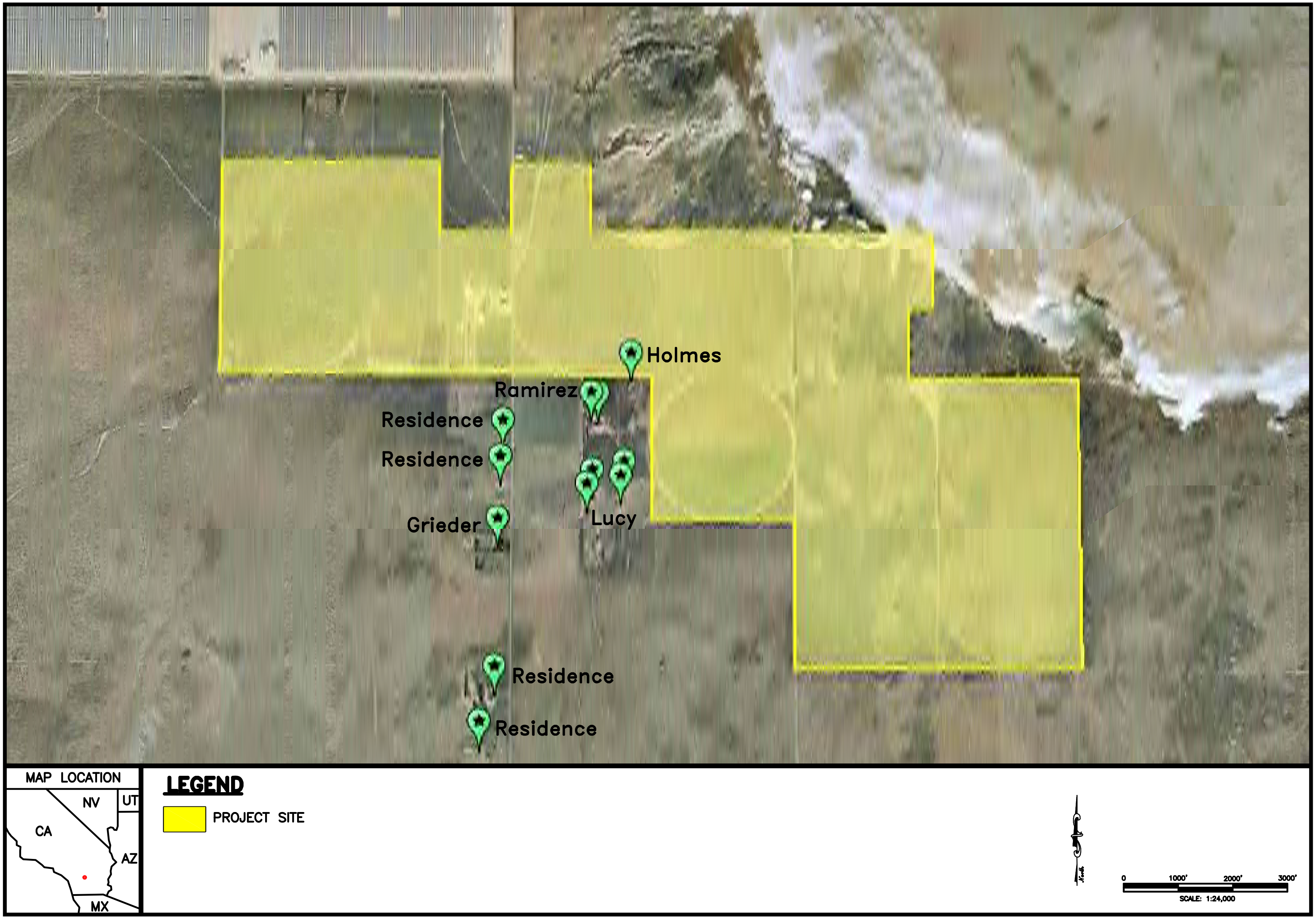
AS 2009a – Abengoa Solar Inc. / E. Garcia (TN 52813). Application for Certification, dated 07/2009. Submitted to CEC/Docket Unit on 08/10/2009.

ESH 2009d – Ellison, Schneider and Harris / C. Ellison (TN 54268). Written Responses to Data Request Set 1B (nos. 1-86), dated 11/25/09. Submitted to CEC on 11/25/2009.

ESH 2010b – Ellison, Schneider and Harris / C. Ellison (TN 54268). Written Responses to Data Request Set 1B (nos. 1-86), dated 1/5/10. Submitted to CEC on 1/8/2010.

VISUAL RESOURCES - FIGURE 1

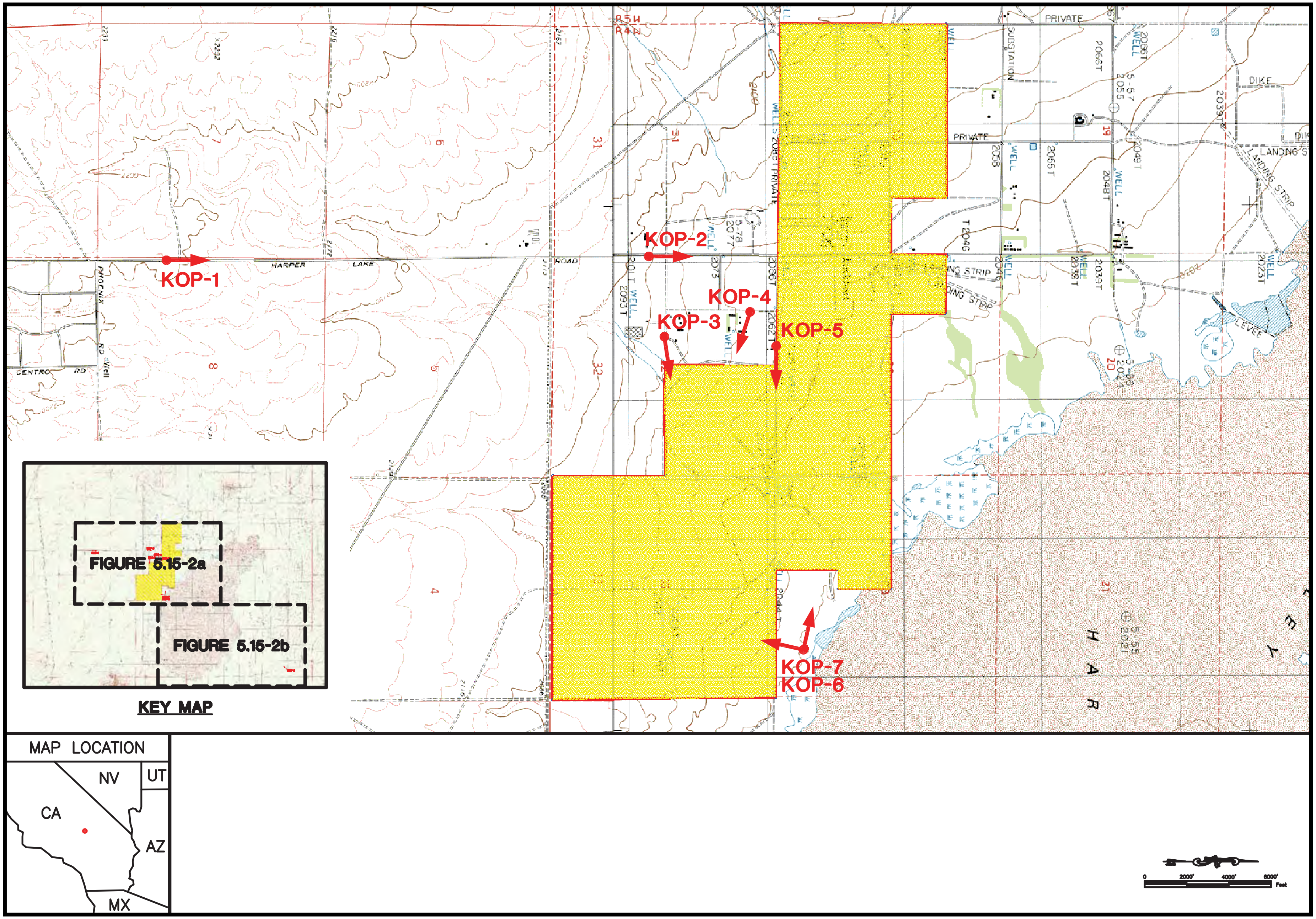
Abengoa Mojave Solar Project - Known Occupied Residence Locations



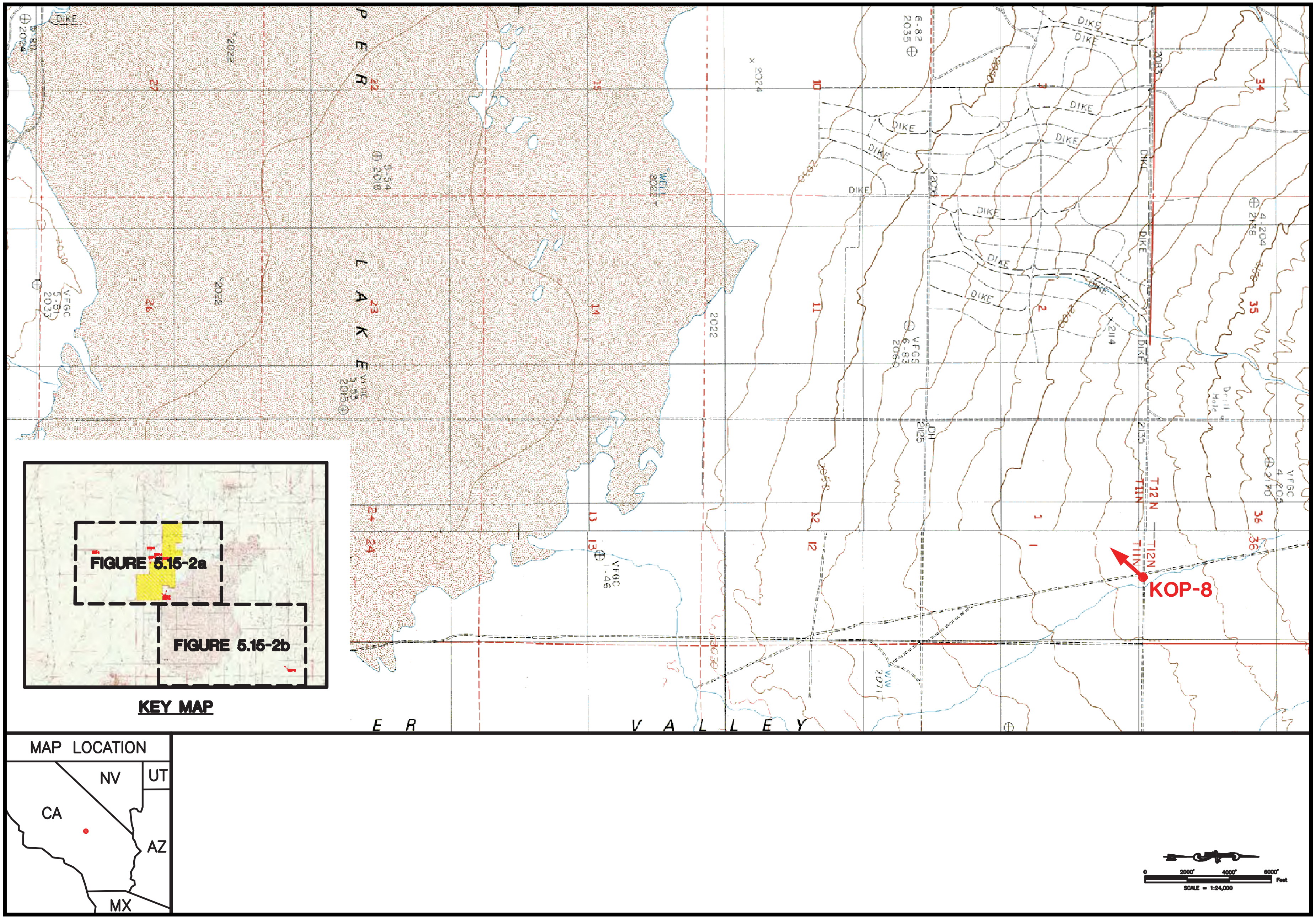
CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

VISUAL RESOURCES - FIGURE 2A

Abengoa Mojave Solar Project - Key Observation Points Map 1



VISUAL RESOURCES - FIGURE 2B
Abengoa Mojave Solar Project - Key Observation Points Map 2



VISUAL RESOURCES - FIGURE 3A

Abengoa Mojave Solar Project - KOP 1 - View from Harper Lake Road near Phoenix Road (Pre-Project)

SOURCE: AFC

VISUAL RESOURCES - FIGURE 3B

Abengoa Mojave Solar Project - KOP 1 - View from Harper Lake Road near Phoenix Road (Post-Project)

SOURCE: AFC

VISUAL RESOURCES - FIGURE 4A

Abengoa Mojave Solar Project - KOP 2 - View from Harper Lake Road South of Roy Road (Pre-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 4B

Abengoa Mojave Solar Project - KOP 2 - View from Harper Lake Road South of Roy Road (Post-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 5A

Abengoa Mojave Solar Project - KOP 3 - View from Roy Road East of Edie Road (Pre-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 5B

Abengoa Mojave Solar Project - KOP 3 - View from Roy Road East of Edie Road (Post-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 6A

Abengoa Mojave Solar Project - KOP 4 - View from Edie Road South of Lockhart Ranch Road (Pre-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 6B

Abengoa Mojave Solar Project - KOP 4 - View from Edie Road South of Lockhart Ranch Road (Post-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 7A

Abengoa Mojave Solar Project - KOP 5 - View from Lockhart Ranch Road East of Edie Road (Pre-Project)

SOURCE: AFC

VISUAL RESOURCES - FIGURE 7B

Abengoa Mojave Solar Project - KOP 5 - View from Lockhart Ranch Road East of Edie Road (Post-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 8A

Abengoa Mojave Solar Project - KOP 6 - Views from Harper Lake Watchable Wildlife Area (Pre-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 8B

Abengoa Mojave Solar Project - KOP 6 - Views from Harper Lake Watchable Wildlife Area (Post-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 9A

Abengoa Mojave Solar Project - KOP 7 - Views from Harper Lake Watchable Wildlife Area (Pre-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 9B

Abengoa Mojave Solar Project - KOP 7 - Views from Harper Lake Watchable Wildlife Area (Post-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 10A

Abengoa Mojave Solar Project - KOP 8 - View from Fossil Bed Road near Black Canyon Road (Pre-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 10B

Abengoa Mojave Solar Project - KOP 8 - View from Fossil Bed Road near Black Canyon Road (Post-Project)

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 11A

Abengoa Mojave Solar Project - Solar Project Trough Glare Example 1

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 11B

Abengoa Mojave Solar Project - Solar Project Trough Glare Example 2

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

SOURCE: AFC

WASTE MANAGEMENT

Testimony of Ellie Townsend-Hough

SUMMARY OF CONCLUSIONS

Staff concludes that management of the waste generated and disposed of during construction and operation of the Abengoa Mojave Solar One Project (AMS) would not result in any significant adverse impacts under CEQA, and would comply with applicable waste management laws, ordinances, regulations, and standards if the measures proposed in the Application for Certification (AFC) and staff's proposed conditions of certification are implemented. The applicant has provided a Phase I Environmental Site Assessment and will provide a site characterization report that includes soil sampling analysis describing the current conditions of the project site. Although the site characterization is not complete, staff expects there will be no unmitigible Waste Management impacts associated with the project.

INTRODUCTION

This Staff Assessment (SA) presents an analysis of issues associated with managing wastes generated from constructing and operating the proposed AMS project and any hazardous wastes already existing on site because of past activities. Staff has evaluated the proposed waste management plans and mitigation measures designed to reduce the risks and environmental impacts associated with handling, storing, and disposing of project-related hazardous and non-hazardous wastes. The technical scope of this analysis encompasses solid wastes existing on site, and those generated during facility construction and operation. Wastewater issues are more fully discussed 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.

Energy Commission staff's objectives in its waste management analysis are to ensure that:

- The management of wastes would be in compliance with all applicable laws, ordinances, regulations, and standards (LORS). Compliance with LORS ensures that wastes generated during the construction and operation of the proposed project would be managed in an environmentally safe manner;
- The disposal of project wastes would not result in significant adverse impacts to existing waste disposal facilities; and
- During project operation, the site is managed such that contaminants would not pose a significant risk to humans or to the environment.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following framework of federal, state, and local environmental LORS exists to ensure the safe and proper management of hazardous wastes from generation to disposal in order to reduce the risks of accidents that might impact worker and public health and the environment.

Waste Management Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
RCRA, Subtitle C and D, 42 USC § 6901 to 6992k, and Section 6.12.2.1	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 (USEPA) 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 USEPA and its ten regional offices. The Pacific Southwest regional office (Region 9) implements USEPA programs in California, Nevada, Arizona, and Hawaii.
40 CFR 260, *et seq.*	Contains regulations promulgated by the EPA to implement the requirements of RCRA as described above. Characteristics of hazardous waste are described in terms of ignitability, corrosively, reactivity, and toxicity, and specific types of waste are listed.
Federal CWA, 33 USC § 1251 *et seq.*	Controls discharge of wastewater to the surface waters of the U.S.
Title 40 CFR Section 112	This establishes procedures, methods, equipment, and other requirements to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into or upon the navigable waters of the United States or adjoining shorelines, or into or upon the waters of the contiguous zone, or in connection with activities under the Outer Continental Shelf Lands Act or the Deepwater Port Act of 1974. Subpart B - The Spill Prevention, Control and Countermeasures (SPCC) Plan includes procedures, methods, and equipment at the facility to prevent discharges of petroleum from reaching navigable waters.

Applicable Law	Description
State	
Public Resources Code § 40000 *et seq.,* California Integrated Waste Management Act of 1989	Provides an integrated statewide system of solid waste management by coordinating state and local efforts in source reduction, recycling, and land disposal safety. Counties are required to submit Integrated Waste Management Plans to the state.
Title 14, California Code of Regulations (CCR), Division 7, 17200, et seq.	These regulations further 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.
Porter- Cologne Water Quality Control Act of 1998, Water Code § 13000 *et seq.*	Controls discharge of wastewater to surface waters and groundwaters of California.
Title 22, (CCR), 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, CCR 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.). 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 Certified Unified Program Agencies (CUPAs).
Title 22, (CCR) § 66262.34	Regulates accumulation periods for hazardous waste generators. Typically, hazardous waste cannot be stored onsite for more than 90 days.
Title 23, (CCR) Division 3, Chapter 30	This Chapter requires the submission of analytical test results and other monitoring information electronically over the internet to the State Water resources Control Board's Geotracker data base.

Applicable Law	Description
Title 22, CCR, Section §66260.20(f), Chapter 10, Article 3, Classification of a Waste as Hazardous or Nonhazardous.	If a person wishes to classify and manage as nonhazardous a waste which would otherwise be a non-RCRA hazardous waste because it has mitigating physical or chemical characteristics which render it insignificant as a hazard to human health and safety, livestock and wildlife, that person shall apply to the Department of Toxic Substances Control (DTSC) for its approval to classify and manage the waste as nonhazardous.
California Health and Safety Code (HSC) § 25100 *et seq.* (Hazardous Waste Control Act of 1972, as amended)	Creates the framework under which hazardous wastes must be managed in California. It mandates the DTSC under the California Environmental Protection Agency (CalEPA), to develop and publish a list of hazardous and extremely hazardous wastes and to develop and adopt criteria and guidelines for the identification of such wastes. It also requires hazardous waste generators to file notification statements with Cal EPA and create a manifest system to be used when transporting such wastes.
California Health and Safety Code (HSC) § 25270-25270.13	25270. This chapter shall be known and may be cited as the Aboveground Petroleum Storage Act. 25270.2. For purposes of this chapter, the following definitions apply: (a) "Aboveground storage tank" or "storage tank" means a tank that has the capacity to store 55 gallons or more of petroleum and that is substantially or totally above the surface of the ground. "Aboveground storage tank" does not include any of the following: (1) A pressure vessel or boiler that is subject to Part 6 (commencing with Section 7620) of Division 5 of the Labor Code. (2) A tank containing hazardous waste, as defined in subdivision (g) of Section 25316, if the Department of Toxic Substances Control has issued the person owning or operating the tank a hazardous waste facilities permit for the storage tank. (3) An aboveground oil production tank that is subject to Section 3106 of the Public Resources Code. (4) Oil-filled electrical equipment, including, but not limited to, transformers, circuit breakers, or capacitors, if the oil-filled electrical equipment meets either of the following conditions: (A) The equipment contains less than 10,000 gallons of dielectric fluid. (B) The equipment contains 10,000 gallons or more of dielectric fluid with PCB levels less than 50 parts per million, appropriate containment or diversionary structures or equipment are employed to prevent discharged oil from reaching a navigable water course, and the electrical equipment is visually inspected in accordance with the usual routine maintenance procedures of the owner or operator. (5) A tank regulated as an underground storage tank under Chapter 6.7 (commencing with Section 25280) of this code and Chapter 16 (commencing with Section 2610) of Division 3 of Title 23 of the California Code of Regulations.

Applicable Law	Description
Title 27, CCR, §15100 et seq. (Unified Hazardous Waste and Hazardous Materials Management Regulatory Program)	Consolidates, coordinates, and makes consistent portions of the following six existing programs: • Hazardous Waste Generators and Hazardous Waste Onsite Treatment; • Underground Storage Tanks; • Hazardous Material Release Response Plans and Inventories; • California Accidental Release Prevention Program; • Aboveground Storage Tanks (spill control and countermeasure plan only); • Uniform Fire Code Hazardous Material Management Plans and Inventories; The statute requires all counties to apply to the CalEPA Secretary for the certification of a local unified program agency.
Title 14, CCR, §17200 et seq. (Minimum Standards for Solid Waste Handling and Disposal)	Sets forth minimum standards for solid waste handling and disposal, guidelines to ensure conformance of solid waste facilities with county solid waste management plans and the California Integrated Waste Management Board, as well as enforcement and administration provisions.
Title 23, CCR, Chapter 15	The regulation in this chapter establishes waste and site classification and waste management requirements for waste treatment storage, or disposal in landfills, surface impoundments, waste piles and land treatment facilities.
Local	
San Bernardino County Ordinance, Title 3 Health and Safety:	These regulations govern the use, generation, storage, and disposal of hazardous materials and wastes with San Bernardino County Fire Department serves as the local CUPA authorized to implement the provisions of the California Unified Program elements. San Bernardino County Public Works Department, Solid Waste Division, has developed a solid waste program to oversee the handling, processing, and disposal of non-hazardous solid waste to safeguard public health.

SETTING

The proposed AMS project is a 250 megawatt (MW) concentrated solar electric generating facility (AS2009a, page 2-1). The facility will be located on approximately 1,765 acres of land, nine miles north of Hinkley, CA and 90 miles east of Los Angeles, CA in an unincorporated area of eastern San Bernardino County, California in the western edge of the Mojave Desert. The site is located next to the existing Solar Electric Generating Stations (SEGS) VIII and IX (AS2009a, page 2-1).

The project will consist of twin, independently operated solar fields. The solar fields are identified as an 884-acre Alpha site (the northwestern portion of the project site) and 800-acre Beta site (the south east portion of the project site). The project also includes an 81-acre drainage channel (AS2009a, Section 2.1). The solar plant is made up of parabolic trough solar thermal technology producing electrical power using a steam turbine generator that is fed from a solar steam generator. Heat transfer fluid (HTF) from the heat collection element located at the focus of the parabolic trough solar collectors circulates through a series of heat exchangers where the fluid generates high-pressure steam in the solar steam generator at the power block, which provides steam to the project’s steam turbine generator; power will be generated by the steam turbine generator (AS2009a, Section 2.0). Natural gas is used to fuel two auxiliary boilers which will reduce plant start-up time and will supply steam for freeze protection for the HTF (AS2009a, page 2-4).

The project will include:

- Two separate power island areas;
- Construction laydown and solar collector assembly building locations;
- Solar collector field;
- Two double-lined five-acre evaporation ponds for each Plant;
- One and a half-acre bioremediation/ land farm units for each Plant area;
- On-site transmission and interconnection facilities;
- On-site gas pipeline facilities;
- Drainage improvements to convey offsite storm water;
- Groundwater well location used for water supply, and Access Roads.

Wastewater generated from spent cooling water and process water will be disposed in the five-acre evaporation ponds. Low concentrations of HTF contaminated soil from spills will be disposed of in a bioremediation/land farm (AS2009a page 5.16-8). Pursuant to CCR, title 27, section 20250, the surface impoundments and the land farm are classified as Class II waste management units.

Pursuant to California HSC Sections 25270 through 25270.13, a facility shall prepare and implement a SPCC Plan if it is either subject to 40 CFR 112 or if the facility has 10,000 gallons or more of petroleum in any or combination of aboveground storage tanks and connecting pipes. This law also requires the immediate reporting, upon discovery, to the Governor's Office of Emergency Services and the CUPA, the occurrence of a spill or release of 42 gallons or more of petroleum. A Spill Prevention Control Countermeasure Plan (SPCC) will be required for AMS that will comply with the Federal Code of Regulations (40 CFR 112 Subpart B) which pertains to the SPCC rule. This federal regulation requires owners or operators of non-transportation-related bulk petroleum storage facilities that have an aggregate aboveground storage capacity greater than 1,320 gallons or a buried storage capacity greater than 42,000 gallons to prepare and maintain a site-specific SPCC Plan for their facility. The SPCC Plan contains information on procedures; methods and equipment at the AMS that are in place to prevent discharges of petroleum from reaching navigable waters. The plan would include measures for addressing discharges of HTF. The requirements for a SPCC Plan for the project are further discussed in the **HAZARDOUS MATERIALS MANAGEMENT** section of the SA.

The applicant expects construction to begin late 2010 and last approximately 24 months. Commercial operation would begin winter 2012 for a planned operational life of 30 years. The AMS could operate for a longer or shorter period depending on economic or other circumstances (AS2009a Section 1.0)

Refer to **PROJECT DESCRIPTION** for a more detailed description of the proposed project and accompanying figures identifying project features and facilities.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

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 and operation.

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 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 by Energy Commission 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 AFC. 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) at 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, an ongoing release is suspected, or to confirm an existing environmental condition.

[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.

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 the proposed project, Energy Commission 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 any mitigation is necessary at the site to ensure protection of human health and the environment from any hazardous substance releases or contamination identified.

Regarding the management of project-related wastes generated during construction and operation of the proposed project, staff reviewed the applicant's proposed solid and hazardous waste management methods to determine whether or not the proposed waste management methods are consistent with the LORS identified for waste disposal and recycling. The federal, state, and local LORS represent a comprehensive regulatory system designed to protect human health and the environment from impacts associated with management of both non-hazardous and hazardous wastes. Absent any unusual circumstances, staff considers project compliance with LORS to be sufficient to ensure that no significant impacts would occur as a result of project waste management.

Staff then reviewed the capacity available at off-site treatment and disposal sites and determined whether or not the proposed power plant's waste would impact the available capacity.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Existing Site Conditions and Potential for Contamination

The 1,765-acre project site is located within an unincorporated area of the County of San Bernardino, California. The site is 10.6 miles northwest of Hinkley, California. All project-related transmission facilities are within the project boundaries (AS2009a Appendix I Page 1).The project site is made up of 16 parcels. Historical uses of the site include agricultural production and cattle ranching. Currently 128 acres of the proposed site is being used for agricultural production. There are also parcels that include undeveloped desert.

A Phase I Environmental Site Assessment (ESA) of the proposed project site, dated May 28, 2009, was prepared by Enviro Check in accordance with the American Society for Testing and Materials Standard Practice E 1527-05 for ESAs (AS2009a Appendix I). The project area is covered by older alluvium consisting of dry, loose-to-medium dense, silty fine-to-coarse sand with occasional gravel. The Phase I identified areas of interest including; remnants of a previous cattle farming operation (pens, watering/feeding toughs), fallow agriculture, aboveground storage tanks, vent pipes normally associated with underground storage tanks, solid waste debris, existing building and structural ruins, and visible staining on soil and concrete throughout the site. Any existing waste on-site is required to be adequately characterized and/or remediated in accordance with all applicable LORS. Based on the findings of the Phase I ESA, staff will need a more detailed characterization of the waste that exists on the site to complete its assessment. Therefore, staff has required the applicant to perform a site investigation, which includes soil sampling and submitting chemical analyses of the various areas of interest necessary for a complete site characterization. **Waste Management Figure 1** show the locations of where soil samples that will be taken throughout the site.

The applicant will use testing methods recommended by US Environmental Protection Agency (EPA) publication SW-846. The EPA publication SW-846, entitled Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, is the Office of Solid Waste's (OSW) official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with the Resource Conservation and Recovery Act (RCRA) regulations. SW-846 primarily functions as a guidance document setting forth acceptable methods for the regulated and regulatory communities to use in responding to RCRA-related sampling and analysis requirements. Testing and analysis for pesticide residue will be verified by USEPA 8081A and USEPA 8151A. Test method USEPA 8015 M will be used to verify the levels of hydrocarbon constituents on the proposed project site. Material samples from existing structures will be tested for lead and asbestos using test methods EPA 6020 and USEPA600/M4-82-020, respectively.

In the event that contaminated soil is later encountered during excavation activities associated with the construction of the project, the soil would be segregated, sampled, and tested to determine appropriate disposal and treatment options. If the soil is classified as hazardous, the San Bernardino County Fire Department would be notified and the soil hauled to a Class I landfill or other appropriate soil treatment and recycling facility, as required. The San Bernardino County Fire Department would be notified also if previously unknown wells, tanks, or other underground storage facilities are discovered during construction (San Bernardino County Ordinances, Title 3 Health and Safety Code). Staff proposes Condition of Certification **WASTE-2**, which would require that an experienced and qualified Professional Engineer or Professional Geologist be available for consultation in the event contaminated soil is encountered during construction. If contaminated soil is identified, **WASTE-3** would require that the Professional Engineer of 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).

Construction Impacts and Mitigation

Site preparation and construction of the proposed project and its associated facilities would last approximately 24 months (AS2009a, page 1-3) and generate both non-hazardous and hazardous wastes in solid and liquid forms. Before construction can begin, the project owner will be required to develop and implement a Construction Waste Management Plan as described in the proposed Condition of Certification **WASTE-3**. This plan must describe all waste streams and methods of managing each waste. Implementation of this plan will ensure that wastes are managed in accordance with appropriate LORS.

Non-Hazardous Wastes

Construction activities as described in the AFC would include site clearing and grading, installation of footings, and installation of the parabolic troughs (AS2009a, Table 5.16-5). Construction non-hazardous solid waste, totaling about 40 cubic yards per week, would consist of paper, wood, glass, plastics from packing material, waste lumber, insulation, scrap metal and concrete, and empty non-hazardous chemical containers (AS2009a, Table 5.16-5). All non-hazardous wastes would be recycled to the greatest extent possible and non-recyclable wastes would be collected by a licensed hauler and disposed of in a solid waste disposal facility (Class III landfill), per Title 14, California Code of Regulations, Section 17200 et seq. (*Minimum Standards for Solid Waste Handling and Disposal*), or in clean fill sites (AS2009a, page 5.16-14).

The San Bernardino County Solid Waste Management Division (SWMD) is responsible for the operation and management of a sanitary landfill system for the disposal of municipal solid waste generated in the unincorporated area within the county and made available to cities within the county (San Bernardino County Ordinances, Title 3 Health and Safety). The landfill disposal system is used for the disposal of municipal solid waste which is not composted, reused, recycled, transformed or otherwise diverted from landfill disposal, pursuant to the California Waste Management Act of 1989. In 1989 the state passed AB 939 that required all local jurisdictions to divert waste from landfill disposal by 50%. Many solid waste generators have significant portions of their waste diverted through recycling programs or at Material Recovery Facilities. However, commercial self-haul customers who take their solid waste to the disposal facilities have limited diversion opportunities. The SWMD has developed the Comprehensive Disposal Site Diversion Program to address materials coming into the landfill from self-haul customers (ESH 2009d, Data Response 78 & 79). In unincorporated areas of San Bernardino County, Burrtec Waste Industries is the exclusive solid waste hauler. SWMD provides oversight, direction and guidance to Burrtec Waste Industries, the county's contractor, for disposal site operations and maintenance. Fees for the Comprehensive Disposal Program are incorporated in Burrtec's hauler fees. The applicant would only participate in the program if Burrtec's services are not used (Richardson 2010, Wulfman 2010). Staff proposes Condition of Certification **WASTE-4,** which will require the applicant to identify the hauler and facilities receiving waste, and to maintain documentation showing the type and volume of waste disposed of. This information shall be maintained at the project site and made accessible to regulatory agencies.

Non-hazardous liquid wastes would be generated during construction, and would include sanitary waste (AS2009a, page 5.16-13). Please see the **SOIL AND WATER RESOURCES** section of this document for more information on the management of project wastewater.

Hazardous Wastes

During construction, anticipated hazardous wastes include waste paint, spent construction solvents, waste cleaners, waste oil, oily rags, waste batteries, and spent welding materials. Approximately 175 gallons of solvents, used oil, paint and oily rags, and 1,000 gallons of Chelant (a heat exchanger cleaning waste), plus 20 batteries, would be generated from construction of the project (AS2009a, page 5.16-13). Empty hazardous material containers would be returned to the vendor or disposed at a hazardous waste facility; solvents, used oils, paint, oily rags, and adhesives would be recycled or disposed at a hazardous waste facility; and spent batteries would be disposed at a recycling facility (AS2009a, Table 5.16-5 page 5.16-13).

The construction contractor is considered to be the generator of hazardous wastes at the site during construction. The construction contractor would be required to obtain a unique hazardous waste generator identification number for the site prior to starting construction, pursuant to proposed Condition of Certification **WASTE-5**. This would ensure compliance with California Code of Regulation Title 22, Division 4.5. Although the hazardous waste generator number is determined based on site location, both the construction contractor and the project owner/operator could be considered the generator of hazardous wastes at the site. Hazardous waste would be collected in hazardous waste accumulation containers and stored in a lay down area, warehouse/shop area, or storage tank on equipment skids for less than 90 days. 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 companies. Staff reviewed the disposal methods in AFC Section 5.16.2 and concludes that all wastes would be disposed of in accordance with all applicable LORS.

In the event that construction excavation, grading, or trenching activities for the proposed project encounter potentially contaminated soils and/or specific handling, disposal, and other precautions that may be necessary pursuant to hazardous waste management LORS, staff finds that proposed Conditions of Certification **WASTE-1** and **WASTE-2** would be adequate to address any soil contamination contingency that may be encountered during construction of the project and would ensure compliance with LORS. Absent any unusual circumstances, staff considers project compliance with LORS to be sufficient to ensure that no significant impacts would occur during construction as a result of project waste management activities.

Operation Impacts and Mitigation

The proposed AMS project would generate both non-hazardous and hazardous wastes in solid and liquid forms under normal operating conditions. Table 5.16-6 of the project AFC gives a summary of the operation waste streams, expected waste volumes and generation frequency, and management methods proposed. Before operations can begin, the project owner would be required to develop and implement an Operations Waste Management Plan as required in the proposed Condition of Certification **WASTE-6**. This would ensure that an accurate record is maintained of the project's waste storage, generation, and disposal, and compliance with waste regulations is maintained during operation.

Heat Transfer Fluid Waste

The AMS project will use solar thermal technology to power a steam-turbine generator. The solar collectors consist of parabolic trough mirrors that heat Therminol VP-1, a petroleum based oil that serves as a heat transfer fluid (HTF). This oil or HTF is a mixture of 26.5% biphenyl and 73.5% diphenyl oxide. The HTF is circulated through a solar steam generator where it transfers heat and generates high pressure steam that turns a steam turbine generator and produces electrical power (AS2009a, page 2-7). Approximately 2,292,000 gallons of Therminol VP-1 would be present with the solar system, including the piping and necessary expansion tanks.

Occasional spills of HTF from either equipment failure or human error can result in the generation of contaminated soil. The applicant estimates that 750 cubic yards per year of soil contaminated with HTF (see AFC Table 5.16-6) would be bioremediated (aeration plus nutrients) or land farmed (aeration only) and approximately 10 yards of HTF-contaminated soil would be sent for disposal at a permitted Class I landfill. (ESH 2009d, Data Response 83 and 86). HTF spills typically spread laterally on the bare ground and soak down to a relatively shallow depth. In these cases, the soil must be removed from the spill site and properly managed. The oil is regulated as a hazardous material by the State of California due to the constituent biphenyl. Biphenyl is listed in Title 22, CCR, Chapter 11 Appendix X (list #299) as an extremely hazardous waste. The listing of a chemical in Appendix X creates the regulatory presumption that a waste containing that chemical (i.e. HTF contaminated soil) is hazardous unless determined otherwise, pursuant to specified procedures.

In an e-mail communication from California Department of Toxic Substances Control (DTSC) (CEC 2009t[2]), they indicated that the determination of whether a discharge of HTF constituted a hazardous waste would need to be made on a case by case basis. Title 22, CCR, section 66260.200(f) places the responsibility of determining whether a waste must be classified as hazardous on the generator of that waste. They also indicated that once a generator establishes a history of managing waste discharges and develops a sufficient data set for characterization of the discharges as hazardous or non-hazardous, DTSC could be petitioned for their concurrence on a standardized waste classification for HTF contaminated soils generated at the facility (Title 22, CCR, section 66260.200(d)). Depending on DTSC findings an operator could modify their operations to standardize treatment and eliminate the need for case by case determinations.

The older facilities such as Luz Solar Energy Stations (SEGS) III through IX have operated in San Bernardino County since 1989 and have a history of using, storing and treating HTF contaminated soils on-site in bioremediation and/or land farm units. DTSC in an April 4, 1995, letter determined that a sample of soil contaminated with HTF in concentrations of less than 10,000 mg/kg was classified as a non-hazardous waste. Soils with concentrations below 10,000 mg/kg were placed in the LTU for treatment and are used as back fill material on the project property. Soil with concentrations in excess of 10,000 mg/kg is contained, handled, managed, and disposed of as a hazardous waste at an approved disposal facility. These criteria are currently used as a basis for ongoing operation of the facility. Also, based on their operation data from this facility, the applicant estimates that approximately 750 cubic yards of HTF-affected soil may be treated per year at the proposed project site.

The HTF system will be designed to minimize the potential for HTF leakage or spills to soil, any occurrences will be reported and the spill will be excavated. The project site will include a bioremediation/land farm units to treat soil contaminated with HTF caused by leaks or spills. The proposed bioremediation and land farm facilities will cover an area of approximately 1.5 acres one will be established at each plant site (ESH 2009d, Data Response 83). Spills of HTF at AMS would be cleaned up within 48 hours, and the contaminated soil would be placed in the staging area of the LTU and covered with plastic sheeting. Samples of excavated HTF contaminated soil would be collected in accordance with the United States Environmental Protection Agency's (USEPA) current

[2] California Energy Commission/ E. Solorio (tn 51934). Staff Dialogue with Department Toxic Substances Control regarding HTF, dated 6/9/09. Submitted to CEC/Docket Unit on 6/11/09.

version of the manual “Test Methods for Evaluating Solid Waste” (SW-846). The waste material would be characterized in accordance with State and Federal requirements and the results would be submitted to DTSC for a determination of the appropriate disposal method based on whether the waste is considered hazardous or non-hazardous. HTF contaminated soil would remain in the LTU staging area until the impacted soils are properly characterized using modified USEPA Method 8015 (ESH 2009d, Data Response 84). Modified USEPA Test Method 8015 is the most common test method used for analyzing total petroleum hydrocarbon (TPH). TPH is defined as the measurable amount of petroleum-based hydrocarbon in an environmental media. The method reports the concentration of purgeable and extractable hydrocarbons, such as gasoline and diesel range organics. The Lahontan Reional Board has determined that 8015, is no longer the appropriate method for biphenyl and diphneyl ether analysis. USEPA Method 1625B (revised July 1, 1995) (40CFR136) will more accurately detect the two compounds (Brathode 2009). Soil characterized as hazardous waste would be transported from the site by a licensed hazardous waste hauler for disposal at a Class I landfill. Soils characterized as non-hazardous would remain and be treated in the LTU (ESH 2009d, Data Response 85).

Staff proposes that once a history of discharges has been established they may petition DTSC, as described above, for their concurrence on a standardized waste classification for HTF contaminated soils generated at the facility. Depending on DTSC findings the applicant would modify their operations to standardize treatment and eliminate the need for case by case determinations.

The applicant’s treatment and disposal methods, as discussed in the **HAZARDOUS MATERIALS MANAGEMENT** Section of this document, are generally consistent with and will be in compliance with the Requirements of Waste Discharge established by the Lahontan Regional Water Quality Control Board (LRWQCB) and presented in **SOIL AND WATER RESOURCES**. Staff proposes Condition of Certification **WASTE-7** to address the Requirements of Waste Discharge. This would require the applicant to comply with the requirements for accidental discharges of HTF associated with the operation of the project and ensure that hazardous concentrations of contaminated HTF-soil will not be treated in the LTU (ESH 2009d, Data Response 85). With implementation of Condition of Certification **WASTE-7** staff believes there would be no significant impacts due to HTF spills during project operation.

Non-hazardous Solid Wastes

Non-hazardous solid wastes generated during project operations would consist of HTF waste from spills, spent dematerialized resin, cooling tower basin sludge, and spent softener resin. To ensure proper disposal of the 10 tons per year of cooling tower basin sludge, staff proposes **WASTE-8,** which requires that the project owner perform the appropriate tests to classify the waste and determine the appropriate method of disposal. Wastes would be recycled to the greatest extent possible and non-recyclable wastes would be removed on a regular basis for disposal in a Class III landfill (AS2009a, pages 5.16-9 to 5.16-10). The project would generate approximately 5,000 cubic yards of non-hazardous solid waste per year (AS2009a, page 5.16-15).

Non-hazardous Liquid Wastes

Non-hazardous liquid wastes generated during the project's operation are further discussed in the **SOIL AND WATER RESOURCES** section of this document. Non-hazardous cooling tower blowdown and the sanitary wastewater would be disposed of in evaporation ponds and a septic leach field, respectively. Stormwater drainage would be drained away from the site to collection ponds and swales, from which the water would percolate or evaporate. Stormwater that comes in contact with hazardous wastes would also be considered hazardous liquid waste. These hazardous liquid wastes are discussed below.

Hazardous Wastes

The project owner/operator would be considered the generator of hazardous wastes at the site during facility operations. Therefore, the project owner's unique hazardous waste generator identification number, obtained prior to construction in accordance with proposed Condition of Certification **WASTE-5**, would be retained and used for hazardous waste generated during facility operation.

The generation of hazardous wastes expected during routine project operation includes used hydraulic fluids, oils, greases, oily filters and rags, spent selective catalytic reduction catalysts, cleaning solutions and solvents, and batteries. In addition, spills and unauthorized releases of hazardous materials or hazardous wastes may generate contaminated soils or materials that may require corrective action and management as hazardous waste. Proper hazardous material handling and good housekeeping practices will 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, staff proposes Condition of Certification **WASTE-9** requiring the project owner/operator to report, clean up, and remediate, as necessary, any hazardous materials spills or releases in accordance with all applicable federal, state, and local requirements. More information on hazardous material management, spill reporting, containment, and spill control and countermeasures plan provisions for the project are provided in the **HAZARDOUS MATERIALS MANAGEMENT** section of this document.

The hazardous wastes generated during the operation of the AMS project would be minor, with source reduction and recycling of wastes implemented whenever possible. The hazardous wastes 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, CCR, §§ 66262.10 et seq.).

Impact on Existing Waste Disposal Facilities

Non-hazardous Solid Wastes

Non-hazardous waste disposal sites suitable for discarding project-related construction and operation wastes are identified in Section 5.16.2 of the AFC (AS2009a). Non-hazardous solid waste would be disposed at the six permitted Class III landfills located in San Bernardino County. As shown on Table 5.16-4 of the AFC, the five landfills have, in combination, over 126 million cubic yards of remaining capacity to operate through their estimated closure dates, which vary from 2012 through 2042 (AS2009a, page 5.16-9). The project will dispose of 4,264 cubic yards of non-recyclable waste during construction and approximately 5,000 cubic yards per year of non-hazardous waste during operation in Class III landfills. Staff believes that the disposal of the solid wastes generated by the AMS project can occur without significantly impacting the capacity or remaining life of any of the facilities located in San Bernardino County.

Hazardous Wastes

Section 5.16.2.2 of the AFC discusses two of California's Class I landfills: Clean Harbor's Buttonwillow landfill in San Bernardino County and Waste Management's Kettleman Hills landfill in Kings County (AS2009a, page 5.16-11). The Kettleman Hills facility accepts Class I waste. In total, there is a combined 16 million cubic yards of remaining hazardous waste disposal capacity at these landfills, with at least 30 years remaining in their operating lifetimes. In addition, the Kettleman Hills facility is in the process of permitting an additional 15 million cubic yards of disposal capacity, and the Buttonwillow facility has 40 years to reach its capacity at its current disposal rate (AS2009a, page 5.16-9).

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. The approximately 121 cubic yards during two years of construction and 43 cubic yards per year during operation will require off-site disposal. This volume would be much less than the remaining capacity of either Class I waste facility. Staff believes that disposal of hazardous wastes generated by the AMS project can occur without significantly impacting the capacity or remaining life of these facilities. Staff believes that the disposal of the hazardous wastes generated by the AMS project can occur without significantly impacting the capacity or remaining life of any of the Class I landfills.

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 [14 Cal. Code Regs., § 15065(A)(3)]. Cumulative impacts can result from actions taking place over time in the same area that are minor when taken individually, but are collectively significant. No projects have been identified in the project vicinity that would create significant cumulative waste management impacts when considered together with the AMS project.

COMPLIANCE WITH LORS

Energy Commission staff concludes that the AMS would comply with all applicable LORS regulating the management of hazardous and non-hazardous wastes during both facility construction and operation. The project owner 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 project operation, the AMS project would be required to obtain a hazardous waste generator identification number from U.S. EPA. The AMS would also be required to properly store, package, and label 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.

Staff has determined that management of the waste generated during construction and operation would comply with waste management laws, ordinances, regulations, and standards if staff's recommended conditions of certification are adopted.

RESPONSE TO AGENCY PUBLIC AND INTERVENOR COMMENTS

Staff received a letter from the Department of Toxic Substances Control (DTSC). The comments in the letter stated that "DTSC has no concerns regarding the future management of hazardous waste at the proposed AMS (DTSC 2008A).

Bill O'Rullian, Supervisor Solid Waste Program, San Bernardino County Environmental Health Services Department, requested a requirement of the project owner to assure "cradle to grave" accountability for waste streams generated at the facility, and prevent illegal dumping, off-site stockpiles, or conditions that constitute a zoning violation or public health nuisance in the counties of Kern, Los Angeles, and San Bernardino. Staff has added Condition of Certification **WASTE-2** to address this concern.

California Unions for Reliable Energy (CURE) offered comments on staff's Preliminary Staff Assessment pertaining to the classification of HTF-contaminated soil (ABJC 2009f pages 55 -57). CURE disputed the project owner's use of a HTF waste classification that was established in a DTSC April 4, 1995 letter. The applicant has revised the mitigation for HTF-contaminated soil in the AMS Project Design Refinements.

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:

1. After review of the applicant's proposed waste management procedures, staff concludes that project wastes would be managed in compliance with all applicable waste management LORS. Staff notes that both construction and operation wastes would be characterized and managed as either hazardous or non-hazardous waste. All non-hazardous wastes would be recycled 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 onsite in accordance with accumulation time limits (90,180, 270, or 365 days depending on waste type and volumes generated) and then properly manifested, transported to, and disposed of at a permitted hazardous waste management facility by licensed hazardous waste collection and disposal companies.

   However, to help ensure and facilitate ongoing project compliance with LORS, staff proposes Conditions of Certification **WASTE-1** through **9**. These conditions would require the project owner to do all of the following:

- Ensure the project site is investigated and any contamination identified is remediated as necessary, with appropriate professional and regulatory agency oversight (**WASTE-1**, **2**, **3**, **5**, **7**, and **9**).
- Obtain a hazardous waste generator identification number (**WASTE-5**).
- Prepare 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-3, 4,** and **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-7** and **8)**.

2. Existing conditions at the AMS project site indicate there are areas where prior site uses may have resulted in releases of hazardous substances or soil contamination. Therefore, staff will review the applicant's site to determine if the proposed AMS project would or would not result in contamination or releases of hazardous substances that would pose a substantial risk to human health or the environment.

3. Regarding impacts of project wastes on existing waste disposal facilities, the existing available capacity for the five Class III landfills that may be used to manage nonhazardous project wastes exceeds 126 million cubic yards. The total amount of nonhazardous wastes generated from construction and operation of the AMS project would be minimal compared to the remaining landfill capacity. Therefore, disposal of project-generated non-hazardous wastes would have a less than significant impact on Class III landfill capacity.

   In addition, the two Class I disposal facilities that could be used for hazardous wastes generated by the construction and operation of the AMS project have a combined remaining capacity in excess of 15 million cubic yards. The total amount of hazardous wastes generated by the AMS project would use less than 0.02% of the remaining permitted capacity. Therefore, disposal of the AMS project-generated hazardous wastes would have a less than significant impact on the remaining capacity at Class I landfills.

Staff concludes that management of the waste generated during demolition, construction and operation of the AMS project would not result in any significant adverse impacts, and would comply with applicable LORS, if the waste management practices and mitigation measures proposed in the AMS project AFC, and staff's proposed conditions of certification, are implemented.

PROPOSED CONDITIONS OF CERTIFICATION

WASTE-1 The project owner shall provide the resume of an experienced and qualified Professional Engineer or Professional Geologist, who shall be available for consultation during building removal, and soil excavation and grading activities, to the CPM for review and approval. The resume shall demonstrate experience in remedial investigation and feasibility studies.

The registered professional engineer or geologist shall be given full authority by the project owner to oversee and modify earth-moving activities to prevent the release or disturbance of contaminated soil.

Verification: At least 30 days before the start of site mobilization, the project owner shall submit the resume to the CPM for review and approval.

WASTE-2 If potentially contaminated soil is unearthed during building removal or excavation at either the proposed site or at 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 file a written report to the project owner and to the 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 further 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 Hazardous Materials Division of San Bernardino County's Environmental Health Services Department for guidance and possible oversight.

Verification: The project owner shall submit any final reports filed by the Professional Engineer or Professional Geologist to the CPM within five days of their receipt. The project owner shall notify the CPM within 24 hours of any orders issued to halt construction.

WASTE-3 The project owner shall prepare a Construction Waste Management Plan for all wastes generated during construction of the facility, and shall submit the plan to the Compliance Project Manager (CPM) for review and approval. 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; 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: No fewer than 30 days before the start of site mobilization, the project owner shall submit the Construction Waste Management Plan to the CPM for approval.

WASTE-4 During the construction and operation phase, the project owner shall maintain copies of the contracted waste and/or refuse haulers documentation of each waste load transferred from the construction site to a disposal site and/or recycling center. The project owner shall maintain the haulers lists of the names of permitted solid waste facilities or recycling centers locations receiving the project's construction waste, and copies of all weigh tickets.

Verification: The project owner shall identify permitted solid waste facilities or recycling centers that receive construction waste and maintain copies of weigh tickets and manifests showing the type and volume of waste disposed. This information shall be maintained at the project site and made accessible to CPM and the San Bernardino County Environmental Health Service Department Solid Waste Program.

WASTE-5 The project owner shall obtain a hazardous waste generator identification number from the United States Environmental Protection Agency 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 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 The project owner shall prepare an Operation Waste Management Plan for all wastes generated during operation of the facility (including construction, operation and dismantling of the onsite manufacturing building) and shall submit the 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 conversations 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.

Verification: The project owner shall submit the Operation Waste Management Plan to the CPM for approval no less 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-7 The project owner shall submit to the CPM and DTSC for approval the applicant's assessment of whether the HTF contaminated soil is considered hazardous or non-hazardous under state regulations. HTF-contaminated soil that exceeds the hazardous waste levels must be disposed of in accordance with California Health and Safety Code (HSC) Section 25203. HTF-contaminated soil that does not exceed the hazardous waste levels may be discharged into the land farm. For discharges into the land farm, the project owner shall comply with the Waste Discharge Requirements contained within in the **SOIL & WATER RESOURCES** section of the Staff Assessment.

Verification: The project owner shall document all releases and spills of HTF as described in Condition of Certification **WASTE-9** and as required in the **SOIL & WATER RESOURCES** section of the Staff Assessment. Cleanup and temporary staging of HTF-contaminated soils shall be conducted in accordance with the approved Operation Waste Management Plan required in Condition of Certification of **WASTE-6**. The project owner shall sample HTF-contaminated soil 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 1625B or other method to be reviewed and approved by DTSC and the CPM.

Within 14 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 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 (HSC) Section 25203 and procedures outlined in the approved Operation Waste Management Plan required in Condition of Certification **WASTE-6** and reported to the CPM in accordance with Condition of Certification **WASTE-9**.

If DTSC and the CPM determine the HTF-contaminated soil is considered non-hazardous it shall be retained in the land farm and treated on-site in accordance with the Waste Discharge Requirements contained in the **SOIL & WATER RESOURCES** section of the Staff Assessment.

WASTE-8 The project owner shall ensure that the cooling tower basin sludge is tested pursuant to Title 22, California Code of Regulations, and section 66262.10 and report the findings to the CPM. The handling, testing, and disposal methods for sludge shall be identified in the Operation Waste Management Plan required in Condition of Certification **WASTE -6**.

Verification: The project owner shall report the results of filter cake testing to the CPM within seven days of sampling. If two consecutive tests show that the sludge is non-hazardous, the project owner may apply to the CPM to discontinue testing. The test results and method and location of sludge disposal shall also be reported in the Annual Compliance Report required in Condition of Certification **WASTE -6**.

WASTE-9 The project owner shall ensure that all spills or releases of hazardous substances, materials, or waste are reported, cleaned up, and remediated as necessary, in accordance with all applicable federal, state, and local requirements.

Verification: The project owner shall document all unauthorized releases and spills of hazardous substances, materials, or wastes that are in excess of reportable quantities (RQs) that occur on the project property or transmission corridors during construction and on the project property during operation. The documentation shall include, at a minimum, the following information:

- Location of release;
- Date and time of release;
- Reason for release;
- Volume released;
- Amount of contaminated soil/material generated;
- How release was managed and material cleaned up;
- 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.

Copies of the unauthorized spill documentation shall be provided to the CPM within 30 days of the date the release was discovered.

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CEC 2009s - CEC / P. Kramer (TN 54399). Hearing Officer Informational Hearing Presentation, dated 12/9/2009. Submitted to CEC on 12/10/2009.

CEC 2009t - CEC / C. Hoffman (TN 54400). Project Manager Informational Hearing Presentation, dated 12/9/2009. Submitted to CEC on 12/10/2009.

CEC 2009u - CEC / N. Vahidi (TN 54396). Report of Conversation with San Bernardino Planning Staff, dated 12/3/2009. Submitted to CEC on 12/10/2009.

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CRWQCB 2010a - California Regional Water Quality Control Board / J. Brathovde (TN 54839). Abengoa Mojave - Lahontan RWQCB Waiting on RoWD to Submit Permit Requirements, dated 1/14/2010 Submitted to CEC on 1/14/2010.

CRWQCB 2010b - California Regional Water Quality Control Board / D. Rice (TN 55168). Letter from SWRCB to CEC Regarding State Policies for Water Quality Control and their Applicability to Power Plant Licensing, dated 1/20/2010 Submitted to CEC on 2/4/2010.

CSB 2010b - County of San Bernardino / C. Hyke (TN 55097). Suggested Conditions of Approval from San Bernardino Co. Submitted to CEC on 2/1/2010.

DTSC 2009a - Department of Toxic Substances Control / G. Holmes (TN 54397). Request for Agency Participation response, dated 12/07/09. Submitted to the CEC on 12/08/09.

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WORKER SAFETY AND FIRE PROTECTION

Testimony of Alvin Greenberg, Ph.D.

SUMMARY OF CONCLUSIONS

Staff concludes that if the applicant for the proposed Abengoa Mojave Solar (AMS) 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 **-7**, the project would incorporate sufficient measures to ensure adequate levels of industrial safety and comply with applicable laws, ordinances, regulations, and standards. The proposed conditions of certification provide assurance that the Construction Safety and Health Program and the Operations and Maintenance Safety and Health Program proposed by the applicant 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 also determined that the project will have a significant impact on the local fire protection services. The proposed facility would be located in an area that is currently served by the San Bernardino County Fire Department (SBCFD). The fire risks at the proposed facility will pose significant added demands on local fire protection services and therefore staff proposes Condition of Certification **WORKER SAFETY-6** as mitigation to reduce the impacts to less than significant.

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 AMS and to determine whether the applicant 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.

Worker Safety and Fire Protection Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	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)	
Fire and Hazardous Materials: San Bernardino County Code, Title 2, Division 3, Chapter 1 et seq.	Includes California Fire Code and specific codes to regulate permits activities and administrative penalties. Adopts the 2007 California Fire Code and adopts State requirements and guidelines as governing hazardous materials release response plans and inventories.
Health and Safety: San Bernardino County Code Title 3, Division 1, et seq.	Includes specific codes to regulate permits, activities (e.g., solid waste management), and administrative penalties.
Building and Construction: San Bernardino County Code, Title 6, Division 3, Chapter 1 et seq.	Adopts national standards such as Uniform Building Code and National Electrical Code.

SETTING

The proposed facility would be located in San Bernardino County approximately nine miles northwest of the city of Hinkley within an agricultural area. The site will be separated into two solar sites called Alpha and Beta each with its own power block. The Alpha site will be separated by Harper Lake Road and the Beta site will be separated from Alpha by Lockhart Road.

Fire support services to the site would be under the jurisdiction of the San Bernardino County Fire Department (SBCFD), North Desert Division. There are a total of twenty fire stations within the SBCFD North Desert Division, the closest of which would be Hinkley Station #125, located at 37284 Flower Street, approximately 14 miles from the AMS site. This station is staffed with paid on-call firefighters, so their response time can range from 15 minutes to no response if they are unavailable. The next closest SBCFD stations would be Silver Lakes/Helendale Station #4 (located off Route 66 between Barstow and Victorville, about 33 miles from the project site) and Harvard Station #46 (located northeast of Barstow, about 50 miles from the project site). Station #4 is staffed full time with four personnel and would respond within 20-30 minutes. Station #46 would respond within 30-50 minutes. In addition to the SBCFD stations, the Barstow Fire Protection District located about 30 miles away would respond to the AMS site though a mutual aid agreement. All personnel at the SBCFD North Desert Division are trained as Emergency Medical Technicians (EMT) Level-1 and as first responders to hazardous materials incidents. The large majority of personnel are also trained paramedics (AS 2009a, Section 5.11.2.6 and SBCFD 2010).

The applicant has stated that certain plant personnel would be trained as a hazardous materials response team and that one or more spill response kits would be available on-site. In the event of a large incident involving hazardous materials, backup support would be provided by the SBCFD which has a hazmat response unit capable of handling any incident at the proposed AMS. The SBCFD Hazmat unit is located at Station #322 in Adelanto, about 50 miles away, and would respond in about 45 minutes (AS 2009a, Sections 5.6.2.1 and 5.6.4.2 and SBCFD 2010).

Worker Safety and Fire Protection Table 2
Fire and Emergency Response for the AMS project*

SBCFD Station	Total Response Time**	Distance to AMS	EMS/HazMat Capability***
Hinkley Station #125	15 min or no response	~14 miles	Y/Y
Silver Lakes/Helendale Station #4	20-30 min	~33 miles	Y/Y
Harvard Station #46	30-50 min	~50 miles	Y/Y

***Source: phone conversation with Chief Weis (SBCFD 2010)
**Total response times are estimated from the moment a 911 call is made to arrival at the site and are dependent upon traffic conditions and other variables.
***All personnel are trained to EMT-1 level and first responder for hazardous materials incidents, and about 95% of personnel are trained paramedics.

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 (AS 2009a, Section 5.16.2.3 & Appendix I). To address the unlikely possibility that soil contamination would be encountered during construction of the AMS, proposed Conditions of Certification **WASTE-1** and **WASTE-2** require a registered professional engineer or geologist to be available during soil excavation and grading to ensure proper handling and disposal of contaminated soil. See the staff assessment section on **WASTE MANAGEMENT** for a more detailed analysis of this topic.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Two issues are assessed in WORKER SAFETY-FIRE PROTECTION:

1. The potential for impacts on the safety of workers during demolition, construction, and operations activities, and

2. Fire prevention/protection, emergency medical response, and hazardous materials spill response during demolition, construction, and operations.

Worker safety issues are thoroughly addressed by 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 applicant 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 applicant 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 applicant 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 applicant 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.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Worker Safety

Industrial environments are potentially dangerous during construction and operation of facilities. Workers at the proposed AMS 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 AMS 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 applicant 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 AMS 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
- Hazard Communication Program
- Heat and Cold Stress Monitoring and Control Program
- Pressure Vessel and Pipeline Safety Program

The Application for Certification (AFC) includes adequate outlines of each of the above programs (AS 2009a, Section 5.18.3.1). Prior to the start of construction of AMS, detailed programs and plans would be provided to the California Energy Commission Compliance Project Manager (CPM) and to the SBCFD pursuant to the Condition of Certification **WORKER SAFETY-1**.

Operations and Maintenance Safety and Health Program

Prior to the start of operations at AMS, 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 AMS, which the applicant 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 (AS 2009a, Section 5.18.3.1). Prior to operation of AMS, all detailed programs and plans would be provided to the CPM and SBCFD pursuant to Condition of Certification **WORKER SAFETY-2**.

Safety and Health Program Elements

As mentioned above, the applicant 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 (AS 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 (AS 2009a, Section 5.18.3.3). 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.

Staff proposes that the applicant submit a final Fire Prevention Plan to the CPM for review and approval and to the SBCFD for review and comment to satisfy proposed Conditions of Certification **WORKER SAFETY-1** and **WORKER SAFETY-2**.

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 AMS 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 (AS 2009a, Section 5.18.3.3).

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 heat a heat transfer fluid (HTF) to approximately 750°F. The pipe containing the HTF will reach temperatures at the mirror focal point as high as 1100 °F. Experience at existing solar generating stations shows that these mirrors break, the pipes age, and HTF can leak and catch fire from ball joints or frayed flex hoses. The area under the solar arrays must be kept free from weeds and thus herbicides will be applied as necessary. Exposure to workers via inhalation and ingestion of dusts containing herbicides poses a health risk. Finally, workers will inspect the solar array for HTF leaks and broken mirrors at least once each day by driving up and down dirt paths between the rows of mirrors and even under the mirrors. 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 applicant has indicated that workers will be adequately trained and protected, but has not included precautions against heat stress and exposure to herbicides. Therefore, to ensure that workers are indeed protected, staff has proposed additional requirements to proposed Conditions of Certification **WORKER SAFETY-1** and **2**. These requirements consist of the following provisions:

- A worker heat stress protection plan that implements and expands on existing Cal OSHA regulations (8 CCR 3395) requiring heat illness prevention; and
- The development and implementation of Best Management Practices (BMP) for the storage and application of herbicides used to control weeds beneath and around the solar array.

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. A BMP requiring proper herbicide storage and application will mitigate potential risks to workers from exposure to herbicides and reduce the chance that herbicides will contaminate either surface water or groundwater. Staff suggests that a BMP follow either the guidelines established by the U.S. EPA (EPA 1993), or more recent guidelines established by the State of California or U.S. EPA.

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% of the labor force. Approximately 1.5 million of these workers are self-employed.
- Of approximately 600,000 construction companies, 90% 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%) between 1980 and 1993.
- Construction injuries account for 15% 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. Therefore, in order to meet the intent of the OSHA standard to provide for a safe workplace during power plant construction, staff proposes Condition of Certification **WORKER SAFETY-3,** which would require the applicant/project owner to designate and provide for a power plant site Construction Safety Supervisor.

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 recent 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:

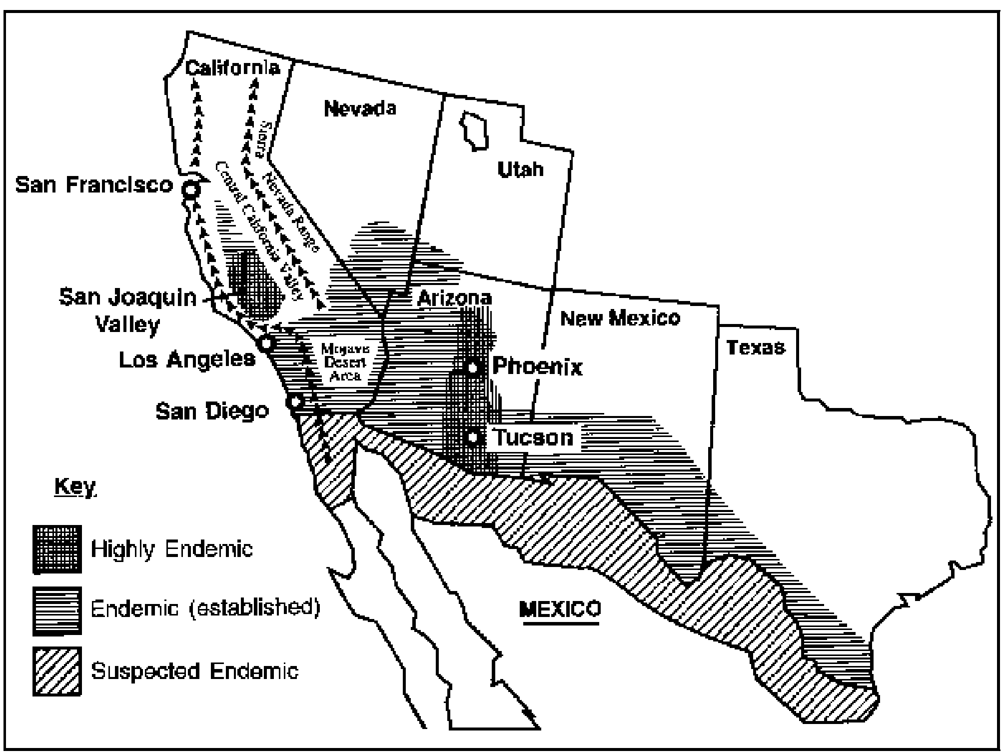
- Lack of posted confined space warning placards/signs;
- Confusing and/or inadequate electrical and machinery lockout/tagout permitting and procedures;
- Confusing and/or inappropriate procedures for handing over lockout/tagout and confined space permits from the construction team to commissioning team 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 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.

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. Kern County, located at the southern end of San Joaquin valley, is where valley fever occurs most frequently (Valley Fever Vaccine Project of the Americas 2010; KCDPH 2008). While the area where the highest rate was found is that part of Kern County to the west of the Sierra Nevada-Tehachapi Range, the eastern side along with the western side of San Bernardino County experience high rates as well. The proposed AMS will be in located in the western part of San Bernardino County and thus staff feels that the following discuss which focuses on Kern County is applicable to this project site as well.

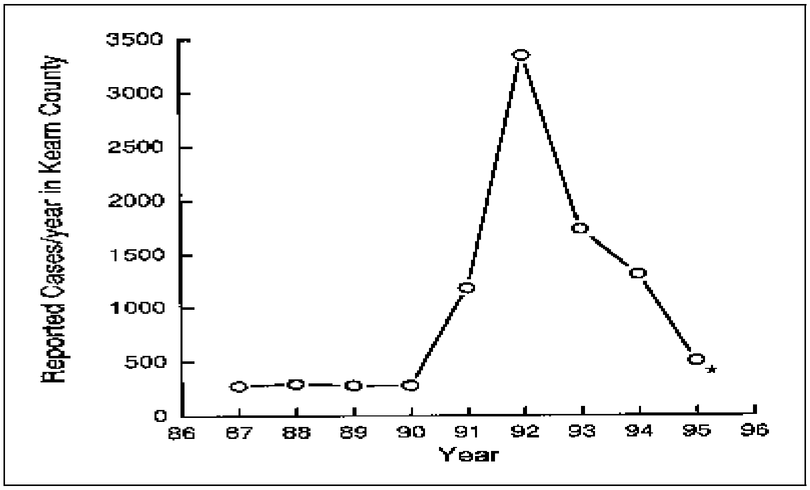
Worker Safety Figure 1
The Geographic Distribution of Coccidioidomycosis*



*Source: CDC 2006, Figure 2

In 1991, 1,200 cases of VF were reported to the California Department of Health Services (CDHS) compared with an annual average of 428 cases per year for the period of 1981 to 1990. In 1992, 4,516 cases were reported in California, and 4,137 cases in 1993. Seventy percent of VF cases were reported from Kern County (CDC 1994; Flaherman 2007; CDHS 2010).

Worker Safety Figure 2
Number of Coccidioidomycosis Cases
Identified by Serologic Testing at the Kern County
Public Health Laboratory Between 1986 and 1996*



*Source: CDC 2006, Figure 4

A 2004 CDC report found that the number of reported cases of coccidioidomycosis in the US increased by 32% 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 (8.7%) 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. The data shows that Kern County had the highest total number and highest frequency of hospitalizations (Flaherman 2007).

Worker Safety Table 1
Hospitalizations for Coccidioidomycosis, California, 1997–2002*

Category	Total hospitalizations	Total person-yrs ($\times 10^6$)	Frequency of hospitalization**	Frequency of hospitalization for coccidioidal meningitis**
Total	7,457	203.0	3.67	0.657
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
Highest Incidence Counties				
Kern	1,700	3.97	42.8	
Tulare	479	2.21	21.7	
Kings	133	0.77	17.4	
SLO	170	1.48	11.5	

*Source: Flaherman 2007 **Per 100,000 residents per year

A 1996 paper that tried to explain the sudden increase in Coccidioidomycosis cases that began in the early 90s 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 (CDC 2006). 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 (CDC 2006). 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 4% 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).

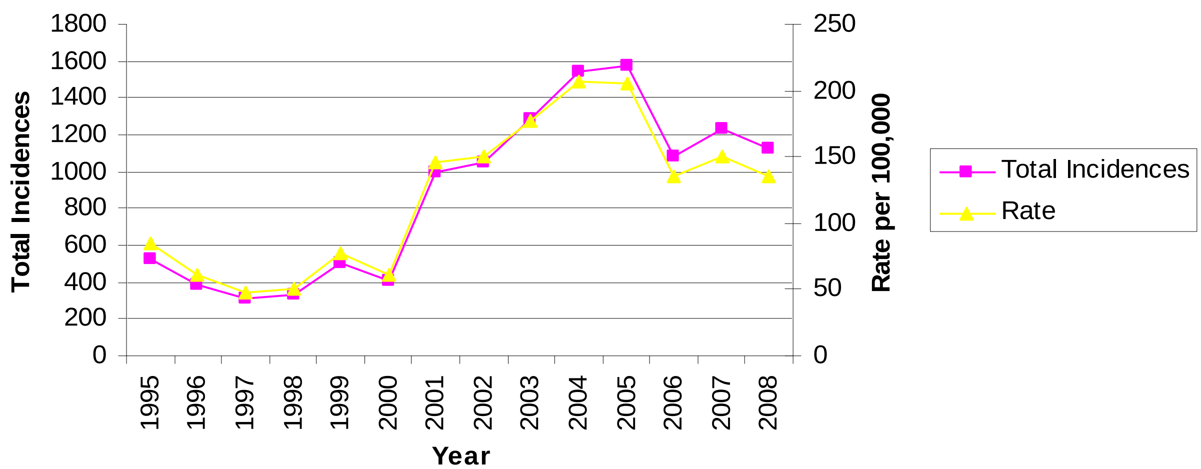
Data from the Kern County Department of Public Health (KCDPH) on the period between 1995 and 2008 shows that VF cases increased in Kern County during the early 1990's, decreased during the late 1990's, increased again between 2000 and 2005, and have been declining slightly in the last several years. The KCDPH data also shows that the particular area of Ridgecrest does not have high incident rates of VF. The majority of VF cases are recorded in the Bakersfield area where 50-70% of all Kern County VF cases occur. Delano, Lamont, and Taft have the next highest recorded incidences of VF. With the exception of the year 2004 when 26 cases of VF were reported in the Ridgecrest area, less than 15 cases have been recorded annually in Ridgecrest since 1995, representing less than 5% of the total cases recorded in Kern County (KCDPH 2008).

Worker Safety Table 2: Valley Fever Cases In Kern County 1995 – 2008*

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Kern County Cases	523	382	307	328	504	406	994	1055	1281	1540	1578	1081	1229	1128
Rate per 100,000	84.5	61	48.3	51.2	77.1	61	145.7	150.9	177.7	206.9	204.9	135.2	150.4	135.1

*Source: KCDPH 2008, Table 1

Figure 3: VF Cases in Kern County 1995 - 2008*



*Source: KCDPH 2008, Figure 2

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).

A VF website claims that most cases of valley fever do not require treatment. Even though 30-60% of the population in areas where the disease is highly prevalent - such as in the southern San Joaquin Valley of California - have positive skin tests indicating previous infection, most were unaware of ever having had valley fever (“Valley Fever Vaccine Project of the Americas” 2010).

Worker Safety Table 3 - Disease Forms

CATEGORIES	**NOTES**
Asymptomatic	• Occurs in about 50% 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
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

Given the available scientific and medical literature on Valley Fever, it is difficult for staff to assess the potential for VF to impact workers during construction and operation of the proposed RSEP with a reasonable degree of certainty. However, the higher number of cases reported in Kern County indicates that the project site may have an elevated risk for exposure, despite the fact that the Ridgecrest area itself has recorded less than 15 cases per year since 1995. To minimize potential exposure of workers and also the public to coccidioidomycosis during soil excavation and grading, extensive wetting of the soil prior to and during construction activities should be employed and dust masks should be worn at certain times during these activities. The dust (PM10) control measures found in the Air Quality section of this SA/DEIS should be strictly adhered to in order to adequately reduce the risk of contracting VF to less than significant. Towards that, staff proposes Condition of Certification **WORKER SAFETY-7** which would require that the dust control measures found in proposed Conditions **AQ-SC3** and **AQ-SC4** be supplemented with additional requirements.

Fire Hazards

During construction and operation of the proposed AMS 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. Fires of heat transfer fluid such as that proposed for use in the solar panels at AMS are rare. Compliance with all LORS would be adequate to assure protection from all fire hazards.

Staff reviewed the information provided in the AFC and spoke to representatives of the SBCFD 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 project 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. In the event of a major fire, fire support services, including trained firefighters and equipment for a sustained response, would be provided by the SBCFD (SBCFD 2010).

Construction

During construction, the permanent fire protection systems proposed for the AMS would be installed as soon as practical and 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 Program (AS 2009a, Section 5.18.3.2).

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. Access to the project would be provided via eight gated access roads equipped with either manual locks or key cards. These access roads would provide two entrance points into each of the four gated sections of the AMS site (see Table 14 and Figure "Proposed Access Plan" provided as an attachment to Data Response Item 92) and would be wide enough for emergency vehicles (ESH 2009c, Data Response Item 92). Having two access points is sound fire safety procedure and allows for fire department vehicles and personal to access the site should the main gate be blocked.

Fire suppression elements in the proposed plant would include both fixed and portable fire extinguishing systems. The fire water would be supplied from on-site wells and stored in two service water storage tanks (one per power island) with a dedicated fire protection supply of 360,000 gallons each. Each water storage tank would feed a fire protection water-piping network with pressure maintained by one electric fire pump and one diesel-fueled backup firewater pump (AS 2009a, Section 5.18.3.3).

Fire hydrants would be installed throughout the site per NFPA requirements. A sprinkler deluge system would be installed in areas of risk including each unit transformer, HTF expansion tank, and HTF circulating pump area. A sprinkler system would be installed at each STG and in administrative buildings. 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. The solar fields would be protected by isolation valves that would allow only a finite amount of HTF to burn before extinguishing (AS 2009a, Section 5.18.3.3).

According to NFPA standards and 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 applicant 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 SBCFD prior to construction and operation of the project to confirm the adequacy of the proposed fire protection measures.

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 has concluded that incidents at power plants that require EMS response are infrequent and represent an insignificant impact on the local fire departments, except for rare instances where 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 on site in order to treat cardiac arrythmias resulting from industrial accidents or other non-work related causes.

Staff proposes Condition of Certification **WORKER SAFETY-5,** which would require 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.

CUMULATIVE IMPACTS 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 Regulation, Title 14, section 15130).

GEOGRAPHIC EXTENT

The geographic areas considered for cumulative impacts on Worker Safety/Fire Protection are within the project boundaries and the regional area served by the local fire department.

EXISTING CUMULATIVE CONDITIONS

For this analysis, there is one project in the area or region that may require the response from off-site fire departments for fire, HazMat, or EMS emergencies, which is the existing SEGS (units VIII and IX), a solar power plant with a combined generation capacity of 160 MW, located immediately northwest of the proposed AMS site. However, this facility is not considered by staff to have had an impact on the area.

Staff has analyzed the potential for Worker Safety/Fire Protection cumulative impacts at many other power plant projects in California. A significant cumulative Worker Safety/Fire Protection impact is defined as the simultaneous need for a fire department to respond to multiple locations such that its resources and those of the mutual aid fire departments (which routinely respond in every-day situations to emergencies at residences, commercial buildings, and heavy industry) are over-whelmed and cannot effectively respond. Staff believes that cumulative impacts are possible and that despite the many safeguards implemented to both prevent and control fires, HazMat releases, and injuries/accidents at solar power plants, the great distances involved in the desert and the many solar plants that are proposed for San Bernardino County all may cause a significant cumulative impact. Staff therefore believes cumulative impacts on the local fire department would be significant. If staff’s proposed mitigation as described in Condition of Certification **WORKER SAFETY-6** is adopted, the impact to the SBCFD would be mitigated to less than significant.

FUTURE FORESEEABLE PROJECTS

<u>Foreseeable Projects in the Project Area</u>

Worker Safety/Fire Protection at the proposed project may also be affected by reasonably foreseeable future projects, including the proposed nearby solar project and wind project (see **Cumulative Impacts Table 3** and **Figure 2**). The SBCFD stated that if a large incident occurred at this facility, they would have to use additional county resources and mutual aid agreements, which they expect would impact their jurisdiction due to the limited staff and equipment stationed in the region (SBCFD 2010).

The applicant will develop and implement a fire prevention program for the AMS independent of any other projects considered for potential cumulative impacts. Staff believes that cumulative impacts are possible and that despite the many safeguards implemented to both prevent and control fires, HazMat releases, and injuries/accidents at solar power plants, the great distances involved in the desert and the many solar plants that are proposed for San Bernardino County all may cause a significant cumulative impact. Staff therefore believes cumulative impacts on the local fire department would be significant. If staff's proposed mitigation as described in Condition of Certification **WORKER SAFETY-6** is adopted, staff concludes that the AMS's contribution to a Worker Safety/Fire Protection cumulative impact would be less than significant.

Foreseeable Renewable Projects in the California Desert

As noted above, cumulative impacts in the area of Worker Safety and Fire Protection can only occur in the general vicinity of the project and therefore impacts to the greater region are not feasible.

FACILITY CLOSURE

The AMS project would be designed for an operating life of between 30 years to 40 years. Depending on maintenance factors, at an appropriate point beyond the designed operating life, the project would cease operation and close down. At that time, it would be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts.

Although the setting for this project does not appear to present any special or unusual closure problems, it is impossible to foresee what the situation would be in 30 years or more when the project ceases operation. Therefore, provisions must be made which provide the flexibility to deal with the specific situation and project setting at the time of closure. Facility closure would be consistent with laws, ordinances, regulations and standards in effect at the time of closure.

OVERALL CONCLUSIONS

Staff finds that this project may have a significant incremental burden on the SBCFD's ability to respond to a fire or medical emergency both individually and cumulatively and recommends mitigation in the form or proposed Condition of Certification **WORKER SAFETY-6** to reduce this impact to less than significance.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments have been received.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Staff concludes that construction and operation of the AMS 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 worker safety and fire protection.

CONCLUSIONS

Staff concludes that if the applicant for the proposed AMS 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 Condition of Certification **WORKER SAFETY-3** through**-7**, the project would incorporate sufficient measures to ensure adequate levels of industrial safety and comply with applicable LORS. Staff also concludes that the operation of this power plant would not significantly impact the local fire department if staff's proposed mitigation is implemented.

PROPOSED CONDITIONS OF CERTIFICATION

WORKER SAFETY-1 The project owner shall submit to the Compliance Project Manager (CPM) a copy of the Project Construction Safety and Health Program containing the following:

- A Construction Personal Protective Equipment Program;
- A Construction Exposure Monitoring Program;
- A Construction Injury and Illness Prevention Program;
- 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.

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 San Bernardino County Fire Department 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 San Bernardino 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 containing the following:

- An Operation Injury and Illness Prevention Plan;
- 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 (8 Cal Code Regs. § 3221); 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 San Bernardino 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 San Bernardino 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 60 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:

- Record of all employees trained for that month (all records shall be kept on site for the duration of the project);
- Summary report of safety management actions and safety-related incidents that occurred during the month;
- Report of any continuing or unresolved situations and incidents that may pose danger to life or health; and
- 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, and for implementing 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.

Verification: At least 60 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.

Verification: 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 either (1) reach an agreement with the San Bernardino County Fire Department regarding funding of its project-related share of capital costs to provide appropriate equipment as mitigation of project-related impacts on fire protection, HazMat, and/or EMS services along with an annual payment to maintain and provide these services, **or**, if no agreement can be reached shall (2) fund its share of the capital costs in the amount of $350,000 plus provide an annual payment of $100,000 to the SBCFD for the support of additional 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 to the CPM either a copy of the agreement or documentation that the $350,000 payment and the first annual payment has been made.

In the annual compliance report submitted to the CPM, the project owner shall provide documentation that the annual payment has been made unless an agreement is reached with the KCFD that an annual payment is not required.

WORKER SAFETY-7 The project owner shall develop and implement an enhanced Dust Control Plan that includes the requirements described in **AQ-SC3** and additionally requires:

i) Site worker use of dust masks (NIOSH N-95 or better) whenever visible dust is present;

ii) Site monitoring for the presence of Coccidioides immitis in soil before site mobilization and monthly thereafter; and

iii) Implementation of enhanced dust control methods (increased frequency of watering, use of dust suppression chemicals, etc. consistent with **AQ-SC4**) immediately whenever visible dust comes from or onto the site.

After three consecutive months of not finding significant soil levels of Coccidioides immitis, the project owner may ask the CPM to re-evaluate and revise this testing requirement.

Verification: At least 60 days prior to the commencement of site mobilization, the enhanced Dust Control Plan shall be provided to the CPM for review and approval.

REFERENCES

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ENGINEERING ASSESSMENT

FACILITY DESIGN

Testimony of Erin Bright

SUMMARY OF CONCLUSIONS

The California Energy Commission staff concludes that the design, construction, and eventual closure of the project and its linear facilities would likely comply with applicable engineering laws, ordinances, regulations and standards. The proposed 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 Abengoa Mojave Solar (AMS) project. 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 will be designed and constructed in accordance with all applicable engineering LORS, in a manner that also ensures 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 applicant's proposed design criteria, including identification of criteria essential to public health and safety;
- Proposed modifications and additions to the application for certification (AFC) necessary for compliance with applicable engineering LORS; and
- Conditions of certification proposed by staff to ensure that the project will be designed and constructed to ensure public health and safety and comply with all applicable engineering LORS.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Lists of LORS applicable to each engineering discipline (civil, structural, mechanical, and electrical) are described in the AFC (AS 2009a, Appendix J). 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	2007 (or the latest edition in effect) California Building Standards Code (CBSC) (also known as Title 24, California Code of Regulations)
Local	San Bernardino 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)

SETTING

AMS would be built on an approximately 1,700-acre site located in San Bernardino County. 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 AFC, Appendix J (AS 2009a).

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 and 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 applicant'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 applicant to adopt a compliance monitoring scheme that will 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 applicant proposes the use of accepted industry standards (see AS 2009a, Appendix J, 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.

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. See condition of certification (**GEN-2)**, below.

AMS shall be designed and constructed to the 2007 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 2007 CBSC takes effect, the 2007 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 applicant 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 (AS 2009a, Appendix J; ESH 2009c, DR 89). 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 AMS is actually designed, procured, fabricated, and installed as described in this analysis.

COMPLIANCE MONITORING

Under 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 applicant, 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 applicant pays in lieu of CBC permit fees to cover the costs of these reviews and inspections.

Engineering and compliance staff will invite San Bernardino County or a third-party engineering consultant to act as CBO for this project. When an entity has been assigned CBO duties, Energy Commission staff will complete a memorandum of understanding (MOU) with that entity to outline both its roles and responsibilities and those of its subcontractors and delegates.

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 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 applicant 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 (decommissioning) when it reaches the end of its useful life ranges from "mothballing," to the removal of all equipment and appurtenant facilities and subsequent restoration of the site. Future conditions that could affect decommissioning are largely unknown at this time.

In order to ensure that decommissioning will be completed in a manner that is environmentally sound, safe, and protects the public health and safety, the applicant shall submit a decommissioning plan to the Energy Commission for review and approval before the project's decommissioning begins. The plan shall include a discussion of:

- Proposed decommissioning activities for the project and all appurtenant facilities that were constructed as part of the project;
- All applicable LORS, local/regional plans, and proof of adherence to those applicable LORS and local/regional plans;

- The activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities; and
- Decommissioning alternatives other than complete site restoration.

Satisfying the above requirements should serve as adequate protection, even in the unlikely event that the project is abandoned. Staff has proposed general conditions (see **GENERAL CONDITIONS**) to ensure that these measures are included in the Facility Closure Plan.

CONCLUSIONS AND RECOMMENDATIONS

1. The laws, ordinances, regulations and standards (LORS) identified in the AFC and supporting documents directly apply to the project.

2. 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.

3. The proposed conditions of certification will ensure that AMS 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.

4. 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 2007 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.

CONDITIONS OF CERTIFICATION

GEN-1 The project owner shall design, construct, and inspect the project in accordance with the 2007 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, or maintenance 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 CBSC is in effect, the 2007 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.

Verification: 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.

<u>Verification:</u> 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. These fees may be consistent with the fees listed in the 2007 CBC, adjusted for inflation and other appropriate adjustments; 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.

<u>Verification:</u> 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.

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, 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 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 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 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 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 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.

<u>Verification:</u> 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 of any major structure or component listed in **Facility Design Table 2** of condition of certification **GEN-2**, above, the project owner shall submit to the CBO for design review and approval the proposed lateral force procedures for project structures and the applicable designs, plans and drawings for project structures. Proposed lateral force procedures, designs, plans and drawings shall be those for the following items (from **Table 2**, above):

1. Major project structures;
2. Major foundations, equipment supports, and anchorage; and
3. Large field-fabricated tanks.

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 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 2007 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 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. Physical layout drawings and drawings not related to code compliance and life safety need not be submitted. 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);
- 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 Bernardino 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

AS 2009a - Abengoa Solar Inc. / E. Garcia (TN 52813). Application for Certification for AMS Project (09-AFC-5), dated 7/2009. Submitted to CEC on 8/10/2009.

ESH 2009c - Ellison, Schneider and Harris / C. Ellison (TN 54243). Written Responses to Data Request Set 1 (nos. 1-93), dated 11/23/09. Submitted to CEC on 11/24/2009.

GEOLOGY AND PALEONTOLOGY

Testimony of Michael S. Lindholm, P.G.

SUMMARY OF CONCLUSIONS

The proposed Abengoa Mojave Solar (AMS) site is located in an active geologic area of the north-central Mojave Desert geomorphic province in southwest San Bernardino County in south-central California. Because of its geologic setting, the site could be subject to intense levels of earthquake-related ground shaking and settlement due to earthquake-induced liquefaction. Near-surface, compressible soils are also present. The effects of strong ground shaking, liquefaction and compressible soils would need to be mitigated, to the extent practical, through structural designs required by the California Building Code (CBC 2007) and the project geotechnical report. The CBC (2007) requires that structures be designed to resist seismic stresses from ground acceleration and, to a lesser extent, liquefaction. A geotechnical evaluation has been performed and presents standard engineering design recommendations for mitigation of seismic shaking and site soil conditions.

There are no known viable geologic or mineralogical resources at the proposed AMS site. Locally, paleontological resources have been documented within older Quaternary alluvium which underlies the younger Quaternary alluvium of 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**.

Based on its independent research and review, California 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, mineralogic, and paleontologic resources from the construction, operation, and closure of the proposed project. It is staff’s opinion that the proposed AMS 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, California Energy Commission (Energy Commission) staff discusses the potential impacts of geologic hazards on the proposed AMS site as well as the project’s potential impacts on geologic, mineralogic, and paleontologic resources. Staff’s objective is to ensure that there would be no consequential adverse impacts to significant geological and paleontological resources during the project construction, operation, and closure and that operation of the plant would not expose occupants to high-probability geologic hazards. A brief geological and paleontological 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.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Applicable laws, ordinances, regulations, and standards (LORS) are listed in the application for certification (AFC) (AS 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 Law	Description
Federal	
Antiquities Act of 1906 (16 United States Code [USC], 431-433)	The proposed AMS facility site is located entirely on private land. Although there is no specific mention of natural or paleontological 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 Bureau of Land Management (BLM), the Forest Service (USFS), and other Federal agencies.
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 Earthquake 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 paleontological resources from state lands, defines unauthorized removal of fossil resources as a misdemeanor, and requires mitigation of disturbed sites.

Applicable Law	Description
Warren-Alquist Act, PRC, Sections 25527 and 25550.5(i)	The Warren-Alquist Act requires the Energy Commission to "give the greatest consideration to the need for protecting areas of critical environmental concern, including, but not limited to, unique and irreplaceable scientific, scenic, and educational wildlife habitats; unique historical, archaeological, and cultural sites…" With respect to paleontologic resources, the Energy Commission relies on guidelines from the Society for Vertebrate Paleontology, indicated below.
California Environmental Quality Act (CEQA), PRC sections 15000 et seq., Appendix G	Mandates that public and private entities identify the potential impacts on the environment during proposed activities. Appendix G outlines the requirements for compliance with CEQA and provides a definition of significant impacts on a fossil site.
Society for Vertebrate Paleontology (SVP), 1995	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 by the SVP, a national organization of professional scientists.
Local	
San Bernardino County 2007 Development Code, Chapters 82.15, 82.20 and Safety Element	Chapter 82.15 requires that a geological study will be undertaken where roads and structures are to be constructed. Also requires that roads and utilities will be perpendicular to faults. Chapter 82.20 defines criteria for site evaluation for paleontological resources in the county, including preliminary field surveys, monitoring during construction, and specimen recovery; also defines qualifications for professional paleontologists. The Safety Element requires compliance with geological/geotechnical reports, the CBC, and other state agencies and regulations.

SETTING

The proposed AMS project would be constructed on 1,765 acres approximately six miles north of State Highway 58 and nine miles northwest of Hinkley, San Bernardino County, California. The property is located entirely on privately owned land which was formerly used for agriculture and is adjacent to the existing Solar Electric Generating Stations (SEGS) VIII and IX.

The proposed AMS project would be a primary power generating facility capable of producing 250 megawatts (MW) of electricity, and would be constructed in two phases. Phase one, known as the Alpha phase, would involve construction of a 125-MW facility on 884 acres in the northwest portion of the property. Phase two or the Beta phase would generate an additional 125 MW from the remaining 800 acres in the southeast portion of the property. (AS 2009a). Power would be generated by parabolic trough and heat transfer fluid technology. Supporting facilities would include a power block building for each phase. Water for the project would be provided from ground water supply wells. The water would be treated to potable standards by an onsite packaged water treatment system, and waste water from the power generating process would be disposed of by evaporation from two concrete-lined ponds. On-site ancillary facilities associated with the solar array would include buried water and natural gas pipe lines, and an electrical transmission line connecting the new substation to the existing Southern California Edison (SCE) Kramer-Cool Water 230-kV transmission Line at the southern edge of the property.

REGIONAL SETTING

The proposed site is located in the central portion of the Mojave Desert physiographic province in Southern California (Norris and Webb 1990). 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 occupies approximately 25,000 square miles in southeastern California and portions of Nevada, Utah, and Arizona. The topography in the Mojave Desert of California is predominately southeast to northwest, and is associated with similarly-oriented faulting. A secondary east to west orientation correlates with structural trends in the Transverse Ranges physiographic province.

PROJECT SITE DESCRIPTION

The proposed AMS facility would be constructed on 1,765 acres (roughly 2.75 square miles) of land north of State Route 58. The proposed site is approximately half way between Kramer Junction and Barstow, and about nine miles northwest of the town of Hinkley in San Bernardino County, California. The potential site is located within the structurally defined Eastern California Shear Zone (ECSZ), and lies near the southwest edge of Harper Lake on land formerly used for irrigated agriculture. Overall the proposed site slopes northeast toward the local topographic low at Harper Lake.

Quaternary age alluvial and lacustrine sedimentary deposits are mapped in the vicinity of the proposed AMS site (CDMG 1962; CDMG 1986; Dibblee 2008 a and b). The surface material over the entire site is unconsolidated, undissected alluvial sediments of Holocene age, which consists of loose to slightly indurated beds of gravel, sand and silt. Argillaceous clays and micaceous silts deposited on mudflats and in a shallow playa lake environment are mapped just northeast of the site in the Harper Lake playa lakebed. These sediments are also shown to be Holocene in age, and likely interfinger with and grade laterally to coarser alluvial sands and gravels to the southwest away from the lake. The California Division of Mines and Geology (CDMG) mapping (CDMG1962; CDMG1986) indicates that both units may contain Pleistocene age materials at depth. Older, locally dissected alluvium of Pleistocene age, which consists of weakly consolidated gravel, sand and silt, is exposed southwest of the proposed site. These deposits probably underlie younger alluvial and lacustrine sediments at an unknown, possibly shallow depth. Older fine-grained lakebed deposits may be interbedded with coarser sediments as well.

Sixty-eight hollow stem auger borings and eight test pits were advanced for the proposed project geotechnical evaluation included in the AFC (AS 2009a). Most borings and test pits explored to a depth of 11.5 feet or less across the site. In locations where construction of the alpha and beta power blocks and other facilities are proposed, borings were advanced to depths ranging from 21.5 to 51.5 feet. The predominant soil type encountered in all locations was well graded sand with silt to silty sand that contains 9 - 24% non-plastic fines. Locally, content of fines increases to 42%. Clayey sand, sandy lean and fat clays were encountered in deeper borings. The fine-grained and clayey sand soils were generally present below 19 feet, vary in thickness from several feet to greater than 15 feet, and are more abundant in the vicinity of the beta power block nearer to Harper Lake. Content of fines ranges from 46 - 55%. Clayey sand, sandy lean clay and sandy silt beds are present at the surface and are interbedded with silty sand in test pits on the margins of Harper Lake. The geotechnical evaluation indicates that all granular and fine-grained soils from the surface are older alluvium, with the exception of a single test pit which encountered 2.5 feet of lacustrine sediments at the surface in Harper Lake.

Blowcounts taken while driving standard penetration test (SPT) and modified split-barrel drive samplers indicate the relative density of soils is medium dense to dense, and commonly very dense in deeper borings. Blowcounts of less than 10 were recorded at a depth of five feet in only three borings scattered across the proposed site. Consolidation testing on samples of sandy fat clay (taken from a minimum depth of 20 feet) indicates that these soils are compressible. The geotechnical evaluation also indicates the surface soils are “generally compressible” (AS 2009a).

The proposed AMS plant site is not crossed by any known active faults, but a designated Alquist-Priolo Earthquake Fault Zone (EFZ, formerly called Special Studies Zones) is delineated in the northeastern part of the property (CDMG 1988). A continuous trench was excavated an average depth of roughly six feet across the entire EFZ perpendicular to the strike of the possible fault (AS 2009a). No evidence for active faulting was found. A number of major, active faults lie within 62 miles of the site. These faults are discussed in detail under the **GEOLOGICAL HAZARDS** section later in this section of staff’s assessment.

The geotechnical evaluation performed for the AMS project (AS 2009a) indicates that the regional ground water table is in excess of 100 feet below the surface, according to California Department of Water Resources (CDWR) records (CDWR 2009). Perched water was encountered in borings and test pits at depths ranging from 4 to 10 feet near Harper Lake, 32 and 33 feet at the Alpha power block location, and 27 and 31 feet in the vicinity of the Beta power block. Water level monitoring at nearby well 11N04W29R001S indicates the depth to water in the primary regional aquifer was 145 feet below ground surface on March 19, 2008 (CDWR 2009). The geotechnical evaluation reports that historic ground water levels on the site have ranged from 19 feet in 1919 to 176 feet in 1996, and that water levels are currently rising due to decreased agricultural pumping (AS 2009a). Water levels beneath the site would vary seasonally and with pumping frequency of nearby irrigation wells.

Existing grade at the proposed power plant site slopes between 1 - 2.5% to the north and northeast towards Harper Lake. Site drainage is by a combination of infiltration and overland sheet flow. A more complete discussion of on-site drainage is included in the **WATER RESOURCES** section of this staff assessment

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 impact the proposed facility could have on existing geologic, mineralogic, and paleontologic resources in the area.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

No federal LORS concerning geologic hazards and geologic and mineralogic resources apply to this project. The California Building Standards Code (CBSC) and CBC (2007) provide geotechnical and geological 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, landslides, tsunamis and seiches, and volcanic hazards.

The California Environmental Quality Act (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 paleontological resource or site or a unique geological 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.

Staff has reviewed geologic and mineral resource maps for the surrounding area, as well as site-specific information provided by the applicant, to determine if geologic and mineralogic resources exist in the area and to determine if operations could adversely affect geologic and mineralogic resources.

Staff reviewed existing paleontologic information and requested records searches for the site area from the Natural History Museum of Los Angeles County and the San Bernardino County Museum (SBCM). Site-specific information generated by the applicant for the 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. Conditions of certification which outline required procedures to mitigate impacts to potential resources, are proposed herein as part of the project's approval.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Ground shaking, liquefaction, and subsidence due to compressible 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. Proposed 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 AMS site is not located within an established Mineral Resource Zone (MRZ) and no economically viable mineral deposits are known to be present at the site (Kohler 2006). Several operating and inactive mines and mineral prospects are present within five miles of the proposed project boundaries. These have produced a number of industrial minerals, including clay, limestone and aggregate. Several inactive gold mines, located on the flanks of the hills and mountains surrounding the Harper Lake valley, are present within 10 miles of the proposed site. No mines are known to have existed within the proposed project boundaries (USGS 2008b).

Near-surface geology beneath the proposed site consists primarily of Quaternary alluvium which increases in age with depth from Holocene at the surface to Pleistocene and older at depth (Dibblee 2008a and b). Coarse-grained sediments grade laterally and are interbedded with lakebed deposits of similar ages to the northeast towards Harper Lake. Pleistocene age older alluvium, which is exposed to the southwest, underlies younger alluvium and lacustrine sediments at an unknown depth on the proposed site. Because most of the proposed site was once tilled for agricultural purposes, the upper 1 to 2 feet of the surface is disturbed.

Staff reviewed correspondence from the Natural History Museum of Los Angeles County (LACM) (McLeod 2009), the SBMC (Scott 2009), and the confidential paleontological resources assessment report (SWCA 2009) for information regarding known fossil localities and stratigraphic unit sensitivity within the proposed project area. Twenty fossil collection sites were recorded by the SBCM within the proposed project boundaries. All fossils were recovered from Quaternary alluvium, but the age of the sediments (Holocene or Pleistocene) of the fossils were not definitively determined. Precise fossil recovery depths are not given, but the SBCM report (Scott 2009) does indicate that some specimens were collected from backfill material from five-foot deep trenches. Vertebrate species collected from these sites include jack and cottontail rabbits, rodents, pocket mouse, antelope squirrel, western chub, and other unspecified chordates and mammals. Gastropods and bivalves have also been recovered. Other major fossil finds consisting of unspecified small vertebrates and invertebrates occur in alluvium within one mile of the proposed project site. The LACM has recorded 11 fossil localities beyond one mile of the project area and ancillary facilities. These include gopher and king snakes, leopard lizard, cottontail rabbit, pocket mouse, kangaroo rat and pocket gopher from younger and older alluvium, and minnow, pond turtle, aquatic birds and terrestrial mammals from lacustrine deposits.

Because the upper 1 to 2 feet of the surface of the proposed AMS site is disturbed, the material is unlikely to contain significant paleontological resources within their natural context. Based on the recorded fossil finds, staff concludes the paleontological resource sensitivity of undisturbed Quaternary alluvium and lacustrine sediments varies from low at shallow depths to very high at greater depths. The paleontological resources assessment report attached to the AFC (SWCA 2009) assigns a low sensitivity rating to alluvial and lacustrine sediments within three feet of the surface, and a high sensitivity rating below. Staff agrees that undisturbed soil within three feet of the surface has a relatively higher probability for being Holocene in age; however, the depth to Pleistocene sediments is currently unknown and could be shallower or deeper. Staff concludes that excavation beneath disturbed ground could encounter Pleistocene age deposits, and all undisturbed sediments should initially be treated as highly sensitive. As monitoring of grading and trenching activities during proposed construction of the site progresses, a qualified professional paleontologist may 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.

Overall, staff considers the probability for significant paleontological resources to be encountered during proposed site construction activities to be negligible in disturbed ground within 1 to 2 feet of the surface. However, for proposed mass grading, deep foundation excavation and utility trenching that penetrates underlying undisturbed soils, the potential for exposure of paleontological resources would be considered to be high, until determined otherwise by the project paleontological resource specialist. This assessment is based on SVP (1995) criteria and the paleontological report appended to the AFC (SWCA 2009). Proposed Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate paleontological resource impacts, as discussed above, to less than significant levels. These conditions essentially require a worker education program in conjunction with the monitoring of earthwork activities by a qualified professional paleontologist (a paleontologic resource specialist, or PRS).

The proposed conditions of certification would allow the Energy Commission's compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with 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, direct or indirect impacts to the project, from geologic hazards, and to potential geologic, mineralogic, and paleontologic resources, from the proposed project, would be low with implementation of the conditions of certification herein proposed.

GEOLOGICAL HAZARDS

The AFC provides documentation of potential geologic hazards at the proposed AMS plant site, including site-specific subsurface information (AS 2009a). Review of the AFC, coupled with staff's independent research, indicates that the potential for geologic hazards to impact the proposed plant site during its practical design life would be low if recommendations for mitigation of seismic shaking, liquefaction, and settlement due to compressible soils are followed. These geologic hazards are addressed in the project geotechnical evaluation attached to the AFC per CBC (2007) requirements (AS 2009a).

Staff's independent research included the review of available geologic maps, reports, and related data of the AMS plant site. Geological information was available from the California Geological Survey (CGS), California Division of Mines and Geology (CDMG, now know as CGS), the U.S. Geological Survey (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 CDMG and USGS publications as well as informational websites in order to gather data on the location, recency, and type of faulting in the proposed project area. Type A and B faults within 62 miles (100 kilometers) of the proposed AMS site are listed in **Geology and Paleontology Table 2**. 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 2**. Because of the large size of the proposed site, the distances to faults are measured from the proposed control building location within the site.

Geology and Paleontology Table 2
Active Faults Relative to the Proposed Mojave Solar Project Site

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Estimated Peak Site Acceleration (g)	Fault Type and Strike	Fault Class
Lenwood-Lockhart-Old Woman Sprgs.	1.4	7.5	0.758	Right-Lateral Strike Slip (Northwest)	B
Gravel Hills-Harper Lake	7.8	7.1	0.323	Right-Lateral Strike Slip (Northwest)	B
Helendale-S. Lockhart	8.3	7.3	0.343	Right-Lateral Strike Slip (Northwest)	B
Blackwater	13.9	7.1	0.215	Right-Lateral Strike Slip (Northwest)	B
Calico-Hidalgo	22.4	7.3	0.167	Right-Lateral Strike Slip (Northwest)	B
Landers	30.7	7.3	0.131	Right-Lateral Strike Slip (Northwest)	B
Garlock (East)	35.0	7.5	0.132	Left-Lateral Strike Slip (Northeast)	A
North Frontal Fault Zone (West)	40.3	7.2	0.123	Reverse (West)	B
Garlock (West)	43.2	7.3	0.101	Left-Lateral Strike Slip (East)	A
Tank Canyon	43.7	6.4	0.076	Normal (Northwest)	B
Little Lake	45.1	6.9	0.079	Right-Lateral Strike Slip (Northwest)	B
Johnson Valley (Northern)	47.0	6.7	0.069	Right-Lateral Strike Slip (Northwest)	B
Panamint Valley	47.7	7.4	0.099	Right-Lateral Normal Oblique Slip (Northwest)	B
Owl Lake	48.1	6.5	0.061	Left-Lateral Strike Slip (Northeast)	B
San Andreas: Whole	48.5	8.0	0.134	Right-Lateral Strike Slip (Northwest)	A
San Andreas: Cholame-Carrizo-Mojave	48.5	7.8	0.120	Right-Lateral Strike Slip (Northwest)	A
San Andreas: Mojave	48.5	7.4	0.097	Right-Lateral Strike Slip (Northwest)	A
Southern Sierra Nevada	48.6	7.3	0.112	Normal (North to Northeast)	B
Pisgah-Bullion Mtn.-Mesquite Lake	48.8	7.3	0.092	Right-Lateral Strike Slip (Northwest)	B
Cleghorn	49.0	6.5	0.060	Left-Lateral Strike Slip (West)	B
San Andreas: San Bernardino	50.9	7.5	0.099	Right-Lateral Strike Slip (Northwest)	A
San Andreas: SB-Coachella	50.9	7.7	0.110	Right-Lateral Strike Slip (Northwest)	A
Cucamonga	51.1	6.9	0.087	Reverse (West)	B
San Jacinto: San Bernardino	54.0	6.7	0.062	Right-Lateral Strike Slip (Northwest)	B
North Frontal Fault Zone (East)	54.9	6.7	0.074	Reverse (West)	B
Emerson South-Copper Mtn.	55.1	7.0	0.071	Right-Lateral Strike Slip (Northwest)	B
Clamshell-Sawpit	57.4	6.5	0.065	Reverse (Northeast))	B
Sierra Madre	57.8	7.2	0.093	Reverse (West)	B

Other Type C and otherwise undifferentiated faults which are more than 20 miles from the proposed site are not discussed here because they are unlikely to undergo movement or generate seismicity which could affect the project.

The potential power plant site is located within a structural area variously referred to in literature as the Barstow-Bristol trough (Glazner et al. 2000), the Eastern California Shear Zone (ECSZ) (Dokka and Travis 1990), and the Mojave Extensional Belt (Ross 1995). All refer, fully or in part, to an area of the Mojave Desert geomorphic province (the Mojave Desert block) which is characterized by northwest trending right-lateral strike-slip faulting which is responsible for approximately 40 miles of lateral offset within the region since the middle Miocene.

Twenty eight Type A and B faults and fault segments were identified within 62 miles of the potential site (**Geology and Paleontology Table 2**). Of these, four are within 15 miles of the site. These are the Lenwood-Lockhart-Old Woman Springs, the Gravel Hills-Harper Lake, the Helendale-South Lockhart, and the Blackwater fault zones. All four faults are subparallel Type B right-lateral northwest trending strike-slip fault systems which lie within designated Alquist-Priolo Earthquake Fault Zones (CDMG 2003). Of these, only the Lenwood-Lockhart-Old Woman Springs EFZ, shown to cross the northeastern part of the proposed AMS site, might contain a fault with a potential for surface rupture (CDMG 1988). However, a fault investigation conducted by Ninyo & Moore (AS 2009a) did not reveal the presence of an active fault within the EFZ.

Evidence of Holocene movement has been found on nearly every major fault in the ECSZ (Trieman et al. 2002). Events such as the Landers earthquake (magnitude 7.3), which occurred on June 28, 1992 approximately 62 miles from the proposed site (Blake 2000b), demonstrate that the proposed site could be subject to intense levels of earthquake-related ground shaking in the future. The effects of strong ground shaking would need to be mitigated, to the extent practical, through structural designs required by the CBC (2007) and the site-specific project geotechnical report.

The estimated bedrock peak horizontal ground acceleration (Site Class B) for the power plant is 0.50 times the acceleration of gravity (0.50g) (USGS 2008a). Based on drilling data, including standard penetration resistance blowcounts, and on the soil profile generated for the site by the geotechnical evaluation, the soils at the proposed AMS site were determined to be Site Class D (CBC 2007; AS 2009a). Buildings and structures are required to be designed with adequate strength to resist the effects of Design Earthquake Ground Motion, as defined by the CBC (2007). This motion is calculated using the site classification, occupancy categories and site coefficients, which in turn are used to determine the design spectral response acceleration parameters at short and 1-second periods. These parameters are generally provided in the design-level geotechnical report for the specific project site.

The potential for strong ground shaking will be addressed in proposed Facility Design Condition of Certification **GEN-1**. Proper design in accordance with this condition, as well as with requirements presented in the site-specific, design-level geotechnical evaluation, should adequately mitigate seismic hazards to the current standards of practice.

Liquefaction

Liquefaction is a condition in which a saturated cohesionless soil may lose shear strength because of a 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.

Geotechnical investigation at the proposed site indicated current depths to water in borings and test pits range from 4 to 10 feet near Harper Lake, 32 and 33 feet at the Alpha power block location, and 27 and 31 feet in the vicinity of the Beta power block. These are likely perched, as water level monitoring at nearby well 11N04W29R001S indicates the depth to the primary regional aquifer was 145 feet below ground surface on March 19, 2008 (CDWR 2009). The geotechnical evaluation also reports that historic ground water levels on the site have ranged from 19 feet in 1919 to 176 feet in 1996, and that water levels are currently rising due to decreased agricultural pumping (AS 2009a).

The geotechnical evaluation indicated that potentially liquefiable sandy beds are present in areas of the subsurface where perched ground water is present. Differential settlement was calculated to be ½ inch and ¾ inch over a horizontal distance of 40 feet at the Alpha and Beta power blocks, respectively (AS 2009a). Therefore, there would be a potential for liquefaction-induced settlement beneath the site during strong seismic events, although the effects would be minor and localized. Measures to mitigate potential catastrophic damage due to liquefaction are presented in the site specific geotechnical evaluation (AS 2009a). Liquefaction potential on the proposed AMS site is also addressed in the proposed Condition of Certification **GEN-1** requirements.

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. Although the proposed AMS site may be subject to minor 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 proposed site surface. Lateral spreading potential on the proposed AMS site was addressed in the project geotechnical report per CBC (2007).

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 is soil density). The decrease in volume can result in settlement of overlying structural improvements. The site specific geotechnical evaluation indicates there would be a potential for minor and localized dynamic compaction resulting from liquefaction during an earthquake (AS 2009a). However, dynamic compaction in dry granular soils is not indicated to be a design consideration for the proposed project.

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 site specific geotechnical evaluation reports that subsurface alluvial deposits which underlie the site do not contain soils that would experience significant hydrocompaction (AS 2009a). However, the report does consider the surface soils to be “generally compressible”, although blowcounts recorded during hollow-stem auger boring indicate the relative density of soils is medium dense to dense, and commonly very dense at depth.

Subsidence

Local subsidence or settlement may occur when areas containing compressible soils are subjected to foundation or fill loads. The site-specific geotechnical evaluation considers the alluvial deposits at the surface which underlie the proposed AMS site to be “generally compressible”. However, the relative density of the granular soils determined from hollow-stem auger borings indicate the materials are generally medium-dense to very dense, which would be unlikely to experience unusual levels of settlement from foundation loading.

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. No petroleum or natural gas withdrawals are taking place in the proposed site vicinity. Ground water extraction for day-to-day site operations would be low and unlikely to cause localized subsidence. It is not known if historic regional subsidence due to ground water withdrawal for irrigation occurred in the proposed site area. However, ground water overdraft for crop irrigation ended in 1996, and water levels within the primary aquifer beneath the site have begun to rise. Therefore, negative impacts to the proposed project due to subsidence resulting from petroleum, natural gas, or ground water extraction would be unlikely.

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 geotechnical evaluation indicates near-surface soils at the proposed site are composed of granular soils, with a low content of non-plastic fines, which are not considered to be expansive (AS 2009a).

Landslides

Due to the low site gradient and the absence of topographically high ground in the site vicinity, the potential for landslide impacts to the site is considered to be negligible.

Flooding

The proposed AMS area has not been mapped by the Federal Emergency Management Agency (FEMA) for flood potential (FEMA 2009). Because the proposed site is topographically higher than Harper Lake to the northeast, it is staffs 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 Kramer Hills and Iron Mountains southwest and south of the site. Storm waters would be carried across the proposed site from roughly southwest to northeast via existing drainages and by sheet flow. Site drainage would be modified during project construction to mitigate potential impacts due to catastrophic flooding (AS 2009a).

Tsunamis and Seiches

The proposed AMS site and associated linear facilities are 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 proposed AMS site is located approximately 42 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 et al. 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 could also 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 proposed AMS 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

Energy Commission staff has reviewed applicable geologic maps, reports, and on-line resources for this area (Blake 2000a and b; CDMG 1990; CDMG 1994; CDMG 1998; CDMG 1999; CDMG 2003; CGS 2002a and b; CGS 2007; Jennings and Saucedo 2002; SCEC 2006; USGS 2003; USGS 2008a and b). Staff did not identify any geological or mineralogical resources at the proposed AMS facility location.

Energy Commission staff reviewed the Paleontological Resources Assessments in Section 5.9 and Appendix E of the AFC (AS 2009a, SWCA 2009). Staff has also reviewed paleontological literature and records searches conducted by the LACM (McLeod 2009) and the San Bernardino County Museum (Scott 2009). These reports document 20 recorded fossil localities in Holocene to Pleistocene age alluvium and lakebed sediments within the proposed AMS site boundaries, as well as numerous others in similar sedimentary deposits within one mile of the project. Based on these recorded fossil finds and the age of the sediments, the paleontological resource sensitivity of undisturbed Quaternary alluvium and lacustrine sediments varies from low at shallow depths to high at deeper depths. 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. After monitoring of grading and trenching activities during proposed construction of the site, the project paleontological resource specialist may determine a more 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. Because the upper 1 to 2 feet of the surface of the proposed AMS site is disturbed, the material is unlikely to contain significant paleontological resources within their natural context and is assigned a negligible paleontological sensitivity rating.

These conclusions are based on SVP criteria, the Paleontological Resource Assessments in the AFC (SWCA 2009), and the independent records searches and paleontological reviews provided by McLeod (2009) and Scott (2009). Proposed Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate paleontological resource impacts, 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 a qualified professional paleontologist (a paleontologic resource specialist, or PRS).

The proposed AMS site is not located within an established Mineral Resource Zone (MRZ) and no economically viable mineral deposits are known to be present (Kohler 2006). Numerous mines and mineral prospects, which have produced clay, limestone, aggregate and gold, are present within 10 miles of the proposed project. No mines are known to have existed within the proposed project boundaries (USGS 2008b).

The proposed conditions of certification would allow the Energy Commission's compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with LORS applicable to geologic hazards and the protection of geologic, mineralogic, and paleontologic resources.

Construction Impacts and Mitigation

The design-level geotechnical evaluation, required for the project by the CBC (2007) and proposed Condition of Certification **GEN-1** should provide standard engineering design recommendations for mitigation of earthquake ground shaking and excessive settlement due to liquefaction and compressible soils (see **PROPOSED CONDITIONS OF CERTIFICATION, FACILITY DESIGN**).

As noted above, no viable geologic or mineralogic resources are known to exist in the vicinity of the proposed AMS site. Construction of the proposed project will include grading, foundation excavation, and utility trenching. Based on the soils profile, SVP assessment criteria, and recorded fossil localities on the proposed site, staff considers the probability of encountering paleontological resources to be negligible in the upper 1 to 2 feet of the disturbed surface and high in undisturbed sediments.

Proposed Conditions of Certification **PAL-1 to PAL-7** are designed to mitigate any paleontological 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 earthwork activities by qualified professional paleontologists (paleontologic resource specialist, or PRS). Earthwork would be halted any time potential fossils are recognized by either the paleontologist or the worker. 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 paleontological resource specialist would be retained, for the project by the applicant, to produce a monitoring and mitigation plan, conduct the worker training, and provide the monitoring.

During the 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 AMS site, the PRS would determine an appropriate depth above which undisturbed alluvial and lacustrine sediments are Holocene in age, have a low paleontological sensitivity, and have little chance of containing significant fossils. The PRS could then recommend decreased monitoring for excavations above that depth. Paleontological 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 Mojave Solar Project, the applicant has proposed monitoring and mitigation measures to be followed during the construction of the project. Energy Commission staff agrees with the applicant that the facility could be designed and constructed to minimize the effect of geologic hazards and impacts to potential paleontological resources at the site during project design life.

Operation Impacts and Mitigation

Operation of the proposed new solar energy generating facility should not have any adverse impact on geologic, mineralogic, or paleontologic resources.

CUMULATIVE IMPACTS AND MITIGATION

Cumulative impacts correspond to a proposed project's potential incremental effect, together with other closely related past, present, and reasonably foreseeable future projects whose impacts on geologic, mineralogic, and paleontologic resources compound to increase the overall impact on the environment.

No geologic hazards which would arise due to cumulative effects during operation of the proposed facility were identified during this investigation.

Paleontological resources have been documented in the general area of the proposed project and within the project boundaries. As the value of paleontological resources is associated with their discovery within a specific geologic host unit, the potential impacts to paleontological resources due to construction activities would be mitigated as required by proposed 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).

Based on the above discussion, staff believes that the potential for significant adverse cumulative impacts to the proposed project from geologic hazards during the project's design life would be negligible and that the potential for impacts to geologic, mineralogic, and paleontologic resources would be very low.

Based upon the literature and archives search, field surveys, and compliance documentation for the submitted AMS project, the applicant proposes monitoring and mitigation measures for construction of the proposed project. Staff agrees with the applicant that the project can be designed and constructed to minimize the effects of geologic hazards at the site and that impacts to fossils encountered during construction would be mitigated to levels of insignificance.

The proposed conditions of certification allow the Energy Commission CPM and the applicant to adopt a compliance monitoring scheme ensuring compliance with applicable LORS for geologic hazards and geologic, mineralogic, and paleontologic resources.

FACILITY CLOSURE

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.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff has not received any agency or public comments regarding geologic hazards, mineral resources, or paleontology at this time.

CONCLUSIONS

The applicant should easily be able to comply with applicable LORS, provided that the proposed conditions of certification are implemented and followed. The design and construction of the project 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 proposed conditions of certification listed below.

PROPOSED CONDITIONS OF CERTIFICATION

General conditions of certification with respect to engineering geology are proposed under Conditions of Certification **GEN-1, GEN-5, and CIVIL-1** in the **FACILITY DESIGN** section. Proposed paleontological conditions of certification follow. It is staff's opinion that the likelihood of encountering paleontologic resources would be high at the plant site.

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.

<u>Verification:</u>

(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.

<u>**Verification:**</u>

(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 five 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.

Verification: 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.

<u>Verification:</u>

(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 presentation 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
Mojave Solar Project (09-AFC-5)

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
1.			
2.			
3.			
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Cultural Trainer: ______________ Signature: __________________ Date: ___ /___ /___

PaleoTrainer: _______________ Signature: __________________ Date: ___ /___ /___

Biological Trainer: ___________ Signature: __________________ Date: ___ /___ /___

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POWER PLANT EFFICIENCY

Testimony of Erin Bright

SUMMARY OF CONCLUSIONS

The Abengoa Mojave Solar project (AMS), if constructed and operated as proposed, would generate 250 megawatts (MW) (nominal net output) of electricity. The project would be a solar thermal power plant proposed on an approximately 1,700-acre site in San Bernardino County, California. The project would use the concentrated parabolic trough solar thermal technology to produce electrical power using a steam turbine generator fed from a solar steam generator. AMS would use solar energy to generate all of its capacity; fossil fuel, in the form of natural gas, would be used only to maintain steam seals and keep the temperature of the heat transfer fluid above its relatively high freezing point.

The project would decrease reliance on fossil fuel, and would increase reliance on renewable energy resources. 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 AMS project, if constructed and operated as proposed, would occupy approximately six acres per MW of power output, a figure about a quarter that of some other solar power technologies.

INTRODUCTION

FOSSIL FUEL USE EFFICIENCY

One of the responsibilities of the California Energy Commission (Energy Commission) is to make findings on whether the energy use by a power plant, including the proposed AMS, would result in significant adverse impacts on the environment, as defined in the California Environmental Quality Act (CEQA). If the Energy Commission finds that AMS's energy consumption creates a significant adverse impact, it must further determine if feasible mitigation measures could eliminate or minimize that impact. In this analysis, staff addresses the inefficient and unnecessary consumption of energy.

In order to support the Energy Commission's findings, this analysis will:

- Examine whether the facility would likely present any adverse impacts upon energy resources;
- Examine whether these adverse impacts are significant; and if so,
- Examine whether feasible mitigation measures or alternatives could eliminate those adverse impacts or reduce them to a level of insignificance.

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. Solar power plants do occupy vast tracts of land, so the focus for these types of facilities shifts from fuel efficiency to land use efficiency. To analyze the land use efficiency of a solar facility staff utilizes 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 or a Stirling Engine-powered 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. Even in a desert environment, disturbing and shading hundreds or thousands of acres of land can impact environmental resources. The extent of these impacts is likely in direct proportion to the number of acres affected. For this reason, staff will evaluate the land use efficiency of proposed solar power plant projects. This efficiency will be expressed in terms of power produced, or MW per acre, and in terms of energy produced, or MW-hours per acre-year. Specifically:

- Power-based solar land use efficiency is calculated by dividing the maximum net power output in MW by the total number of acres impacted by the power plant, including roads and electrical switchyards and substations.

- 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. Since different solar technologies consume differing quantities of fossil fuel for morning warm-up, cloudy weather output leveling and heat transfer fluid freeze protection (and some consume no fossil fuel at all), this effect will be accounted for. Specifically, fossil fuel consumption will be backed out by reducing the plant’s net energy output by the amount of energy that could have been produced by consuming the project’s annual fuel consumption in a modern combined cycle power plant. (See **EFFICIENCY APPENDIX A**, immediately following.) This reduced energy output will then be divided by acres impacted.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

No federal, state, or local/county laws, ordinances, regulations, and standards (LORS) apply to the efficiency of this project.

SETTING

The applicant proposes to build and operate AMS, a solar thermal power plant producing a total of 250 MW (nominal net output) and employing the concentrated parabolic trough solar thermal technology. The project would consist of arrays of parabolic mirrors, solar steam generator heat exchangers, two steam turbine generator, and a wet cooling tower (AS 2009a, AFC §§1.1, 2.1, 2.4).

The project's power cycle would be based on a steam cycle (also known as the Rankine cycle) (AS 2009a, AFC §2.4.1). The solar steam generator heat exchangers would receive heated heat transfer fluid from the solar thermal equipment comprised of arrays of parabolic mirrors that collect energy from the sun. The heated heat transfer fluid would be used to generate steam in the heat exchangers. This steam would then expand through the steam turbine generator to produce electrical power.

The project would utilize two auxiliary boilers fueled by natural gas to keep the temperature of the heat transfer fluid above its relatively high freezing point (54 degrees Fahrenheit [°F]). The project would not use fossil fuel to generate electricity (AS 2009a, AFC § 2.1).

ASSESSMENT OF IMPACTS — FOSSIL FUEL ENERGY USE

METHOD AND THRESHOLD FOR DETERMINING THE SIGNIFICANCE OF FOSSIL FUEL ENERGY RESOURCES

CEQA guidelines state that the environmental analysis "…shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy" (Title 14 CCR §15126.4[a][1]). Appendix F of the guidelines further suggests consideration of such factors as the project's energy requirements and energy use efficiency; its effects on local and regional energy supplies and energy resources; its requirements for additional energy supply capacity; its compliance with existing energy standards; and any alternatives that could reduce the wasteful, inefficient, and unnecessary consumption of energy (Title 14, CCR §15000 et seq., Appendix F).

The inefficient and unnecessary consumption of energy, in the form of non-renewable fuels such as natural gas, propane and oil, constitutes an adverse environmental impact. An adverse impact can be considered significant if it results in:

- Adverse effects on local and regional energy supplies and energy resources;
- A requirement for additional energy supply capacity;
- Noncompliance with existing energy standards; or
- The wasteful, inefficient, and unnecessary consumption of fuel or energy.

PROJECT ENERGY REQUIREMENTS AND ENERGY USE EFFICIENCY

AMS would consume insignificant amounts of fossil fuel for power generation. It would consume fossil fuel only to reduce startup time and to keep the temperature of the heat transfer fluid above its relatively high freezing point.

The project would burn natural gas at a nominal rate of approximately 189,000 Million British thermal units (MMBtus) per year (AS 2009a, AFC §2.4.4.2). 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.

There are currently no legal or industry standards for measuring the efficiency of solar thermal power plants (CEC 2008d). The average steam cycle efficiency of the typical modern steam turbines currently available in the market ranges from 35% to 40%. Thus, the project would most likely utilize steam turbines that fall in this range.

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 (AS 2009a, AFC §§ 2.4.4.2, 2.5). Natural gas for AMS would be supplied from an existing Southern California Gas Company (SCG) pipeline connection. The SCG system is capable of delivering the required quantity of gas to the project. The SCG natural gas supply represents a reliable source of natural gas for this project. Therefore, it appears unlikely that the project could pose a substantial increase in demand for natural gas in California.

ADDITIONAL ENERGY SUPPLY REQUIREMENTS

There appears to be little likelihood that AMS would require additional supply (see above in **ADVERSE EFFECTS ON ENERGY SUPPLIES AND RESOURCES**).

COMPLIANCE WITH ENERGY STANDARDS

No standards apply to the efficiency of AMS or other non-cogeneration projects.

ALTERNATIVES TO REDUCE WASTEFUL, INEFFICIENT, AND UNNECESSARY ENERGY CONSUMPTION

Staff 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. Even though staff does not believe the project's fuel consumption would be significant, staff evaluates alternatives that could reduce or eliminate the use of fossil fuel.

Efficiency of Alternatives to the Project

AMS's objectives include the generation of electricity using the concentrated parabolic trough solar thermal technology (AS 2009a, AFC §2.2).

Alternative Generating Technologies

Alternative generating technologies for AMS are considered in the AFC (AS 2009a, AFC § 4.9) and the section of this document entitled **ALTERNATIVES**. For purposes of this analysis, staff has evaluated fossil fuel use by other solar based technologies to compare efficiency.

Given the project objectives, location, air pollution control requirements, and the commercial availability of the above technologies, staff agrees with the applicant that from an energy efficiency perspective the selected solar thermal technology is a feasible selection.

Staff, therefore, believes that AMS would not constitute a significant adverse impact on fossil fuel energy resources compared to feasible alternatives.

ASSESSMENT OF IMPACTS — SOLAR LAND USE

The solar insolation falling on the earth's surface can be regarded as an energy resource. Since this energy is inexhaustible, its consumption does not present the concerns inherent in fossil fuel consumption. What is of concern, however, is the extent of land area required to capture this solar energy and convert it to electricity. Setting aside hundreds or thousands of acres of land for solar power generation removes it from alternative uses. Constructing buildings and solar collector foundations can disturb environmental resources.

To evaluate AMS, 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.

METHOD AND THRESHOLD FOR DETERMINING THE SIGNIFICANCE OF SOLAR LAND USE ENERGY RESOURCES

Energy Commission staff proposes to compare the land use of a solar power plant project to that of other solar projects in the Energy Commission's siting process. It has not been determined how great a difference in land use would constitute a significant difference; staff proposes to compare the five solar projects currently in the process.

As this is written, there are currently nine solar power plant projects that have progressed significantly through the Energy Commission siting process. These projects' power and energy output, and the extent of the land occupied by them, are summarized in **Efficiency Table 1**, below. The solar land use efficiency for a typical fossil fuel-fired (natural gas-fired) combined cycle power plant is shown only for comparison.

ADVERSE EFFECTS ON LAND USE

While the Energy Commission customarily requires full mitigation for such impacts, such mitigation is generally regarded as less effective in protecting resources than avoiding the impact entirely. A solar power project that occupies twice as much land as another project holds the potential to produce twice the environmental impacts.

PROJECT LAND USE

AMS would produce power at the rate of 250 MW net, and would generate energy at the rate of 630,000 MW-hours net per year, while occupying approximately 1,684 acres (AS 2009a, AFC §§2.3, Figure 2-4). Staff calculates power-based land use efficiency thus:

Power-based efficiency: 250 MW ÷ 1,420 acres = **0.18 MW/acre** or **5.7 acres/MW**

Staff calculates energy-based land use efficiency thus:

Energy-based efficiency: 630,000 MWh/year ÷ 1,420 acres =**444 MWh/acre-year**

As seen in **Efficiency Table 1**, AMS, employing the linear parabolic trough technology, is roughly 25% more efficient in use of land than the Ivanpah SEGS project, which employs BrightSource power tower technology, and 30% more efficiency than the Stirling Energy Systems Solar Two project.

Efficiency Table 1 — Solar Land Use Efficiency

Project	Generating Capacity (MW net)	Annual Energy Production (MWh net)	Annual Fuel Consumption (MMBtu LHV)	Footprint (Acres)	Land Use Efficiency (Power-Based) (MW/acre)	Land Use Efficiency (Energy – Based) (MWh/acre-year)	
						Total	Solar Only[2]
AMS (09-AFC-5)	**250**	**630,000**	**94,280**	**1,420**	**0.18**	**444**	**434**
Beacon Solar (08-AFC-2)	250	600,000	36,000	1,321	0.19	454	450
Ivanpah SEGS (07-AFC-5)	400	960,000	432,432	3,744	0.11	256	238
Calico Solar (08-AFC-13)	850	1,840,000	0	8,200	0.11	224	224
SES Solar Two (08-AFC-5)	750	1,620,000	0	6,500	0.12	249	249
Solar Millenium Blythe (09-AFC-6)	1,000	2,100,000	207,839	5,950	0.17	353	348
Solar Millenium Palen (09-AFC-7)	500	1,000,000	103,919	2,970	0.17	337	332
Genesis Solar (09-AFC-8)	250	600,000	60,000	1,800	0.14	333	329
Solar Millenium Ridgecrest (09-AFC-9)	250	500,000	51,960	1,440	0.17	347	342
Avenal Energy (08-AFC-1)[3]	600	3,023,388	24,792,786	25	24.0	120,936	N/A

[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.

ALTERNATIVES TO REDUCE SOLAR LAND USE IMPACTS

Building and operating a typical fossil fuel-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.

Building a solar power plant employing a different technology, such as the BrightSource power tower technology of the Ivanpah SEGS project or the Stirling Engine technology of the SES Solar projects, would reduce the solar land use efficiency of AMS.

Alternative Heat Rejection System

The applicant proposes to employ a wet cooling system (an evaporative cooling tower) as the means for rejecting power cycle heat from the steam turbine (AS 2009a, AFC §§ 2.4.1, 2.4.4.5). An alternative heat rejection system would utilize an air-cooled condenser.

In low temperatures and high relative humidity (low dry-bulb temperature), the air-cooled condenser performs slighly more efficiently than the evaporative cooling tower. In high temperatures and low relative humidity, typical of the project area, the evaporative cooling tower performs slightly more efficiently than the air-cooled condenser. However, such an improvement may be less significant compared to the adverse environmental impacts of wet cooling over dry cooling, such as those identified in the **SOIL AND WATER RESOURCES** section of this document.

CUMULATIVE IMPACTS

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.

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 AMS 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 fossil fuel burning power plants. The project would therefore cause a positive impact on the cumulative amount of fossil fuel consumed for power generation.

NOTEWORTHY PUBLIC BENEFITS

AMS 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.

CONCLUSIONS AND RECOMMENDATIONS

FOSSIL FUEL ENERGY USE

AMS, if constructed and operated as proposed, 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.

LAND USE

AMS, if constructed and operated as proposed, would occupy nearly six acres per MW of power output, a figure lcomparable to other projects proposing the same solar thermal technology. Employing a more land-intensive solar technology, such as the BrightSource power tower technology or Stirling Engine technology, would decrease land use efficiency. Staff believes AMS represents one of the most land use-efficient solar technologies currently available.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed.

REFERENCES

AS 2009a - Abengoa Solar Inc. / E. Garcia (TN 52813). Application for Certification for AMS Project (09-AFC-5), dated 7/2009. Submitted to CEC on 8/10/2009.

CEC 2008d – Report of Conversation between Steve Baker (CEC staff, Power Plant Siting Division) and Golam Kibrya (CEC staff, Energy Resource and Development Division). February 22, 2008.

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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 Therminol freeze protection. As a proxy, we will 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.

The most recent such projects are:

- 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**
- KRCD Community Power Plant (07-AFC-7)
  - Nominal 565 MW 2-on-1 Combined Cycle with GE or Siemens F-class CGTs
  - Evaporative cooling, evaporative or fogging inlet air cooling
  - Efficiency with GE CGTs: 497 MW @ 54.6% LHV
  - Efficiency with Siemens CGTs: 565 MW @ 56.1% LHV
  - Efficiency (average of these two): **55.4% 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: **<u>53.7% LHV</u>**

POWER PLANT RELIABILITY

Testimony of Erin Bright

SUMMARY OF CONCLUSIONS

The applicant predicts an equivalent availability factor of 95%, which staff believes is achievable. (The availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability.) Based on a review of the proposal, with the exception of the source of water supply currently selected by the applicant (see the **SOIL AND WATER RESOURCES** section of this document), staff concludes that the Abengoa Mojave Solar (AMS) Project would be built and would operate in a manner consistent with industry norms for reliable operation. No conditions of certification are proposed.

INTRODUCTION

In this analysis, California Energy Commission (Energy Commission) staff addresses the reliability issues of the AMS project 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 applicant has predicted an equivalent availability factor of 95% for AMS (see below), staff uses typical industry norms as the benchmark, rather than the applicant's projection, to evaluate the project's reliability.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

No federal, state, or local/county laws, ordinances, regulations, or standards (LORS) apply to the reliability of this project.

SETTING

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 have been developed and put in place that allow sufficient reliability to be maintained under the competitive market system. “Must-run” power purchase agreements and “participating generator” agreements are two mechanisms that have been employed to ensure an adequate supply of reliable power.

In September 2005, California AB 380 (Núñez, Chapter 367, Statutes of 2005) became law. This modification to the Public Utilities Code requires the California Public Utilities Commission to consult with the California ISO to establish resource adequacy requirements for all load-serving entities (basically, publicly and privately owned utility companies). These requirements include maintaining a minimum reserve margin (extra generating capacity to serve in times of equipment failure or unexpected demand) and maintaining sufficient local generating resources to satisfy the load-serving entity’s peak demand and operating reserve requirements.

In order to fulfill this mandate, the California ISO has begun to establish specific criteria for each load-serving entity under its jurisdiction. These criteria guide each load-serving entity in deciding how much generating capacity and ancillary services to build or purchase, after which the load-serving entity issues power purchase agreements to satisfy these needs.

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). It is possible that, if significant numbers of power plants were to exhibit individual reliability sufficiently lower 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 applicant proposes to operate the 250-megawatt (MW) (net power output) AMS, 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, as all its generated electricity would be produced by a reliable source of energy that is available during the hot summer afternoons, when power is needed most.

The project is expected to achieve an equivalent availability factor in the range of 95%. The project is anticipated to operate at an annual capacity factor of approximately 27% (AFC §2.4.1).

ASSESSMENT OF IMPACTS

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 availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability. 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, AMS is expected to operate reliably (AFC §2.4.2.1). 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 a project and compares them to industry norms. If the factors compare favorably for this project, staff will then conclude that AMS would be as reliable as other power plants on the electric system and would not degrade system reliability.

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 the adequate maintenance and repair of the equipment and systems discussed below.

Quality Control Program

The applicant describes a QA/QC program (ESH 2009c, Data Response 89) 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 standard 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 project, as proposed in the AFC, 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 in parallel provides inherent reliability. A single equipment failure cannot disable more than one train, thus allowing the plant to continue to generate (at reduced output). The nature of solar thermal generating technology also provides inherent redundancy; the series-parallel arrangement of solar collector assemblies would allow for reduced output generation if one (or possible several) rows of solar collectors were to require service or repair (AFC §§ 2.4, 2.4.1, 2.4.2). 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.

Maintenance Program

Equipment manufacturers provide maintenance recommendations for their products, and the applicant would most likely base the project's maintenance program on those recommendations. The 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

AMS would consume insignificant amounts of natural gas for power generation. The sole consumption of natural gas would be to maintain steam seals (thereby reducing startup time) and keep the temperature of the heat transfer fluid above its freezing point while the plant is not operating.

Natural gas would be delivered to the AMS site via an existing pipeline connecting to the Southwest Gas Corporation (SGC) system that was installed to support the existing and previously planned SEGS (Solar Energy Generating Station) projects at Harper Dry Lake. The SGC natural gas system represents a resource of considerable capacity and offers access to adequate supplies of gas. Staff agrees with the applicant's prediction that there would be adequate natural gas supply and pipeline capacity to meet the project's needs.

Water Supply Reliability

AMS has proposed to use well water for domestic and industrial water needs, including makeup for the cooling tower and steam cycle, mirror washing, service water and fire protection water. According to the **SOIL AND WATER RESOURCES** section of this document, the proposed use of onsite groundwater for power plant cooling is in conflict with water use policies and is currently under review. Therefore, at this time, staff cannot conclude that this source of water supply is a reliable source of water for the project.

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.

Seismic Shaking

The site lies within the seismically active Southern California. Also, a portion of the project site is located within a State of California Alquist-Priolo Earthquake Fault Zone (AFC §§ 5.5.2.2, 5.5.2.3); 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 (AFC Appendix J). 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 flood plain (AFC § 2.4.5.6). 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 **SOIL AND 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, and wind fencing would be installed around the project perimeter to reduce the effects of wind; 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 latest edition of the California Building Code (AFC § 2.4.2.1). 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 and periodically summarizes and publishes those statistics on the Internet at <http://www.nerc.com>. Because no statistics are available for solar power plants, staff compares the project's availability factor to the average availability factor of fossil fuel-fired units. Also because the project's total net power output would be 250 MW, staff uses the NERC statistics for 200–299 MW units. The NERC reported an availability factor of 86.01% as the generating unit average for the years 2002 through 2006 for fossil fuel units of 200-299 MW (NERC 2007).

The concentrated parabolic trough solar thermal technology is not new. This technology has been employed for over 20 years at the nearby Solar Electric Generating System facilities in the Mojave Desert. Staff believes that the parabolic trough technology is likely to exhibit the projected reliability.

The project would use multi-pressure condensing steam turbine technology. Steam turbines incorporating this technology have been on the market for many years now and are expected to exhibit typically high availability. Also, because solar-generated steam is cleaner than burnt fossil fuel, AMS steam cycle units would likely require less frequent maintenance than units that burn fossil fuel. Therefore, the applicant's expectation of an annual availability factor of 95% (AFC § 2.4.1) appears reasonable when compared with the NERC figures throughout North America (see above). In fact, these machines might well be expected to outperform the fleet of various turbines (mostly older and smaller) that make up NERC statistics. Additionally, the project, as proposed, 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.

The applicant's estimate of plant availability, therefore, appears to be realistic. Stated procedures for assuring the design, procurement, and construction of a reliable power plant appear to be consistent with industry norms, and staff believes they are likely to ultimately produce an adequately reliable plant.

NOTEWORTHY PROJECT BENEFITS

This project would help serve the need for renewable energy in California, as most of the electricity generated would be produced by a reliable source of energy that is available during the hot summer afternoons, when power is needed most.

PUBLIC AND AGENCY COMMENTS

Staff did not receive any public or agency comments in the area of Power Plant Reliability.

CONCLUSION

The applicant predicts an equivalent availability factor of 95%, which staff believes is achievable. Based on a review of the proposal, with the exception of the source of water supply currently selected by the applicant (see the **SOIL AND WATER RESOURCES** section of this document), staff concludes that the plant would be built and operated 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

AS 2009a - Abengoa Solar Inc. / E. Garcia (TN 52813). Application for Certification for AMS Project (09-AFC-5), dated 7/2009. Submitted to CEC on 8/10/2009.

ESH 2009c - Ellison, Schneider and Harris / C. Ellison (TN 54243). Written Responses to Data Request Set 1 (nos. 1-93), dated 11/23/09. Submitted to CEC on 11/24/2009.

McGraw-Hill 1994—McGraw-Hill Energy Information Services Group. 1994. *Operational Experience in Competitive Electric Generation*. Executive Report.

NERC 2007—North American Electric Reliability Corporation. 2007. *2002–2006 Generating Availability Report*.

TRANSMISSION SYSTEM ENGINEERING

Testimony of Ajoy Guha, P. E. and Mark Hesters

SUMMARY OF CONCLUSIONS

The proposed interconnection facilities for the Abengoa Mojave Solar project (AMS) including the proposed new Alpha and Beta 230 kV switchyards, the generator 230 kV tie lines to the proposed new Southern California Edison (SCE) Lockhart 230 kV substation and their terminations would be adequate in accordance with industry standards and good utility practices, and are acceptable to staff according to engineering Laws, Ordinances, Regulations and Standards (LORS).

The Interconnection Facilities Study/Technical Assessment Study demonstrate that the addition of the AMS project would cause new normal (N-0) and single contingency (N-1) overloads on the Kramer-Lugo No. 1 & No. 2 230 kV lines during 2013 summer peak and light spring system conditions. The study also identified transient stability violation for loss of the Lugo-Cool Water 230 kV line. The current mitigation plan responsibility for the AMS includes building a new 53-mile Cool Water-Lugo double circuit 230 kV line, and installation of a new Special Protection Systems which requires new wood pole support of fiber optic cable OR congestion management and new Special Protection Systems tripping the AMS generation output and requiring new wood poles to support fiber optic communication lines.

The applicant has chosen the Special Protection Systems mitigation alternative which staff finds acceptable. Staff considers the fiber optic cables strung on new wood poles required for implementation of the Special Protection Systems a reasonably foreseeable consequence of the proposed AMS project and require analysis sufficient to meet the California Environmental Quality Act standards for indirect project impacts.

Several new fiber optic lines on new wood poles in existing corridors would be required for Special Protection Systems including:

1. Lockhart to Alpha and Beta Substations approximately three miles and could be installed on existing poles constructed for AMS.
2. Lockhart substation – Kramer substation, approximately 14 miles.
3. Lockhart Substation – Cool Water Substation, approximately 46 miles.
4. Kramer Substation – Victor Substation, approximately 38 miles.

The AMS would meet the requirements and standards of all applicable LORS upon compliance with the recommended Conditions of Certification.

The applicant has signed a power purchase agreement with Pacific Gas and Electric for renewable power supply. The AMS solar generation project would provide clean renewable energy towards meeting state mandate and goals.

INTRODUCTION

The Transmission System Engineering (TSE) analysis examines whether or not the facilities associated with the proposed interconnection conforms to all applicable LORS required for safe and reliable electric power transmission. Staff's analysis evaluates the power plant switchyard, outlet line, termination and downstream facilities identified by the applicant. Additionally, under the 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 transmission facilities downstream of the proposed interconnection that are required for interconnection and represent the "whole of the action." The downstream network upgrade mitigation measures that will be required to maintain system reliability for the addition of the power plant, are used to identify the requirement for any additional CEQA analysis.

Energy Commission staff relies on the interconnecting authority for the analysis of impacts on the transmission grid as well as the identification and approval of required new or modified facilities downstream from the proposed interconnection that would be required as mitigation measures. The proposed AMS project would interconnect to the SCE transmission network and requires analysis by SCE and approval of the California ISO.

SCE'S ROLE

SCE is responsible for ensuring electric system reliability in the PG&E system for addition of the proposed generating plant. SCE will provide the analysis and reports in their System Impact and Facilities studies, and their approval for the facilities and changes required in the SCE system for addition of the proposed transmission modifications.

CALIFORNIA ISO'S ROLE

The California ISO is responsible for ensuring electric system reliability for all participating transmission owners and is also responsible for developing the standards necessary to achieve system reliability. The California ISO is responsible for completing the studies of the SCE system to ensure adequacy of the proposed transmission interconnection. The California ISO will 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 Tariffs, the California ISO will determine the "Need" for transmission additions or upgrades downstream from the interconnection point to insure reliability of the transmission grid. The California ISO will, therefore, review the System Impact Study (SIS) performed by SCE and/or any third party, provide their analysis, conclusions and recommendations. On satisfactory completion of the SCE Interconnection Facility Study (IFS)/Technical Assessment Study (TAS) and in accordance with the LGIP as in the California ISO Tariff, the California ISO instead of issuing a final approval letter, would proceed to execute the LGIA between the California ISO and the project owner and subsequently perform an Operational study examining the impacts of the project on the grid based on the expected

December, 2012 COD or current COD. The California ISO may also provide written and verbal testimony on their findings at the Energy Commission hearings, if necessary.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

- 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 project where it will promote economic efficiency or maintain system reliability. The California ISO also determines the Cost Responsibility of the proposed project and provides an Operational Review of all facilities that are to be connected to the California ISO grid (California ISO 2007a).

PROJECT DESCRIPTION

The AMS project, a solar thermal generating plant, would be located in a 1,765-acre site in the Mojave Desert in San Bernardino County immediate southwest of Harper Dry Lake and about nine miles northwest of Lockhart. The project would have two independent solar fields, Alpha and Beta, each feeding a 125 MW power island with a solar steam generator to operate a steam turbine generator (STG). The AMS would have a total 250 MW nominal output with two 125 MW STG units. Each STG unit rated 165 MVA, 13.8 kV would be connected through an 8,000-ampere segregated bus duct to the low voltage terminal of a dedicated 148/175 MVA, 13.8/230 kV generator step-up (GSU) transformer with an impedance of 9% @148 MVA (AS 2009a, AFC, sections 1 & 2; AS 2009b, DA supplemental AFC).

SWITCHYARDS AND INTERCONNECTION FACILITIES

The new Alpha and Beta 230 kV switchyards would have a 1,200-ampere single bus arrangement. The 230 kV high voltage terminals of each GSU transformer at the Alpha and Beta solar fields would be connected to its switchyard 230 kV bus by short 700-ampere overhead conductors through a 1,200-ampere, 230 kV circuit breaker and two disconnect switches.

The Alpha and Beta switchyards would be interconnected to the SCE Kramer-Cool Water No. 1 230 kV line by building a new SCE Lockhart 230 kV substation located at the southwest corner of Beta solar field and looping the existing Kramer-Cool Water No. 1 230 kV line into the new substation (ESH 2010b, Page 3). The Alpha switchyard would be interconnected to Lockhart substation by building a new 2.17-mile long single circuit 230 kV overhead line with 477 kcmil steel-reinforced aluminum conductors (ACSR) on 80 to 110-foot steel poles within the plant boundary. The Beta switchyard would be interconnected to Lockhart substation by building a new 0.84-mile long single circuit 230 kV overhead line with 477 kcmil ACSR conductors on 80 to 110-foot steel poles within the plant property. The generator tie lines would be connected to their respective Alpha and Beta 230 kV switchyard bus through a 1,200-ampere disconnect switch. The applicant would build, own and operate the AMS Alpha and Beta switchyards and the generator tie lines.

The new SCE Lockhart 230 kV substation is proposed as a 2,000-ampere double bus arrangement with a breaker and a half configuration with provision for two switch bays for connecting four circuits. The switch bays would be built with six 2,000-ampere circuit breakers and associated twelve 2,000-ampere disconnect switches. Each of the generator tie lines from Alpha and Beta switchyard would be connected to a Lockhart substation switch bay through a 1,200-ampere disconnect switch. The other switch bay would be used for looping the SCE Kramer-Cool Water No. 1 230 kV line. SCE would build, own and operate the new Lockhart substation and interconnection facilities within its fence line, and all transmission outlets (AS 2009a, AFC, sections 1 & 2; AS 2009b, DA supplemental AFC).

The configuration of the AMS Alpha and Beta 230 kV switchyards, the generator 230 kV overhead tie lines and their terminations at the proposed new Lockhart 230 kV substation would be adequate in accordance with industry standards and good utility practices, and is acceptable to staff. Proposed Conditions of Certification TSE 1 to TSE 8 insure that the proposed facilities are designed, built and operated in accordance with good utility practices and applicable LORS.

TRANSMISSION SYSTEM IMPACT ANALYSIS

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 AMS project, SCE and California ISO are responsible for ensuring grid reliability. In accordance with the FERC/California ISO/Utility Tariffs, System Impact and Interconnection Facilities Studies are conducted to determine the preferred and alternate interconnection methods to the grid, the downstream transmission system impacts and the mitigation measures needed to ensure system conformance with performance levels required by the 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 project 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 (NERC2006, WECC 2006, California ISO 2002a and 2007a).

The System Impact and Interconnection Facilities Studies/Technical Assessment Study analyze the grid with and without the proposed project under conditions specified in the planning standards and reliability criteria. The standards and criteria define the assumptions used in the study and establish the thresholds by which grid reliability is determined. The studies must analyze the impact of the project for the proposed first year of operation and thus are based on a forecast of loads, generation and transmission. Load forecasts are developed by the interconnected utility, which would be SCE in this case. Generation and transmission forecasts are established by an interconnection queue. The studies are focused on thermal overloads, voltage deviations, system stability (excessive oscillations in generators and transmission system, voltage collapse, loss of loads or cascading outages), and short circuit duties. SCE completed the System Impact Study in June 2008 and the Interconnection Facilities Study in October 2009.

The applicant has also provided the Harper Lake Solar Power Plant Interconnection Optional Study Report which forecasts the curtailment of the AMS project if congestion management is chosen as a means to mitigate overloads identified in the Interconnection Facilities Study.

If the studies show that the interconnection of the project 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.

SCOPE OF SYSTEM IMPACT STUDY (SIS)/ INTERCONNECTION FACILITIES STUDY

The June 27, 2008 SIS was prepared by the California ISO in coordination with SCE to evaluate the impact of the proposed AMS project on the SCE transmission system and was supplanted by the IFS which included the TAS completed on December 12, 2008 (ESH 2010b, page 3). The TAS updated the generation interconnection queue, removing many generators that dropped out or moved to lower queue positions. The updated generation interconnection queue used in the TAS provides a more accurate forecast of the impacts of the AMS interconnection. The SIS and IFS/TAS were prepared with and without the AMS 250 MW generation output with the following base cases based on the most expected critical loading condition for the transmission system in SCE’s service area:

- A 2013 summer peak base case derived from the current SCE’s California ISO annual transmission expansion study base cases and has 1-in -10 year extreme weather load level for SCE’s service area.
- A 2013 light spring peak base case at 65% of the summer peak load level.

In each of the studies southern California generation and critical seasonal power flows in WECC Paths were maintained within limits. The base cases included planned California ISO approved transmission upgrades that would be operational by 2013. The pre-project base cases also included all queue generation projects with higher positions than the AMS project, for the SIS this was 5,846 MW, in the IFS/TAS only 1,460 MW were left in the interconnection queue ahead of AMS (ESH 2010b, TAS page 9).

In addition, the study evaluated conditions with dispatch of generation inside and outside SCE territory that maximized loadings in the north of Lugo area. This included adjusting the West-of-River (Path 46) flow and modeling all pertinent queue generation in the vicinity of the AMS project.

The study included analyses for power flow, short circuit, substation evaluation, transient stability, and post-transient voltage. The study also provided preliminary scope of work and cost estimates for the upgrades in the proposed Lockhart substation including downstream network reliability upgrades in the SCE system, assuming SCE would engineer, construct, own and maintain the new Lockhart substation and downstream network upgrades (AS 2009a, AFC, Appendix N: SIS report).

Power Flow Study Results and Mitigation

The IFS/TAS found that the addition of the AMS would cause new normal (N-0) and single contingency (N-1) overloads on the Kramer-Lugo No. 1 & No. 2 230 kV lines during 2013 summer peak and light spring system conditions. The Power Flow study results are shown in Tables 2.1 & 2.4, and section IV.A of the SIS (AS 2009a, AFC; Appendix N, SIS, pages 23-38).

Below is a summary of the results of the California ISO's power flow analysis for the AMS with the base cases (ESH 2010b).

- Under 2013 summer peak and light spring system conditions the study identified new normal (N-0) overloads on the Kramer-Lugo No. 1 & No. 2 230 kV lines (119% of their normal ratings) due to the addition of the AMS:

  Mitigation:

  Staff considers mitigation alternative 1 or alternative 2 acceptable.

  - **Alternative 1**:

    A. Construction of a new double circuit Cool Water – Lugo 230 kV line and participation in Special Protection Systems designed curtail AMS generation under certain conditions. This line would be designed, built and operated by SCE and the CPUC would be the lead agency for permitting. The new 53 mile line would require a new corridor for 37 miles and would replace the 16 mile of the existing Lugo 230 kV line for 16 miles.

       And

B. New All Dielectric Self Supporting Fiber (ADSS) Optic Cable on new wood poles:

   I. Lockhart to Alpha and Beta Substations approximately three miles and could be installed on existing poles constructed for AMS.

   II. Lockhart substation – Kramer substation, approximately 14 miles in an existing transmission corridor.

   III. Lockhart Substation – Cool Water Substation, approximately 46 miles in an existing corridor.

   IV. Kramer Substation – Victor Substation, approximately 38 miles in an existing corridor.

- **Alternative 2**

A. Use congestion management and Special Protection Systems to mitigate overloads. This requires New All Dielectric Self Supporting Fiber (ADSS) Optic Cable on new wood poles:

   I. Lockhart to Alpha and Beta Substations approximately three miles and could be installed on existing poles constructed for AMS.

   II. Lockhart substation – Kramer substation, approximately 14 miles in an existing transmission corridor.

   III. Lockhart Substation – Cool Water Substation, approximately 46 miles in an existing corridor.

   IV. Kramer Substation – Victor Substation, approximately 38 miles in an existing corridor.

- Under 2013 summer peak and light spring system conditions the study identified the that the AMS aggravated pro-project overloads of the Kramer-Lugo No. 1 & No. 2 230 kV lines under single (N-1) contingency conditions:

  Mitigation: With the additional upgrades in place for the new normal (N-0) overloads as stated above, the study determined that installation of a special protection system (SPS) for both the above lines under the single contingency conditions would be required to mitigate thermal and transient stability problems by tripping off the AMS project. Staff considers the mitigation measure acceptable under the study assumptions.

- With the additional upgrades identified to mitigate new overloads caused by the addition of AMS, the study does not identify any double (N-2) contingency overloads in the local area.

The applicant has chosen alternative 2, congestion management and SPS, as the mitigation for overloads identified in the power flow studies. Based on the current studies, congestion management and SPS are acceptable mitigation for the identified overloads.

Short Circuit Study Results A and Substation Evaluation

Three line-to-ground (3 LG) and single line-to-ground (SLG) faults were simulated with and without the AMS project to determine if there are any overstressed circuit breakers in SCE substations in the project vicinity caused by the addition of the project. The short circuit duty analysis included all queue projects and the related transmission upgrades. The short circuit results shown in Tables 2-5 and 2-6 in section D of the SIS present the impact for the addition of the AMS project only, while the results shown in the Tables 2-7 and 2-8 present the incremental impacts for the addition of upgrades required for the AMS (AS 2009a, Appendix N, SIS, Section IV. D, Pages 39-42). The Interconnection Facilities Study found that the AMS does not trigger the need for circuit breaker replacement but does aggravate pre-project conditions that could require the upgrade/replacement of fifty-two circuit breakers at eight different locations (EHS 2010b, page 4).

The replacement of circuit breakers usually occurs within the fenceline of existing facilities and does not require further CEQA review. If CEQA review is required the CPUC would be the lead agency for required permits.

Transient Stability Study Results and Mitigation

Transient stability analysis is performed to determine whether the transmission system would remain stable with the addition of the AMS project. The analysis was performed with the 2013 summer peak and light spring base cases with simulated faults under selected critical single and double contingencies. Transient stability plots for summer and spring load conditions are provided in Appendices A and B of the SIS report (AS 2009a, Appendix N, SIS, section IV.B, pages 38-39).

The IFS/TAS found one transient stability violation caused by the AMS project. The SPS identified for the mitigation of the N-1 overload above would also mitigate the transient stability violation (EHS 2010b, page 5).

Post-transient Voltage Analysis Results

The power flow study revealed that without facility upgrades identified under the pre-project base case conditions, the AMS project aggravates previous low voltage conditions, including case non-convergence, which are indicative of voltage collapse conditions. These voltage problems would be mitigated with implementation of pre-project transmission upgrades for higher queue projects (AS 2009a, Appendix N, SIS, section IV.C, page 39).

Interconnection Option Study Results

The Interconnection Optional Study analyzed the potential curtailment for the AMS project if congestion management and the SPS (Alternative 2, above) were used to mitigate transmission overloads identified in the TAS. The study looked at the historical loading of the transmission lines affected by the AMS project and found that the likely maximum annual curtailment for the AMS would be 5% under the congestion management and SPS mitigation alternative (AS 2010d).

CALIFORNIA ISO REVIEW

In accordance with the provisions of LGIP, the June 27, 2008 SIS was prepared by the California ISO in coordination with SCE and evaluated the impact of the proposed 250 MW generation output from the AMS to a new Lockhart 230 kV substation with the loop-in of the existing Kramer-Cool Water 230 kV line. The IFS/TAS identified mitigation plan to eliminate the adverse impacts of the AMS would be adequate. The California ISO may also provide written and verbal testimony on their findings at the Energy Commission hearings, if necessary.

Execution of the LGIA would ensure system reliability in the California ISO grid and compliance with WECC/NERC and California ISO Planning standards (WECC 2006, NERC 2006, California ISO 2002a and 2007a). Condition of Certification TSE-5 requires the submittal of the LGIA to the Energy Commission at least 30-days prior to the construction of transmission interconnection facilities.

DOWNSTREAM FACILITIES

Besides the proposed interconnection facilities for the proposed AMS project including Alpha & Beta switchyards, generator tie lines and construction of a new SCE Lockhart substation, accommodating the interconnection of the AMS new generation output to the SCE system would involve the installation of several optic communications cables on new wood poles in existing transmission corridors. The installation of the new cables is considered a reasonably foreseeable consequence of the proposed AMS project and requires analysis sufficient to meet the CEQA requirements for indirect project impacts.

CUMULATIVE IMPACTS

Since the AMS is being connected to the north of Lugo SCE area which requires several major transmission upgrades for the reliable interconnection of both the AMS project and generators with higher queue positions, staff believes that the AMS project would create some cumulative effects in the SCE local network under certain conditions until all the identified transmission facilities are in place.

However, the cumulative impacts due to the AMS project, as identified in the SIS or IFS which includes higher queue projects, would be mitigated. Staff also believes that there would be some positive impacts because the project, as local solar generation, would provide clean renewable energy, meet the increasing load demand in the SCE network, provide additional reactive power and voltage support, and enhance reliability in the SCE local network.

ALTERNATIVE TRANSMISSION ROUTES

The AMS site has access to two major transmission lines abutting its southern boundary, the Mead-Adelanto 500 kV line in the Los Angeles Department of Water and Power (LADWP) system and the SCE Kramer-Cool Water No. 1 230 kV line. The applicant did not choose to interconnect to the LADWP line with multiple owners, as the interconnection would increase costs, uncertainty, complexity and would be harder to ensure delivery of the project to the California ISO grid. The interconnection to the SCE system would ensure earlier interconnection and power delivery to the California ISO grid.

The generator overhead tie lines from the proposed AMS Alpha and Beta switchyards to the SCE Kramer-Cool Water 230 kV line through the proposed SCE Lockhart substation would also follow the shortest, least expensive routes within the AMS site with least environmental impacts (GWF2008a, AFC, section 4.5).

CONFORMANCE WITH LORS AND CEQA REVIEW

The configuration of the AMS Alpha and Beta switchyards, the generator interconnection overhead tie lines and their terminations at the proposed new Lockhart 230 kV substation would be adequate in accordance with industry standards and good utility practices, and is acceptable to staff.

The IFS/TAS demonstrate that there would be some adverse impacts on the SCE system for the addition of the AMS. The mitigation plan would be adequate and would eliminate the adverse impacts of the AMS.

SCE would be responsible for designing, building and operating the new 230 kV Cool Water – Lugo line. Sixteen miles of the new line would replace the existing Lugo – Pisgay 230 kV line as it heads east from the Lugo substation. SCE has not identified a route for the new 37-miles of the line as it heads north to the Cool Water substation.. The final routing and permitting of the 230 kV line would not occur until the LGIA is signed and CPUC permitting for the line could take twelve-months or more. Until a route for the line is chosen by SCE or through the permitting process any environmental analysis would require speculation on that final route. Without a specific route staff and the applicant are unable to provide an environmental analysis of this indirect project impacts.

The AMS would meet the requirements and standards of all applicable LORS with the applicant's submission of all required information as stated above and upon satisfactory compliance of the Conditions of Certifications.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency or public comments related to the TSE discipline have been received.

CONCLUSIONS AND RECOMMENDATIONS

1. The configuration of the AMS Alpha and Beta switchyards, the generator interconnection overhead tie lines and their terminations at the proposed new Lockhart 230 kV substation would be adequate in accordance with industry standards and good utility practices, and is acceptable to staff according to engineering LORS.

2. The IFS/TAS demonstrates that the addition of the AMS would cause new normal (N-0) and single contingency (N-1) overloads on the Kramer-Lugo No. 1 & No. 2 230 kV lines during 2013 summer peak and light spring system conditions. The study also identified transient stability violation for loss of the Lugo-Cool Water 230 kV line. The current mitigation plan responsibility for the AMS includes building a new 53-mile Cool Water-Lugo double circuit 230 kV line, and installation of a new SPS which requires new wood pole support of fiber optic cable OR new SPS tripping the AMS generation output and requiring new wood pole supports.

3. The applicant has chosen the Special Protection Systems mitigation alternative which staff finds acceptable. Staff considers the fiber optic cables strung on new wood poles required for implementation of the Special Protection Systems a reasonably foreseeable consequence of the proposed MPS project. Several new fiber optic lines on new wood poles in existing corridors would be required for Special Protection Systems including:

   A. Lockhart to Alpha and Beta Substations approximately three miles and could be installed on existing poles constructed for AMS.

   B. Lockhart substation – Kramer substation, approximately 14 miles.

   C. Lockhart Substation – Cool Water Substation, approximately 46 miles.

   D. Kramer Substation – Victor Substation, approximately 38 miles.

4. The AMS would meet the requirements and standards of all applicable LORS upon compliance with the recommended Conditions of Certification.

5. The applicant has signed a power purchase agreement with Pacific Gas and Electric for renewable power supply. The AMS as a solar generation would provide clean renewable energy towards meeting state mandate and goals.

RECOMMENDATIONS

If the Energy Commission approves the project, staff recommends the following Conditions of Certification to ensure system reliability and conformance with LORS.

CONDITIONS OF CERTIFICATIONS FOR TSE

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: At least 60 days (or a lesser number of days mutually agreed to by the project owner and the CBO) prior to the start of construction, 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 in **Table 1: Major Equipment List** 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.

Table 1: Major Equipment List
Breakers
Step-up Transformer
Switchyard
Busses
Surge Arrestors
Disconnects and Wave-traps
Take off facilities
Electrical Control Building
Switchyard Control Building
Transmission Pole/Tower
Insulators and Conductors
Grounding System

TSE-2 Prior to the start of construction the project owner shall assign an electrical engineer <u>and at least one of each</u> of the following to the project:

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 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 a civil engineer or 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, 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 in conformance with 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 earthwork and to require changes if site conditions are unsafe or do not conform with predicted conditions used as a basis for design of earthwork 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: At least 30 days (or a lesser number of days mutually agreed to by the project owner and the CBO) 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 (1998 CBC, 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 shall reference 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 disapproval, and 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 increment of construction until plans for that increment 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: At least 30 days (or a lesser number of days mutually agreed to by the project owner and the CBO) 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, outlet line and termination, including a copy of the signed and stamped statement from the responsible electrical engineer attesting to compliance with the 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, including the requirements listed below. The project owner shall submit the required number of copies of the design drawings and calculations to the CBO as determined by the CBO.

A. The power plant switchyard and 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 accommodate full output from the project and 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 from 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 copy of the executed LGIA signed by the California ISO and the project owner.

Verification: At least 60 days prior to the start of construction of transmission facilities (or a lesser number of days mutually agree to by the project owner and CBO), the project owner shall submit to the CBO for approval:

A. Design drawings, specifications and calculations conforming with CPUC General Order 95 or NESC, Title 8, Articles 35, 36 and 37 of the “High Voltage Electric Safety Orders”, NEC, applicable interconnection standards and related industry standards, for the poles/towers, foundations, anchor bolts, conductors, grounding systems and major switchyard equipment.

B. 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 NESC, Title 8, California Code of Regulations, Articles 35, 36 and 37 of the, “High Voltage Electric Safety Orders”, NEC, applicable interconnection standards, and related industry standards.

C. Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements **TSE-5** a) through f) above.

D. The Special Protection System (SPS) sequencing and timing if applicable shall be provided concurrently to the CPM.

E. A copy of the executed LGIA signed by the California ISO and the project owner.

TSE-6 The project owner shall inform the CPM and CBO of any impending changes that may not conform to requirements **TSE-5** a) through f), and have not received CPM and CBO approval, and request approval to implement such changes. A detailed description of the proposed change and complete engineering, environmental, and economic rationale for the change shall accompany the request. Construction involving changed equipment or substation configurations shall not begin without prior written approval of the changes by the CBO and the CPM.

Verification: At least 60 days prior to the construction of transmission facilities, the project owner shall inform the CBO and the CPM of any impending changes that` may not conform to requirements of **TSE-5** and request approval to implement such changes.

[1] Worst case conditions for the foundations would include for instance, a dead-end or angle pole.

TSE-7 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-8 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:

A. “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, and these conditions shall be provided concurrently.

B. 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”.

C. 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

California ISO (California Independent System Operator) 1998a. California ISO Tariff Scheduling Protocol posted April 1998, Amendments 1,4,5,6, and 7 incorporated.

California ISO (California Independent System Operator) 1998b. California ISO Dispatch Protocol posted April 1998.

California ISO (California Independent System Operator) 2002a. California ISO Planning Standards, February 7, 2002.

California ISO (California Independent System Operator) 2007a. California ISO, FERC Electric Tariff, First Replacement Vol. No. 1, March, 2007.

California ISO (California Independent System Operator) 2009a, Large Generator Interconnection Procedures, dated.

AS 2009a: Abengoa Solar Inc. Application for Certification (AFC) for the AMS, dated 7-2-09. Appendix N: Interconnection System Impact Study report. Submitted on 8-10-2009.

AS 2009b: Abengoa Solar Inc. Data Adequacy Supplement dated 9-4-09. Submitted on 9-24-2009.

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AS 2010b: Abengoa Solar Inc. / E. Garcia (TN 55215). Abengoa Mojave - Facility Transmission System Upgrade, dated 2/5/2010. Submitted to CEC on 2/8/2010.

ESH 2009c. Ellison. C. Response to Data Request set no 1. Submitted on 11-24-09.

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AS 2010d-Abengoa Solar Inc. / K. Sullivan (TN 55679). Interconnection Optional Study by California ISO, January 2010, dated 2/24/2010. Submitted to CEC on 2/25/2010.

CEC 2009m: CEC Data Request set 1A (1-93) dated 10-22-09. Submitted on 10-22-09.

NERC (North American Electric Reliability Council) 2006. Reliability Standards for the Bulk Electric Systems of North America, May 2 2006.

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 Management	Congestion management is a scheduling protocol, which provides that 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 Ampere (MVA)	A unit of apparent power, equals the product of the line voltage 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 Scheme (RAS)	A remedial action scheme is an automatic control provision, 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 Contingency	Also known as emergency or N-1 condition, occurs when one major transmission element (circuit, transformer, circuit breaker, etc.) or one generator is out of service.
Solid Dielectric Cable	Copper or aluminum conductors that are insulated by solid 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

Testimony of Suzanne Phinney, D.Env.

SUMMARY OF CONCLUSIONS

In this analysis of the Abengoa Mojave Solar (AMS) project, eight alternative project sites were examined, as well as several alternative generation technologies. Two of the alternative sites are potentially feasible for a solar thermal project, but do not have any environmental advantages over the proposed site. Some of the alternative technologies could achieve most of the project objectives, but would likewise not substantially lessen or avoid environmental impacts.

The alternative sites considered in this Staff Assessment (SA) are similar to the proposed project in size and land characteristics. The six sites identified by the applicant, however, would have slightly to significantly greater combined impacts to resources and need for new infrastructure than the proposed site, and were not retained for further consideration. Staff identified and retained the Garlock Road and Daggett alternatives sites, but do not consider them superior to the applicant's proposed site. The Garlock Road Alternative site, like the AMS site, has been previously farmed, but a project at the Garlock Road site would have potentially greater impacts to cultural and visual resources. The Daggett site is also previously disturbed and close to existing industrial infrastructure, but locating a project there would cause greater impacts to cultural resources. Both sites would require a new transmission interconnection, which has the potential to increase environmental impacts. Impacts to other environmental issue areas would be similar to the proposed AMS site.

The proposed AMS site configuration minimizes environmental impacts (particularly to biological resources) and ties into adjacent, existing gas and transmission connections. As alternative configurations would likely increase the potential for impacts, staff did not consider any site facility arrangement or linear alternatives. Since staff has determined that groundwater extraction would not result in a significant impact, a dry cooling alternative and/or construction of pipelines to deliver (and possibly return) recycled water would have minor environmental benefit.

Alternative solar thermal technologies (Stirling dish and distributed tower power) were considered. As with the proposed parabolic trough technology, these technologies would not generate air emissions although water use varies among the technologies. Given similar or greater acreage requirements, they would not lessen the environmental impacts associated with extensive land use. Solar photovoltaic (PV) facilities would likewise require extensive acreage, but less water. Distributed rooftop (commercial and residential) PV could minimize land requirements. Statewide distributed rooftop solar development could meet the project capacity (although many years after the date when the AMS project is proposed to being construction),and is contingent upon state incentives and favorable business models.

Other generation technologies (wind, geothermal, biomass, tidal, wave, natural gas, and nuclear) were also examined as possible alternatives to the project. Wind, geothermal, biomass, tidal, and wave technologies have environmental advantages and disadvantages of their own. Geothermal, biomass, tidal, and wave projects are generally smaller in capacity than the proposed project, and some are unproven at the scale to replace the proposed AMS project; multiple smaller projects could be required to achieve equivalent capacity. Furthermore, tidal and wave technologies are still in developmental stages, and their environmental impacts have yet to be fully analyzed. . A natural gas plant would contribute to greenhouse gas emissions and would not meet the project's renewable generation objective. Finally, construction of new nuclear power plants is currently prohibited under California law.

Conservation and demand side management programs would likely not meet the state's growing electricity needs that could be served by the AMS. In addition, these programs would not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements. Staff also believes that the "no project" alternative is not superior to the proposed project. The "no project" alternative would likely delay development of renewable resources, and would lead to increased operation of existing plants, which use non-renewable technologies.

INTRODUCTION

This section considers potential alternatives to the construction and operation of the proposed AMS project. The purpose of this alternatives analysis is to comply with state environmental laws by providing an analysis of a reasonable range of feasible alternative sites which could substantially reduce or avoid any potentially significant impacts of the proposed project (Cal. Code Regs., tit. 14, §15126.6; Cal. Code Regs., tit. 20, §1765). This section discusses potentially significant impacts of the proposed project that were identified in various technical sections of this SA and analyzes alternative sites and different technologies that may reduce or avoid those impacts.

In cases where, based upon evidence presented at the final hearing, the Energy Commission identifies one or more viable alternatives that it determines meet the project objectives and avoid or substantially lessen one or more of any significant effects of the project, the Energy Commission is authorized to, among other things, deny certification of the proposed project based on the existence of the alternative(s). The Energy Commission does not have authority to require applicants to move proposed projects to different locations or to build alternative projects.

CALIFORNIA ENVIRONMENTAL QUALITY ACT CRITERIA

Energy Commission siting regulations require the examination of the "feasibility of available site and facility alternatives to the applicant's proposal which substantially lessen the significant adverse impacts of the proposal on the environment" (Cal. Code Regs., tit. 20, § 1765).

In addition, the *CEQA Guidelines* require an evaluation of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project." (Cal. Code Regs., tit. 14 § 15126.6(a). In addition, the analysis must address the "no project" alternative (Cal. Code Regs., tit. 14, § 15126.6(e)).

The range of alternatives is governed by the “rule of reason,” which requires consideration only of those alternatives necessary to permit informed decision-making and public participation. *CEQA Guidelines* state that an environmental document does not have to consider an alternative of which the effect cannot be reasonably ascertained and of which the implementation is remote and speculative (Cal. Code Regs., tit. 14, § 15126.6(f)(3)).

PROJECT DESCRIPTION AND SETTING

Mojave Solar LLC proposes to construct, own, and operate the AMS project, with a projected start of commercial operation in the winter of 2012. The 250 MW net solar thermal power plant would use single-axis (north-south) tracking parabolic trough solar collectors. Steam – generated by solar-heated heat transfer fluid (HTF) in solar stream generators – would expand through steam turbine generators to produce electrical power. No supplementary fossil fuels would be required for power production. Wet cooling towers would be used for power plant cooling, with onsite wells supplying water.

The AMS project would be located near the western margin of Harper Dry Lake, in the former town of Lockhart in unincorporated San Bernardino County. The 1,765-acre site consists of 14 privately-owned parcels situated within Sections 28, 29, 30, 32, and 33 of Township 11N, Range 4W (AS 2009a, Appendix I). The site was historically used for agricultural production and cattle ranching since at least the 1930s, and is currently largely barren with some patches of desert saltbrush scrub (*Atriplex*). Existing SEGS VIII and IX solar thermal facilities are on 1,000 acres adjacent to the northwest.

The project would consist of two independently-operated 125-MW solar fields, the 884-acre Alpha (in the northwest portion of site) and the 800-acre Beta (in the southeast portion of site). Each solar field would feed into its own 125-MW power island, to then join at the transmission line interconnection substation. The full-output transmission interconnection would connect to Southern California Edison’s Kramer – Cool Water 230-kV transmission line, which runs adjacent to the southern border of project.

Groundwater from onsite wells would supply water needs for process water makeup, solar collector array washing, and potable uses. The applicant estimates water use to be 2,164 acre feet per year (AFY). Water storage tanks would include two 1,930,000-gallon tanks for raw water and service water, respectively. Sanitary wastewater would be disposed via a sanitary septic system and onsite leach field. Natural gas (for auxiliary boilers, space heating, and other ancillary purposes) would be supplied by a Southwest Gas Corporation pipeline that runs to the project boundary near the Alpha power island. The two-lane Harper Lake Road would serve as the primary access to the site from Highway 58.

The Alpha and Beta islands would each have a 1.5-acre bioremediation/land farm unit to treat soil contaminated with heat transfer fluid (HTF), as well as a warehouse and control/administration building. Solar collector array assembly buildings would be installed in the northeast portion of the Alpha solar field and later converted to warehouses (AS 2009a Sections 2.0, 5.3, and 5.13).

DETERMINING THE SCOPE OF THE ALTERNATIVES ANALYSIS

The purpose of staff's alternatives analysis is to identify the potential significant impacts of AMS project and then focus on alternatives that are capable of reducing or avoiding these impacts.

To prepare this alternative analysis, the staff used the methodology summarized below:

- Describe the basic objectives of the project.
- Identify any potential significant environmental impacts of the project.
- Identify and evaluate alternative locations or site facility arrangements to determine whether the environmental impacts of the alternatives are the same, better, or worse than the proposed project.
- Identify and evaluate technology alternatives to the project which would mitigate impacts.
- Evaluate the impacts of not constructing the project in order to compare the "no project" alternative to the project as proposed.

BASIC OBJECTIVES OF THE PROJECT

Project objectives were defined by the applicant in the AFC and are presented directly below. According to the AFC, the applicant chose the proposed site to satisfy the following requirements (AS 2009a, page 4.0-2):

- To help achieve the State of California renewable energy objectives and to support the state's electric utility requirements with the long term production of renewable electric energy,
- To safely and economically construct, operate and maintain an efficient, reliable, and environmentally-sound power generating facility,
- To develop a Project using up-to-date and improved versions of an already-proven renewable energy technology, minimizing technical risk and improving the financial viability of the project,
- To maximize the renewable energy from a site with an excellent solar resource, appropriate slope and grading, availability of water rights and availability of transportation and other infrastructure in order to minimize the cost of renewable energy for consumers,
- To reduce or eliminate potentially significant adverse environmental impacts by locating away from sensitive noise and visual receptors and sensitive species,
- To electrically interconnect to suitable electrical transmission while minimizing environmental impacts associated with interconnection and minimizing cost
- To develop a site with close proximity to natural gas infrastructure in order to minimize environmental impacts and cost, and
- To meet the requirements of the October 2009 power purchase agreement with PG&E.

Staff then assesses these project objectives to ensure that they are not inappropriately narrow, which could impede the development of a reasonable range of alternatives for the project. Staff specifically includes the underlying purpose of the project. (Cal. Code Regs., tit. 14 § 15124(b). Having taken into consideration the eight objectives set forth by Mojave Solar, LLC in its AFC, the Energy Commission identified the following three basic project objectives. These objectives are used to evaluate the viability of alternatives in accordance with CEQA.

- To safely and economically construct and operate a mid-sized (250 MW) solar power generating facility in California that will meet regional and state-wide needs.
- To site the facility in areas with high solar energy potential and consistent with local land use plans, and where it can be interconnected to the existing transmission system without substantial upgrade or cost.
- To start commercial operation by winter of 2012.

POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE PROJECT

Staff has determined that construction and operation of the AMS project would not result in significant impacts.

SITE ALTERNATIVES TO THE PROJECT

This section evaluates the alternative sites identified by the applicant and other site possibilities identified by staff or the public. It also describes the many factors that were considered in identifying alternative sites.

SCREENING CRITERIA

A variety of screening criteria were used to determine whether another site location would be evaluated as an alternative to the AMS project. Screening criteria include the following:

- Staff reviewed the three project objectives to determine whether an alternative site would feasibly attain most of the objectives.
- Staff reviewed the process by which the applicant assessed available land around the project and configured the project to avoid environmental impacts.
- Staff analyzed maps to identify land that was relatively flat, with sufficient solar insolation for parabolic trough technology.
- Staff consulted the California Independent System Operator generation queue (CAISO 2010) and the Bureau of Land Management (BLM) Application list (BLM 2010) to determine if other solar applicants had indentified locations in the Harper Lake region that would be suitable for a solar thermal project. Staff reviewed the Renewable Energy Transmission Initiative (RETI) Phase 1B and Phase 2A reports (Black and Veatch 2008 and 2009) to determine the location of competitive

renewable energy zones (CREZs) and potential solar projects. The RETI reports evaluate and rank potential renewable energy sites within California based on certain economic and environmental criteria.

- Staff evaluated whether there was high voltage transmission infrastructure (e.g., 230 kV line and substation) within a reasonable distance of an alternative site. Lengthy transmission connections would increase the potential for environmental impacts.
- Staff reviewed Desert Tortoise Critical Habitat, Mohave Ground Squirrel Conservation Areas, Desert Wildlife Management Areas, and Areas of Critical Environmental Concern to determine locations that would not have impacts to desert tortoise, Mohave ground squirrel, or other protected species.
- Staff reviewed criteria developed by the environmental community to provide ecosystem level protection to the California Desert Conservation Area. These criteria give preference to disturbed lands, steering development away from lands with high environmental values, and avoiding the deserts' undeveloped cores.
- Staff reviewed land use information (maps, zoning information, and land ownership) to determine whether there were constraints (e.g., wilderness area or National Park Service land) associated with an alternative site. Staff looked for land that would be large enough (e.g., 1,765 acres) to accommodate the proposed project, was relatively flat and generally available. The proximity to sensitive receptors (e.g., residential areas) was also considered.
- Staff reviewed public comments; however no comments were received pertaining to alternative sites.

Using information derived from the above, **Alternatives Figures 1 and 2** depict land ownership, biological areas, and other development constraints affecting identification of alternative sites in the Western Mojave and the project vicinity. **Alternatives Figure 1** also shows the location of all alternative sites identified by the applicant and staff.

SITES IDENTIFIED BY APPLICANT

The applicant went through a lengthy process to determine the proposed project site identified in the AFC. The applicant designed the site to avoid biological resource management areas designated by the BLM and USFWS; **Alternatives Figure 2** depicts the avoidance of Desert Tortoise Critical Habitat, Mohave Ground Squirrel Conservation Area, Superior-Cronese and Fremont-Kramer Desert Wildlife Management Areas, and the ACEC protecting the remnant marsh at Harper Dry Lake (AS 2009a, p. 5.3-7). The project further avoids recorded desert tortoise locations (AS 2009a, fig. 5.3-4). The applicant also sited the solar fields and other facilities on disturbed parcels characterized by large barren rudereal areas and patches of regrowth desert scrub, rather than on the relatively undisturbed desert scrub habitat that lies beyond the project boundary (AS 2009a, p. 5.3-8 to 9). The site is adjacent to existing transmission and gas infrastructure.

The applicant identified six alternative sites in the Mojave Desert. AFC Section 4.4.2 provides very limited geographical information and analysis for each site; responses to staff data requests (ESH2009c p. 25-33) provide additional information. The applicant's target size for each site area was 1,600 acres, with approximate dimensions of 2.5

miles from east to west and 1.0 miles north to south (ESH2009c Item 41). The applicant identified generalized screening areas rather than specific locations and thus was unable to identify parcels comprising the sites, the number of individual landowners on each site or acreages of the parcels comprising each site (ESH2009c Item 42). A general description of the sites follows:

- **Superior Dry Lake** consists of BLM, Department of Defense (DOD), and private land north of Barstow and just south of Fort Irwin Military Base (35°15'17.86"N 117° 3'49.32"W). The partially disturbed site, with nearby railroad facilities, is located in a low area that is not well visible from most locations. Natural drainages would likely be impacted, and water supplies are unknown. Solar insolation of 7.675 kWh/m2/day is comparable to the proposed site (which has 7.740 kWh/m2/day). The applicant dropped the site due to difficult/uncertain site control, need for lengthy electrical interconnection and gas line, need for new roads (approximately 25 miles), and large undisturbed areas required for development..
- **Coyote Dry Lake** comprises BLM and private land northeast of Barstow and south of Fort Irwin Military Base (35° 1'22.04"N 116°43'31.58"W). The partially disturbed site, with nearby railroad facilities, is located in a low area that is not well visible from most locations. Natural drainages would likely be impacted, and water supply is unknown. Approximately three miles of new access roads would be needed. Solar insolation of 7.359 kWh/m2/day is slightly less than the proposed site. The applicant dropped the site due to difficult/uncertain site control, less than ideal topography, and small to medium undisturbed areas required for development.
- **Bristol Dry Lake** comprises BLM property south of Amboy and east of Twentynine Palms Marine Corps Air Ground Combat Center (34°29'31.19"N 115°38'49.54"W). Although proximate to rail facilties and located in a low area not well visible from most locations, the site is undisturbed without road access. Five miles of new access roads would be required. The water supply is unknown, but a project at the site would be unlikely to impact natural drainage features. The applicant dropped the site due to reduced solar insolation (7.164 kWh/m2/day), difficult/uncertain site control, need for lengthy electrical interconnection, minimal transportation accessibility, and large undisturbed areas required for development. The applicant identified that other developers have filed BLM ROW applications (CACA 50552, 48728, and 48811) in the area Staff reviewed BLM solar applications (BLM 2010) and found that CACA 48728 and 48811 are closer to the Blythe area in eastern Riverside County than to Bristol Dry Lake. In addition to CACA 50552 in the Bristol Dry Lake vicinity, staff also located CACA 49430 and 49432, within the same vicinity.
- **Imperial Valley** comprises private property south of the Salton Sea and south of Interstate 8 (32°44'38.09"N 115°42'10.84"W). The mechanically disturbed site likely supports groundwater use, and does not impact natural drainage features. Roads and railroad access are nearby; railroad unloading facilities are unknown. The site would be visible from the nearby Interstate. The applicant dropped the site due to reduced solar insolation (7.086 kWh/m2/day) and lack of transmission capacity.
- **Imperial Valley East** comprises BLM property east of El Centro (32°49'8.79"N 115° 5'47.40"W). The undisturbed site needs road access, and is likely visible from Interstate 8. Railroads are nearby, but unloading facilities are unknown. New roads approximately seven miles in length would be required. Natural drainage features

would unlikely be impacted; water supplies are unknown. The applicant dropped the site due to reduced solar insolation (7.246 kWh/m2/day), difficult/uncertain site control, lack of transmission capacity, and large undisturbed areas required for development.

- **Northwest of Blythe** comprises BLM property northwest of Blythe (33°41'4.06"N 114°42'13.98"W). The partially disturbed site is visible from the southeast. Water supplies are unknown, and natural drainage features would likely be impacted. Roads are needed (approximately five miles); rail is nearby, but unloading facilities are unknown. Solar insolation of 7.337 kWh/m2/day is slightly less than the proposed site. The applicant dropped the site due to difficult/uncertain site control and large undisturbed areas required for development.

SITES IDENTIFIED BY STAFF

The staff-identified alternatives include the following:

- **Garlock Road** comprises 2,000 acres of disturbed private agricultural land near Garlock (ghost town), southwest of Ridgecrest in Kern County. Six private landowners own 11 parcels ranging from 80 acres to 480 acres in size (Kern County 2010). The site is located south of the intersection of Garlock Road and Redrock-Randsburg Road; both are two-lane paved roads, connecting Highway 395 near Johannesburg to Highway 14 south of Red Rock Canyon State Park. The site lies in a valley – framed by the El Paso Mountains on the north and Rand Mountains on the south – which drains to Koehn Dry Lake to the west. Railroad tracks run by the north of the site along the south side of Redrock-Randsburg Road; it is unclear whether the tracks are operable. An approximately 8-mile transmission interconnection would be required to connect the site to SCE's Kramer-Inyoken 230-kV transmission line, which runs near Highway 395. In addition, a Los Angeles Department of Water & Power (LADWP) 230-kV line runs roughly along the east side of Highway 14. Alternatives Figure 3 shows the proposed alternative site, land uses, sensitive lands and available infrastructure.

- **Daggett** comprises 2,000 acres of privately-owned disturbed land in the Daggett-Yermo area east of Barstow, between Interstate 40 and Interstate 15 in San Bernardino County. The generalized screening area is roughly bounded by the Mojave River to the north, SEGS I and II to the west, Barstow airport to the south, and Minneola Road to the east. The site is characterized by active and fallow agriculture, with approximately 30 parcels. In addition to the existing SEGS projects and airport, the Barstow USMC Logistics Base Yermo Annex (to the west), the decommissioned U.S. DOE Solar Two project (to the west), and RRI Coolwater Powerhouse (a 608 MW natural gas-fired plant to the southwest) give the area an industrial character. A large transmission corridor cuts northeast to southwest through the site, containing one 500-kV DC Intermountain Power Agency (IPA) line, two 500-kV LADWP lines, and one 287-kV LADWP line. In addition, SCE's Coolwater-Dunn Siding 115-kV transmission line is north of the site, Railroads roughly follow the south side of Interstate 15 and the north side of 40. The site is accessed via Minneola Road from Interstate 15, and via Hidden Valley Road from Interstate 40. **Alternatives Figure 4** shows the proposed alternative site, land uses, sensitive lands and available infrastructure.

SITES NOT CARRIED FORWARD FOR FURTHER EVALUATION

Staff rejected all of the six site locations identified by the applicant. For reasons discussed in the above section, none of the sites offer a clear advantage over the proposed site. For each site, the combined impacts to resources and need for new infrastructure are slightly to significantly greater than that of the proposed site.

SITES CARRIED FORWARD FOR FURTHER EVALUATION

Staff is further considering the Garlock Road and Daggett alternative sites. For both sites, transmission interconnection and permitting timeframes would push the project beyond the 2012 on-line schedule.

Garlock Road

The Garlock Road Alternative site consists almost exclusively of historic agricultural operations and fallow agricultural fields and is surrounded largely by undisturbed, native vegetation communities. Elevation on the Garlock Road Alternative site ranges from approximately 1,960 to 2,200 feet. The Garlock Road Alternative site occurs in the bottom Fremont Valley and slopes gently to the southwest toward Koehn Lake. These soil series are mapped for the site: Rosamond, Gila, and Cajon (Soil Survey Staff 2009).

No potential jurisdictional areas were observed on the Garlock Road Alternative site, and none are suspected based on aerial photograph and U.S. Geological Survey topographic map interpretation. There is a wash along the northern border of the site as well as a wash that skirts the northwestern-most corner of the Garlock Road Alternative site that may be waters of the U.S. under the jurisdiction of the U. S. Army Corps of Engineers since the washes may have connection to Koehn Lake. A focused delineation would be necessary to confirm jurisdiction.

Similar to the proposed site, the Garlock Road alternative consists of fallow agricultural land in a a relatively undeveloped area. With 11 privately-owned parcels comprising 2,000 acres, the degree of parcelization is less than the criterion used in the RETI Final Phase 2A Report (2009) of 20 owners per two square miles. RETI considers greater densities to be problematic for site control. There are a few isolated structures/residences onsite, as well as a handful of residences in the town of Garlock to the north of the site (opposite the road). It is unknown if they are occupied.

The transmission interconnection to SCE’s Kramer-Inyoken 230-kV transmission line would follow Garlock Road to the east and then Goler Road to the south; additional private party and BLM parcel crossings would be required. Due to the remote location, interconnection to a natural gas pipeline could be lengthy. Trucking and storing propane onsite has been proposed for other projects in the vicinity (i.e. Beacon Solar Energy Project and Ridgecrest Solar Power Project) and would likely be used for a project at the Garlock Road site.

The site is located within the Koehn sub-basin of the Fremont Valley Groundwater Basin. The Koehn sub-basin is bounded by the California City sub-basin to the southeast, the Chaffee sub-basin to the south and the Oak Creek sub-basin to the southwest (BS 2008a, Figure 5.17-1). Large scale alfalfa farming began within the sub-basin in the mid-1950s and extended through the mid 1980s. During this time, groundwater pumping lowered the water table several hundred feet, which formed a large groundwater depression and caused land subsidence within the sub-basin. Due to the lowered groundwater elevation, pumping costs increased to a point that farming was no longer profitable and most farming operations ceased (BS 2008a). Depth to groundwater varies throughout the sub-basin and ranges from more than 300 feet deep away from Koehn Lake to as shallow as approximately 14 feet deep in the immediate vicinity of the lake.

The Garlock Road Alternative site consists almost exclusively of historic agricultural operations and fallow agricultural fields, and is surrounded largely by undisturbed, native vegetation communities. The site encompasses five vegetation communities (in this approximate order of coverage from high to low): disturbed habitat, disturbed desert saltbush scrub, disturbed stabilized dunes, desert saltbush scrub, and developed. Disturbed habitat supports species such as mustard (*Sisymbrium* sp.), thistle (*Salsola* sp.), Mediterranean grass (*Schismus* sp.), and filaree (*Erodium* sp.). Special status species observations have been reported to the California Natural Diversity Database (CNDDB) within five miles of the Garlock Road Alternative site. Listed species include Desert tortoise (*Gopherus Agassizii*), western snowy plover (*Charadrius alexandrinus nivosus*) and Mohave ground squirrel (*Spermophilus mohavensis*).

Archaeological studies of the nearby El Paso Mountains (north of the site) indicate prehistoric activity. The western subregion of the mountains (west of Black Mountain) has evidence of occupation during the Rose Spring/Haiwee period (1350-650 B.P.), but occupation declines in the later Marana period (600 B.P. to 1850 A.D.). Meanwhile the eastern subregion featured a continual increase in activity during the Marana period (Rogers 2006). Mining activity in the El Paso Mountains dates to the 1860s, although the majority of the activity took place in the 1890s. The discovery of gold east of Red Rock Canyon in 1893 led to camps and mills, including a small stamp mill at Garlock. Garlock at its peak had at “least two bars, two hotels, a stage depot, a laundry, doctor's and dentist's office and a school,” but most of the residents moved away by 1900. Later activities in the area included railroad construction, salt production at Koehn Dry Lake, and a mining prospect at Mesquite Springs (Vredenburgh 2005).

The site has comparable solar insolation (7.25 to 7.75 kWh/m^2-day) to the proposed site (7.5 to 7.75 kWh/m^2-day) (NREL 2010).

Staff has identified the environmental impacts that would likely result from constructing the AMS project at the Garlock Road site. Staff’s analysis identifies whether this site could reduce or avoid any potentially significant impacts of the proposed project.

Environmental Impacts

- **Air quality:** As with the proposed site, the Garlock Road alternative has been previously graded for agricultural use. Minimal excavation and ground disturbance (and associated air emissions) would be expected. Access from Redrock-Randsburg Road would require upgrading the existing dirt roads. Construction and operational emissions at the Garlock Road alternative would be similar to those of the AMS site.

  Exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment and fugitive particulate matter (dust) would be essentially the same at any site. Exhaust emissions would also be caused by workers commuting to and from the work sites, from trucks hauling equipment and supplies to the sites, and crew trucks (e.g., derrick trucks, bucket trucks, pickups). If workers were still to come from the Barstow area (which is 26 miles to the proposed AMS site), they would have to travel over 70 miles on mostly two-lane highway to reach the Garlock Road site. The site is 25 miles from both California City and Ridgecrest, and 60 miles from Lancaster. Appropriate mitigation at the Garlock Road site would likely involve similar, locally oriented recommendations such as the conditions of certification presented in the **AIR QUALITY** section of this PSA.

- **Biological resources:** The Garlock Road alternative site would be located largely on disturbed land and the overall potential for desert tortoise is expected to be low because in some areas the substrate may be too sandy to support burrowing (e.g., disturbed stabilized dunes) and/or the vegetation has been too altered to provide necessary forage and shelter (e.g., disturbed habitat). Tortoise could occur immediately off site in surrounding Mojave creosote bush scrub habitat. Mohave ground squirrel would not be expected given the nature of the site.

  The largely disturbed nature of the Garlock Road Alternative site would limit wildlife use of the site for foraging, sheltering, breeding, or dispersal. However, since the site occurs in the center of Fremont Valley, wildlife may cross the site to travel between the mountains to the north and south or between the upper elevations in the valley to the east to Koehn Lake to the west.

  Although disturbed private land, the site appears to be within boundaries for the Mohave Ground Squirrel Conservation Area and the Fremont-Kramer DWMA; mitigation measures or other requirements may apply. Desert Tortoise Critical Habitat is to the south and east of the site.

  Impacts from noise, light, and other project activities are likely to be similar to that of the project at the proposed site. Overall, biological impacts are likely to be comparable to the proposed site.

- **Cultural resources:** Due to proximity to the El Paso Mountains and Garlock mining town, the Garlock Road site has the possibility of culturally significant remnants. The El Paso Mountains have evidence of prehistoric occupation in *the Rose Spring/Haiwee (1350-650 B.P.) and Marana (600 B.P. to 1850 A.D.) periods, and the area featured a mining boom in the 1890s. Salt production and railroad construction later took place in the Fremont Valley. Given the activity in the region,* a project at the Garlock Road site would have the potential to destroy prehistoric archaeological deposits and historic artifacts. Impacts to cultural resources are likely to be greater than the proposed AMS site.

- **Land use:** The Garlock Road site consists of 11 parcels zoned for exclusive agriculture by Kern County. For rezoning to an electric generating facility, the Energy Commission would likely require the project to abide to local development regulations. Chapter 19.12 of the Kern County Zoning Ordinances requires a Conditional Use Permit for such a conversion (Kern County 2009). Several of the parcels also have non-renewal Williamson Act contracts. Conversion from farmland is allowed when the nine-year non-renewal contract expires; termination of the contract prior to expiration requires cancellation procedures (CDC 2007). The proposed AMS site does not contain any Williamson Act land, but is zoned rural living, which likewise requires a Conditional Use Permit for conversion to a solar facility. The Garlock Road site would have overall similar land use impacts as the proposed site.

- **Noise and vibration:** A solar project at the Garlock Road site would add a dominant noise source; the nearest large noise generators are near Cantil to the west and Randsburg/Johannesburg to the east. Existing onsite structures would likely be removed prior to development, leaving few sensitive receptors. While the Garlock Road site would not have noise effects on an adjacent watchable wildlife area (as would the proposed AMS site), it could possibly be heard by users of the BLM Rand Mountains Fremont Valley Management Area, which lies to the west, south, and east (BLM 2008). In terms of noise impacts, the Garlock Road site does not present an overall advantage over the proposed site.
- **Soil and water resources:** The northwestern portion of the site falls within a flood zone designated by the Federal Emergency Management Agency DFIRM (Digital Flood Insurance Rate Map); parcels 154-131-09 and 154-150-06 are affected (Kern County 2010). Use of these parcels would likely require engineering measures to reduce the risk of flooding. In addition, the Redrock-Randsburg Road is subject to flooding, and closures may affect site access.

  The physical boundaries of the Koehn groundwater sub-basin include the Randsburg-Mojave Fault and Rand Mountains to the south; the El Paso Mountains to the north; the Sierra Nevada Mountains to the west; and the confluence of the El Paso and Rand Mountains to the northeast (Weir et al. 1965, Bloyd 1967, DWR 1968, Moyle et. al.,1985, DWR 2003). Depth to groundwater varies from more than 300 feet deep away from Koehn Lake to as shallow as approximately 14 feet deep in the immediate vicinity of the lake. Groundwater quality in the Koehn sub-basin also varies spatially in relationship to the lake. Beneath Koehn Lake, the Total Dissolved Solids (TDS) concentration of the groundwater is as high as 100,000 mg/L (Dockter, 1979, DWR, 2003); TDS concentrations at the upstream Garlock site would be slightly decreased with slightly increasing water quality.

  It is highly unlikely that groundwater at the Garlock Road site would be suitable for domestic use, which requires a TDS level below 1000 mg/l, with a recommended limit below 500 mg/l (Cal. Code Regs., tit. 22, §§ 64431, 64449). When TDS levels are suitable for domestic use, the Energy Commission and the State Water Resources Control Board (SWRCB) require consideration of alternate water sources. California City and the Rosamond Community Services District have both proposed supplying recycled tertiary-treated water for the Beacon Solar Energy Project (BSEP), located near the community of Cantil just west of Koehn Dry Lake. If these recycled water supplies are developed, they should be also considered for the Garlock Road Site. Pipelines (perhaps in conjunction with those used for the BSEP) would be required to transport water from the wastewater treatment facilities to the site. Approximate pipeline distances would be 25 miles from California City and 48 miles from Rosamond.

- **Visual resources:** With minimal surrounding development, a project at this site would develop an otherwise vacant desert landscape. Redrock-Randsburg Road is slightly elevated above the site, and a solar thermal facility would likely be visible to motorists traveling in both directions. It could also be visible to users of designated offroad routes in the BLM Rand Mountains Fremont Valley Management Area. The transmission interconnection to SCE's Kramer-Inyoken 230-kV transmission line would be visible to the Management Area. There are also a number of offroad trails in the El Paso Mountains including Last Chance Canyon, Mesquite Canyon, and Goler Canyon. There is the potential for the site to be visible from the southeast portion of the Red Rock Canyon State Park.

  The proposed AMS site is adjacent to the BLM's Harper Lake Watchable Wildlife Viewing Area, but is also adjacent to existing SEGS VIII and IX facilities. Also the road leading to the AMS site would have far fewer travelers than the combined traffic on Redrock-Randsburg Road and Garlock Road. The Garlock Road alternative would have greater visual impacts than the proposed AMS site.

Daggett

The Daggett Alternative site has minimal slope and has previously been graded for agriculture use. It also has similar solar insolation (7.0-7.75 kWh/m^2-day) as the proposed Harper Lake site (NREL 2010).

Situated in a disturbed, developed area, the site would not industrialize a remote part of the Mojave Desert. It is close to railroads and interstate highways, and is convenient to workers from the Barstow and Victorville areas. A transmission interconnection study would be required to determine whether the project could connect to one of the four lines that runs through the site, or whether an upgrade or construction of a new line would be needed. With the RRI Coolwater Powerhouse and other industrial features in the immediate vicinity, staff expects a short interconnection to an existing natural gas pipeline.

The site contains scattered agricultural structures, primarily located along Minneola Road, Valley Center Road, and Silver Valley Road. Removal of these structures may be required. A low-density residential area is located to the north of the site. Approximately 30 privately-owned parcels comprise the 2,000 acre site, making site control more difficult. The former San Pedro, Los Angeles, and Salt Lake Railroad, now the Union Pacific Railroad, and segments of the Old Spanish Trail, the Mormon Trail, and the Mojave Road are thought to run through the area comprising the alternative site; the presence and integrity of these segments are presently unconfirmed .

The site would be located within the Mojave Desert Air Basin, regulated by the Mojave Desert Air Quality Management District (MDAQMD). Ozone and particulate matter violate ambient standards, despite the low population density east of Barstow (USEPA 2008).

The Mojave River (which rarely flows in the Daggett area) runs to the north of the site. There are patches of well developed riparian habitat and areas of no and poorly developed riparian habitat. The ancient river and lakes formed sandy beaches and prevailing winds carried the finer particles to the east, forming hummocks and dunes.

These blowsand areas now support unique species of insects, plants, and reptiles, including the Mojave fringe-toed lizard *(Uma scoparia)*, whose entire distribution can be traced to the former path of the ancient Mojave River and Amargosa River (BLM 2004). In addition, the following sensitive species occur in the vicinity of the alternative site (CNDDB, 2009), and several are noted because of the proximity to the Mojave River: southwestern pond turtle *(Actinemys marmorata pallida)*, vermilion flycatcher *(Pyrocephalus rubinus)*, Mohave tui chub *(Gila bicolor mohavensis)*, desert tortoise *(Gopherus agassizii)*, Parish’s popcorn-flower *(Plagiobothrys parishii)*, pallid bat *(Antrozous pallidus)*, Townsend's big-eared bat *(Plecotus townsendii)*, burrowing owl *(Athene cunicularia)*, and Barstow woolly sunflower *(Barstow woolly sunflower)*.

The environmental impacts that would likely result from constructing the AMS project at the Daggett alternative site are as follows:

- **Air quality:** As with the proposed site, the Daggett alternative would require minimal grading, and emissions from excavation and large scale ground disturbance would not be expected. Construction and operational emissions at the Daggett Alternative would be similar to those of the AMS site.

  Exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment and fugitive particulate matter (dust) would be essentially the same at any site. Exhaust emissions would also be caused by workers commuting to and from the work sites, from trucks hauling equipment and supplies to the sites, and crew trucks (e.g., derrick trucks, bucket trucks, pickups). Workers and trucks hauling equipment and supplies would have to commute up to 18 miles (from Barstow) or 48 miles (from Victorville) to reach the Daggett alternative site. These distances are slightly less than the 26 miles from Barstow and 52 miles from Victorville to the proposed AMS site. Appropriate mitigation at the Daggett site would likely involve similar, locally oriented recommendations such as the conditions of certification presented in the **AIR QUALITY** section of this SA.

- **Biological resources:** The Daggett alternative site would be located on habitat that is considered suitable for the Mohave ground squirrel. However it is outside of the species’ historic range, and populations in southwestern San Bernardino County appear to be extirpated (CDFG 2005, CDFG 2009). CNDDB data did not identify the ground squirrel at the site.

  The site is located in habitat of varying quality for desert tortoise. Although the habitat/plant community varies somewhat with elevation, slope, and soils, many areas have been heavily disturbed and some are actively farmed. The majority of the habitat is unsuitable for desert tortoise, and the site is not near Critical Habitat.

  The proximity of the Mojave River (approximately one-half mile from the site) and associated riparian habitat would most likely result in increased bird activity in the area. However the increase is not expected to result in significant impacts. Impacts from noise, light, and other project activities are likely to be similar to that of the project at the proposed site. Overall, biological impacts are likely to be comparable to the proposed site.

- **Cultural resources:** Further study of resources associated with the San Pedro, Los Angeles, and Salt Lake Railroad; Old Spanish Trail; Mormon Trail; and the Mojave

Road could reveal that a solar facility on the Daggett Alternative site would have significant physical and visual impacts on historically significant segments that contribute respectively to the historic significance of each overall transportation route.

Given the historic significance of the Mojave River corridor during most of prehistory and the character of the diverse archaeological site types known for the Daggett Alternative and adjacent areas, it is, however, reasonable to conclude that the alternative would have the potential to destroy significant prehistoric archaeological deposits. Federal and State regulatory programs would require treatment for all such deposits.

The development of a solar facility on the Daggett Alternative site would likely have cultural resource impacts that exceed those of the AMS project near Harper Dry Lake.

- **Land use:** The County's land use zoning for the site is Rural Living (San Bernardino County 2007). Electrical power generation is an allowed use in an area designated as Rural Living with a Conditional Use Permit, which requires a General Plan Amendment to apply the Energy Facilities Overlay (San Bernardino 2009). The proposed AMS site would similarly require a Conditional Use Permit.

  The vast majority of the acres of the Daggett site are or were used for agricultural purposes; however, no lands under Williamson Act contracts would be impacted (DOC 2008). The construction and operation of the solar power plant would eliminate existing agricultural operations and foreseeable future agricultural use. This loss of agricultural lands would require a condition of certification potentially requiring purchase of an equivalent number of acres of farmland. Land use impacts at the Daggett Alternative site would be similar to the AMS site.

- **Noise and vibration:** With surrounding industrial features (including the Barstow airport, existing solar projects, RRI Coolwater Powerhouse, and transmission line, and solar projects), the addition of a solar project at the Daggett alternative site would not add a dominant noise source to the area. There would be more sensitive receptors with the residences to the north and east of the Daggett site. Overall noise impacts would be comparable to that of the proposed site.

- **Soil and water resources:** It is unlikely that groundwater would be encountered during grading activities as the recorded depth to groundwater in the Lower Mojave River Valley Groundwater Basin is between 50 and 800 feet. The volume of groundwater required for construction would be similar to that required for constructing the project at the proposed Harper Lake location; however, there is a general trend in this basin for declining groundwater levels. While it is unknown at this time if there is sufficient groundwater available in the Lower Mojave River Valley Groundwater Basin to meet the construction and operation requirements of the Daggett Alternative, staff expects that water use associated with the project would be less than the annual volume of water associated with current agriculture practices.

- **Visual resources:** The site would be visible to motorists looking north from Interstate 40, which is slightly elevated above the site. However a solar thermal project at the site would not be visually prominent and would blend in with the surrounding industrial landscape (which includes the Barstow airport, existing solar projects, RRI Coolwater Powerhouse, and transmission line). The site would be comparatively less visible from Interstate 15 (which is level with the site), and a berm would block some portions from view. The project, however, would disrupt views from the scattered residences to the north and east of the site. This compares to the proposed Harper Lake site, which briefly comes into view on the approach from Harper Lake Road but is not visible from SR-58. There are approximately 10 rural residences and farms located within one mile of the proposed site, and the majority would have direct, unobstructed views of the project. Overall, a project at the Daggett alternative site would have a similar impact to the visual environment.

Alternatives Table 1
Comparison of Impacts of Alternatives to the Proposed AMS project*

	Garlock Road Site	**Daggett Site**
Environmental Assessment		
Air Quality	Similar to proposed site	Similar to proposed site
Biological Resources	Similar to proposed site	Similar to proposed site
Cultural Resources	Greater than proposed site	Greater than proposed site
Land Use	Similar to proposed site	Similar to proposed site
Noise and Vibration	Similar to proposed site	Similar to proposed site
Soil and Water Resources	Similar to proposed site	Similar to proposed site
Visual Resources	Greater than proposed site	Similar to proposed site
Feasiblity Assessment		
Solar Insolation	Similar to proposed site	Similar to proposed site
Site Control	Similar to proposed site	More parcels than proposed site
Linear Connections		
Transmission interconnection *Adjacent for proposed site*	Greater than proposed site (8 miles of new transmission line)	Greater than proposed site *(New or upgraded transmission line possibly required)*
Recycled water pipeline *Over 24 miles for proposed site*	Similar to proposed site (25 miles from California City; 48 miles from Rosamond CSD)	Similar to proposed site (18 miles from Barstow)
Natural gas pipeline *Adjacent for proposed site*	Greater than proposed site (Truck delivery required)	Similar to proposed site (Neaby interconnection likely)

*Shaded cells identify greater impacts than proposed project.

The Garlock Road Alternative site would likely have similar impacts to land use, noise and vibration, and soil and water resources as the proposed site. The site would have a greater visual impact than the proposed project, with changes in the visual character of a currently remote desert location.Cultural resource impacts would be greater. The Garlock Road site would require a new transmission interconnection, possibly a lengthy reclaimed-water pipeline, as well as trucking to deliver natural gas. The linear features would generally follow existing roads and other public rights-of-way, but have the potential for greater visual and biological impacts than at the proposed site, where interconnections would be adjacent to the solar facility. Meanwhile, delivering natural gas by truck could slightly increase traffic and air quality impacts. While the Garlock Road alternative may be a feasible site for a solar project (with reasonable site control and adequate solar insolation), it presents slight disadvantages and no advantages compared to the site proposed for the AMS project.

The Daggett site would potentially have similar impacts as the proposed site to air quality, biological resources, land use, noise and vibration, soil and water resources, and visual resources. However greater impacts to cultural resources (from proximity to historic transportation routes) would be expected. A transmission interconnection study is required to determine whether an interconnection upgrade would be required and whether it could take place in the existing corridor. With neaby industrial facilities, a natural gas interconnection in proximity of the site is likely; environmental impacts would be similar. Although the Daggett site has similar solar insolation as the proposed site, site control could be more challenging with the greater number of parcels and existing onsite structures.

Neither alternative site presents a clear advantage over the proposed AMS site.

SITE FACILITY ARRANGEMENT ALTERNATIVE

As discussed above, the site facility arrangement is designed to capitalize on existing transmission and gas infrastructure. With proposed adjacent interconnections, any alternative linear routes would likely be longer and increase the potential for environmental impacts. The project is further situated on previously farmed areas (where natural vegetation has been disturbed/removed). It would avoid recorded desert tortoise locations and BLM and USFWS designated biological habitat constraints. The proposed site facility would minimize environmental impacts, and other arrangements would potentially increase impacts. As such, staff does not recommend a site facility arrangement alternative.

ALTERNATIVE WATER TECHNOLGIES AND SUPPLIES

The AMS parabolic trough technology will employ wet-cooling and water use from onsite wells is estimated at 2,154 AFY (AS2009a, p. 2.0-14). Groundwater at the Harper Lake site may be too brackish (high TDS level) to be considered suitable for domestic use. If unsuitable, it is acceptable to use groundwater for solar plant processes under state law. Although groundwater extraction from the Harper Lake Basin would not result in a significant impact, staff evaluated alternative cooling technologies and water supply options.

Dry-cooling uses an air-cooled condenser (ACC) to cool the steam turbine exhaust with a large array of fans that force air over finned-tube heat exchangers. Steam is condensed inside the tubes through indirect contact with the ambient air; forced convection then forces heat into the atmosphere. Water savings occur as there is no evaporation during the cooling process. Meanwhile, the proposed wet-cooling tower applies water to the outside of the condenser while simultaneously using fans to evaporate the water; the evaporation typically provides approximately a 5-7% greater efficiency than dry-cooling. The applicant provides additional reasons that wet cooling systems are more efficient than dry cooling systems in areas with low humidity (such as the proposed site) in Section 4.7.2.2 of the AFC. Dry cooling could have slightly greater impacts to visual resources (ACC is larger) and noise (ACC has more and larger fans) but lesser impacts to air emissions (no drift emissions as from wet cooling tower) and waste (wastewater processing generates less solid wastes) (AS2009a, p. 4.0-11 to -14). An expanded solar field and associated facilities could offset the generation loss from dry-cooling; however, expanding the site footprint would increase impacts to biological resources

If the AMS were to use wet-dry hybrid cooling in place of wet cooling, there would be an 80% reduction in required project makeup water (426 AFY versus 2,154 AFY). (AS 2009a, p. 4.0-14). The applicant also did a cost impact analysis for wet-dry hybrid cooling and calculated a net impact of $52,230,000. Although there would be some cost savings related to reduced water extraction and treatment, decreased evaporation pond size, and civil work, the applicant factored in greater additional costs from initial capital costs and reduced generation (AS 2009a, p. 4.0-13).

The applicant and staff also considered alternate water supplies. The City of Barstow, Town of Adelanto, and Victor Valley Wastewater Reclamation Authority all have wastewater treatment facilities that could potentially supply tertiary-treated water to the project. Delivery distances would be 24-25 miles, 34 miles, and 33 miles, respectively. These water suppliers have indicated to the applicant that they desire the water to be returned as groundwater to their own jurisdictions. This would potentially require a return pipeline from the project, which may be infeasible to Adelanto and Victor Valley due to respective elevation differences of 583 feet and 562 feet. Estimated pipeline construction and operation costs range from $29-$35 million (single supply) to $54-$94 million (bidirectional). In addition, project water needs vary throughout the year, with the highest demand during the summer (AS 2009a, p. 4.0-17 to 18).

Dry-cooling and piping in recycled water would thus have greater costs and minor environmental benefit given that groundwater extraction is not determined to be a significant impact.

GENERATION TECHNOLOGY ALTERNATIVES

CONSERVATION AND DEMAND SIDE MANAGEMENT

Conservation and demand-side management consist of a variety of measures that reduce electricity use, including energy efficiency and conservation, building and appliance standards, and load management and fuel substitution. In 2005, the Energy Commission and the California Public Utilities Commission (CPUC) joint Energy Action

Plan II declared cost-effective energy efficiency as the resource of first choice for meeting California's energy needs. Energy efficiency measures have helped flatten the state's per capita electricity use and saved consumers more than $56 billion since 1978 (CPUC 2008). The Investor-Owned Utilities' (IOU) 2006-2008 efficiency portfolio marks the single-largest energy efficiency campaign in U.S. history, with a $2 billion investment by California's energy ratepayers (CPUC 2008). However, with population growth, increasing demand for energy, and the need to reduce greenhouse gases, additional energy efficiency measures will be required.

The CPUC, with support from the Governor's Office, the Energy Commission, and the California Air Resources Board, among others, adopted the California Long-Term Energy Efficiency Strategy Plan for 2009 to 2020 in September 2008 (CPUC 2008). The plan is a framework for all sectors in California including industry, agriculture, large and small businesses, and households. Major goals of the plan include:

- All new residential construction will be zero net energy by 2020;
- All new commercial construction will be zero net energy by 2030;
- Heating, ventilation, and air conditioning industries will be re-shaped to deliver maximum performance systems;
- Eligible low-income customers will be able to participate in the Low Income Energy Efficiency program and will be provided with cost-effective energy efficiency measures in their residences by 2020.

Conservation and demand-side management is important for California's energy future and cost effective energy efficiency is considered as the resource of first choice for meeting California's energy needs. However, with population growth and increasing demand for energy, conservation and demand-management alone is not sufficient to address all of California's energy needs. Additionally, it will not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements; therefore technologies like solar thermal generation would be required.

ALTERNATIVE SOLAR GENERATION TECHNOLOGIES

Staff evaluated other solar generation technologies that have been implemented for utility-scale production. The solar alternatives could achieve most of the project objectives, but would not substantially lessen or avoid environmental impacts and may require greater land use. For these reasons, staff is not retaining the following technologies in this analysis:

- **Photovoltaic.** Photovoltaic (PV) facilities include both utility-scale facilities placed on the ground and distribution-scale rooftop and localized installations. Panels composed of semiconductor materials – crystalline silicon, cadmium telluride, copper indium gallium diselinide, or amorphous silicon – absorb solar radiation and convert it directly to electricity. The panels are mounted at a fixed-angle or on tracking structures. Their black surface enhances sunlight absorption and reduces glare.

  Utility-scale ground-mounted PV facilities can require from 4 acres per MW (crystalline silicon) to 10 acres per MW (thin film and tracking) (NRDC and Sierra Club 2008). While water is not required for electricity generation, 2 to 10 acre feet per year (AFY) per 100 MW may be needed to wash panels, for an average of 0.6 AFY/MW (NRDC and Sierra Club 2008). The 550 MW Topaz Solar Farm proposed for eastern San Luis Obispo County is projected to use 4,100 acres of land (7.5 acres/MW) and 3.5 AFY of water (0.006 AFY/MW) during operations (Topaz Solar Farms 2008). The AMS project has a comparable land use efficiency of about 6.4 acres/MW. The AMS would require about 1,400 times the operational water supply as the Topaz Solar Farm, with AMS' water use efficiency at about 8.6 AFY/MW (2,154 AFY/250 MW).

- **Distributed Rooftop PV installations** by their nature reduce the amount of new or disturbed land required as well as the quantity of water required. Most distributed rooftop PV systems in California are crystalline systems, and result in approximately 15% of sunlight converted to energy (SB 2009). The newer technology is thin film, which converts approximately 5-10% of sunlight to energy.

  California currently has over 515 MW of distributed solar PV systems which cover over 40 million square feet (CPUC 2009). During 2008, 158 MW of distributed solar PV was installed in California, doubling the amount installed in 2007 (78 MW), and installation data suggests that at least the same amount of MW could be installed in 2009 as in 2008 with 78 MW installed through May 2009 (CPUC 2009).

  California's IOUs have announced significant aggregations of small-scale solar PV projects. Southern California Edison (SCE) has installed the first 3 MW of a planned 250 MW of solar panels on two square miles of commercial rooftop (in 150 installations) in the next five years (SCE 2009). In July 2008, San Diego Gas and Electric (SDG&E) proposed its Solar Energy Project, which it projects will result in up to 77 MW of new installed solar capacity in the San Diego load basin. SDG&E would build and operate 52 MW of rooftop solar and expects that customer opportunities resulting from this effort could result in the installation of up to an additional 25 MW of capacity under the California Solar Initiative (CSI) that would not have otherwise been built (SDG&E 2008). In February 2009, PG&E announced plans to develop 500 MW of solar PV projects over the next five years. In contrast to the SCE and SDG&E programs, PG&E would largely focus on projects from 1 to 20 MW, with ground-mounted systems, rather than rooftop panels, playing a substantial role (PG&E 2009). In June 2009, the City of San Jose issued a solicitation for installation of 50 MW on city facilities and/or land, as part of its Green Vision goal of achieving 100% of electricity from renewable energy by 2020 (San Jose 2010).

  A study prepared in 2007 by Navigant Consulting, Inc. (NCI) and the Energy Commission calculated the economic potential of distributed rooftop PV, by county, for new and retrofitted buildings (NCI 2007). **Alternatives Table 2** identifies those counties with the greatest retrofit[1] economic potential. The calculations are based on

[1] New construction economic potential was substantially less than retrofit potential..

the most favorable scenario using state subsidies (California Solar Initiative incentives) and new business models[2] favoring PV development.

Alternatives Table 2
California Counties with Greatest Economic Potential for Distributed Rooftop PV (MW)

County	2010-Residential	2010 – Commercial	2016 – Residential	2016 – Commercial
Los Angeles	16	45	85	168
San Bernardino	14	11	181	99
San Diego	3	15	23	137
Orange	11	15	71	77
Riverside	4	7	33	60

Projections for potential distributed rooftop PV development in San Bernardino County of 280 MW in the year 2016 would thus be comparable to the AMS project's 250 MW capacity. Without state subsidies and new business models favoring development, these projections are significantly lower. For instance, San Bernardino's rooftop potential (retrofit and new construction) in 2016 would be 44 MW. With state subsidies, but without new business models, the County would have a potential of 125 MW (half of the capacity of the proposed project) in 2016 (NCI 2007). Due to variable factors affecting the state's economic climate, the projected economic potential in the county and statewide is uncertain. Even if feasible, multiple distributed PV installations would not meet the permitting timeframes identified for the proposed AMS project.

- **Stirling Dish.** A paraboloid dish of mirrors focuses sunlight on the receiver end of a Stirling engine. A Stirling engine field requires 7 to 9 acres per MW; generation of 250 MW would thus have similar land requirements as the AMS project. For example, the proposed SES Solar 2 Project in Imperial County would comprise 30,000 Stirling dishes to generate 750 MW on 6,500 acres (SES Solar 2 2008). Stirling technology – with dishes 38 feet tall and 40 feet wide (in the case of SES Solar 2) – would have similar, if not greater, visual impacts than parabolic trough structures.
- **Distributed Power Tower.** A large field of mirrors mounted on pylons (the heliostats) surrounds and focuses light on an elevated power tower. A boiler would be supported at the top of the power tower, and power plant equipment similar to the AMS project (e.g. steam turbine-generator and cooling tower) would be located at ground level. The power towers would be significantly taller than the parabolic troughs; for example, the proposed Ivanpah Solar Electric Generating System would

[2] For this analysis, NCI used three of the seven business models developed with CEC's Public Interest Energy Research Program: *PV as an Appliance* (where PV systems can be sold to a homeowner and incorporated into the home like an appliance as "plug and play"), *No Hassle PV* (where a single entity bundles the system design, purchase, permitting, rebate application, installation, maintenance, and financing into one transaction for the customer), and *PV Consumer Finance* (in which initial PV system costs are financed using standard consumer finance models)

consist of one to four towers for each solar field with heights from 300 to 440 feet. The heliostats making up the solar field would be approximately 20 feet high, and combined with the power towers would have significant visual effects. Also, the circular heliostat arrangement is less efficient in terms of land use; the 400 MW Ivanpah plant would require approximately 4,065 acres for solar generation (Solar Partners 2007) equating to about 10 acres per MW, compared to AMS project at 6.7 acres per MW.

ALTERNATIVE TECHNOLOGIES

Staff also considered other renewable and non-renewable energy sources. Some of the technologies are not fully proven. Others may be applicable, but present no clear advantage over the proposed project. A combination of all technologies would be required to meet California's renewable energy goals.

- **Wind.** Wind carries kinetic energy that can be utilized to spin the blades of a wind turbine rotor and an electrical generator, which then feeds alternating current (AC) into the utility grid. Wind turbines currently being manufactured have power ratings ranging from 250 watts to 1.8 MW (AWEA 2004). Wind farms require less intense land use than a parabolic trough facility. Approximately 5.5 acres per MW are required, though the turbines themselves may use only 3-5% of the land (CEC 2008). Environmental impacts include bird and bat collisions and visual pollution. Utility-scale wind projects are proposed throughout the Mojave Desert, including 28 wind applications currently under review in the BLM Barstow Field District (BLM 2009).

- **Geothermal.** Steam or high-temperature water from geothermal reservoirs is harnessed to drive steam turbine/generators. Geothermal plants range in size from under 1 MW to 200 MW, and the 0.2 to 0.5 acre required per MW would be significantly less than a solar facility. Potential environmental impacts include hazardous materials emissions (particularly hydrogen sulfide and byproducts) and groundwater contamination. Geothermal plants provide highly reliable base-load power, with capacity factors from 90-98%. Plants, however, must be built near geothermal reservoir sites, as steam and hot water cannot be transported long distances without significant thermal energy loss. Geothermal plants are currently operating in the California counties of Lake, Sonoma, Imperial, Inyo, Mono, and Lassen. The nearest known geothermal resource area to the project site is in Randsburg (east of the Garlock Road alternative). Larger geothermal areas in the Mojave Desert are in Coso Hot Springs (southwestern Inyo County) and Imperial County (CEC 2005). The state has an estimated potential of more than 4,000 MW additional geothermal output (CEC 2009b), although few projects are currently proposed. Multiple smaller geothermal projects – and related transmission lines, wells, and pipelines – would likely be required to achieve the capacity of the proposed AMS project.

- **Biomass.** Electricity is generated by burning organic fuels (feedstock) in a boiler to produce steam, which then turns a turbine. Biomass can also be converted into a fuel gas such as methane and burned. Major biomass feedstocks include forestry and mill wastes, agricultural field crop and food processing wastes, and construction and urban wood wastes. Biomass facilities do not require an extensive amount of land for the actual facility, although fuel production could require extensive acreage if specifically farmed. As a fuel combustion technology, biomass generally has significant air emissions, which require mitigation. Biomass facilities are generally small-scale, in the range of 3 to 10 MW. Facilities would ideally be situated near a large feedstock source, otherwise ongoing truck deliveries would be required to supply biomass fuel from other locations.

- **Tidal.** Tidal generation of electricity includes barrage, fence, and turbine technology. Tidal barrages are dams built across a bay or estuary. Water retained behind the barrage at high tide produces a power head sufficient to generate electricity as the tide ebbs and water released from within the dam turns conventional turbines. Worldwide, existing tidal barrages include a 240-MW plant in France, a 20-MW plant in Nova Scotia, and a 0.5-MW plant in Russia (EPRI 2006).

  Tidal fences are barrages that completely block a channel. Fences allow for increased current velocity through the turbines (higher output) and keep electrical equipment above water, but can be very destructive if deployed across the mouth of an estuary. They are also limited to areas adjacent to a body of water with large difference between high and low tides. There are plans for a tidal fence across the Dalupiri Passage in the Philippines (Osborne 2006). Meanwhile, tidal turbines – which look like underwater wind turbines – are less disruptive to wildlife, allow small boats to continue to use the area, and have much lower material requirements than tidal fences. Also, the majority of the turbine assembly is hidden below the waterline and all cabling is along the sea bed. Verdant Power's Roosevelt Island Turbine Energy (RITE) project was initiated in 2002 and generates 1 MW in New York's East River (Verdant Power 2009). However, tidal turbines are unproven at the scale that would be required to replace the AMS project capacity. Additionally the potential for adverse impacts of tidal turbines is still under review, as demonstrated by the RITE project under environmental monitoring in New York.

- **Wave**. Wave energy technologies which include terminator devices, point absorbers, attenuators, and overtopping devices – extract energy from surface wave motion or subsurface pressure fluctuations (MMS 2007). Setbacks and a general lack of confidence have contributed to slow progress towards proven devices that would have a good probability of becoming commercial sources of electrical power using wave energy. The highest energy waves are concentrated off the western coasts in the 40^{o} to 60^{o} latitude range north and south. The power in the wave fronts varies in these areas between 30 and 70 kilowatts per meter (kW/m) with peaks to 100 kW/m in the Atlantic southwest of Ireland, the Southern Ocean and off Cape Horn. Many wave energy devices are still in the research and development stage and would require large amounts of capital to get started. Additional costs from permitting and environmental assessments also make wave energy problematic (WEC 2010).

  In 2008, CPUC rejected PG&E's request for approval of a renewable resource procurement contract with Finavery Renewables (for a 2 MW wave farm off the coast in Eureka) due to conclusions that the project had not been shown to be viable and because of significant uncertainty surrounding the technology (CPUC 2008). More recently, PG&E applied for a Federal Energy Regulatory Commission (FERC) preliminary permit on December 11, 2009, to study the feasibility of a wave energy project located within state waters near Point Arguello. If granted, the permit would allow study of the offshore environment to determine whether the location is appropriate for a wave energy facility.

Environmental issues associated with wave technology include: modifications to water circulation and currents, changes to larval distribution and sediment transport, marine mammal entanglement, chemical spills and paint release, changes to fish community structures and among other effects (Boehlert 2008).

- **Natural Gas.** Natural gas-fired power plants typically consist of combustion turbine-generators for simple cycle peaking units and may also include heat recovery steam generators and a steam turbine-generator for combined cycle units. Additional equipment common to both simple and combined cycle plants includes wet or dry cooling towers, air inlet cooling, intermediate cooling for some gas turbines and various support equipment. An interconnection with a source of natural gas and a water connection are required. Natural gas plants emit greenhouse gases and would not contribute towards meeting AB 32 renewable energy goals in the state.
- **Nuclear.** California law currently prohibits the construction of any new nuclear power plants in California until the California Energy Commission finds that the federal government has approved, and there exists a demonstrated technology for the permanent disposal of spent fuel from these facilities (CEC 2009).

THE “NO PROJECT” ALTERNATIVE

The “no project” alternative under CEQA assumes that the project is not constructed. In the CEQA analysis, the “no project” alternative is compared to the proposed project and determined to be superior, equivalent, or inferior to it. The CEQA Guidelines state that “the purpose of describing and analyzing a “no project” alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project” (Cal. Code Regs., tit. 14, §15126.6(e)(1)). Toward that end, the “no project” analysis considers “existing conditions” and “what would be reasonably expected to occur in the foreseeable future if the project were not approved” (Cal. Code Regs., tit. 14 §15126.6(e)(2)). CEQA Guidelines and Energy Commission regulations require consideration of the “no project” alternative. The no-action alternative is compared to the effects of the proposed action.

In short, the site-specific and direct impacts associated with the AMS project would not occur at this site if the project does not go forward. If the “no project” alternative were selected, the construction and operational impacts of the AMS project would not occur. Installation of new foundations, parabolic trough equipment, piping, and utility connections would not be required. There would be no groundwater extraction from the Harper Lake Basin. Cumulative impacts of the AMS with proposed wind and solar projects (throughout the Western Mojave) and nearby projects (including Nursery Products’ Hawes Composting Facility and Optisolar’s PV application) would be avoided.

In the absence of the AMS project, other power plants, including renewable facilities, could be constructed in the project area or in California to serve the demand that could be met with the AMS project. These plants could have lesser, similar or greater environmental impacts than the proposed project. In the near term, the more likely result is that existing plants, many of which use non-renewable resources, could operate more. Continuing use of fossil fuel to generate electricity contributes to greenhouse gas emissions and runs counter to California's efforts to reduce 1990 levels of GHG emissions by 80% by 2050.

If the project is not built, the region and state would not benefit from the clean, renewable source of new generation that this facility would provide. There may be substantial transmission interconnection delays associated with upgrade requirements if the project were sited elsewhere.

Considering the above, the no-action alternative is not superior to the proposed project.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments have been received to date.

CONCLUSIONS AND RECOMMENDATION

Staff has analyzed project site and technology alternatives, conservation measures, water supply alternatives, and the "no project" alternative. The Garlock Road and Daggett site alternatives retained for further analysis in this do not provide substantial environmental advantage over the proposed site. Due to location on disturbed previously farmed land, proximity to transmission/gas interconnections, and avoidance of habitat constraints, the proposed location is environmentally preferable as compared to the alternatives considered. As the proposed site configuration minimizes environmental impacts (particularly to biological resources), staff did not consider any site facility arrangement alternatives. Dry cooling and piping in recycled water would have minor environmental benefit if groundwater extraction is not determined a significant impact.

Other solar technologies may require greater land or water use, and would likewise not substantially lessen environmental impacts. If distributed rooftop PV were developed to its residential and commercial potential in San Bernardino County, it could generate electricity comparable to the proposed project but many years after the date when the AMS project would begin construcition. Without state subsidies and business models favorable to photovoltaic development, the County's potential for rooftop PV would be significantly less than the project. A similar reduction would be seen statewide. Wind, geothermal, biomass, tidal, and wave technologies have environmental advantages and disadvantages of their own. Geothermal, biomass, tidal, and wave projects are generally smaller in capacity than the proposed project, and some are unproven at the scale to replace the proposed AMS project; multiple smaller projects could be required to achieve equivalent capacity. Furthermore, tidal and wave technologies are still in developmental stages, and their environmental impacts have yet to be fully analyzed. Natural gas plants would not meet renewable objectives, and nuclear facilities are currently prohibited in California. Conservation and demand side management programs would likely not meet the state's growing electricity needs that could be served by the AMS project. Although the “no project” alternative would eliminate all impacts of this project, the benefits of increasing regional and state-wide renewable energy generation would not be achieved.

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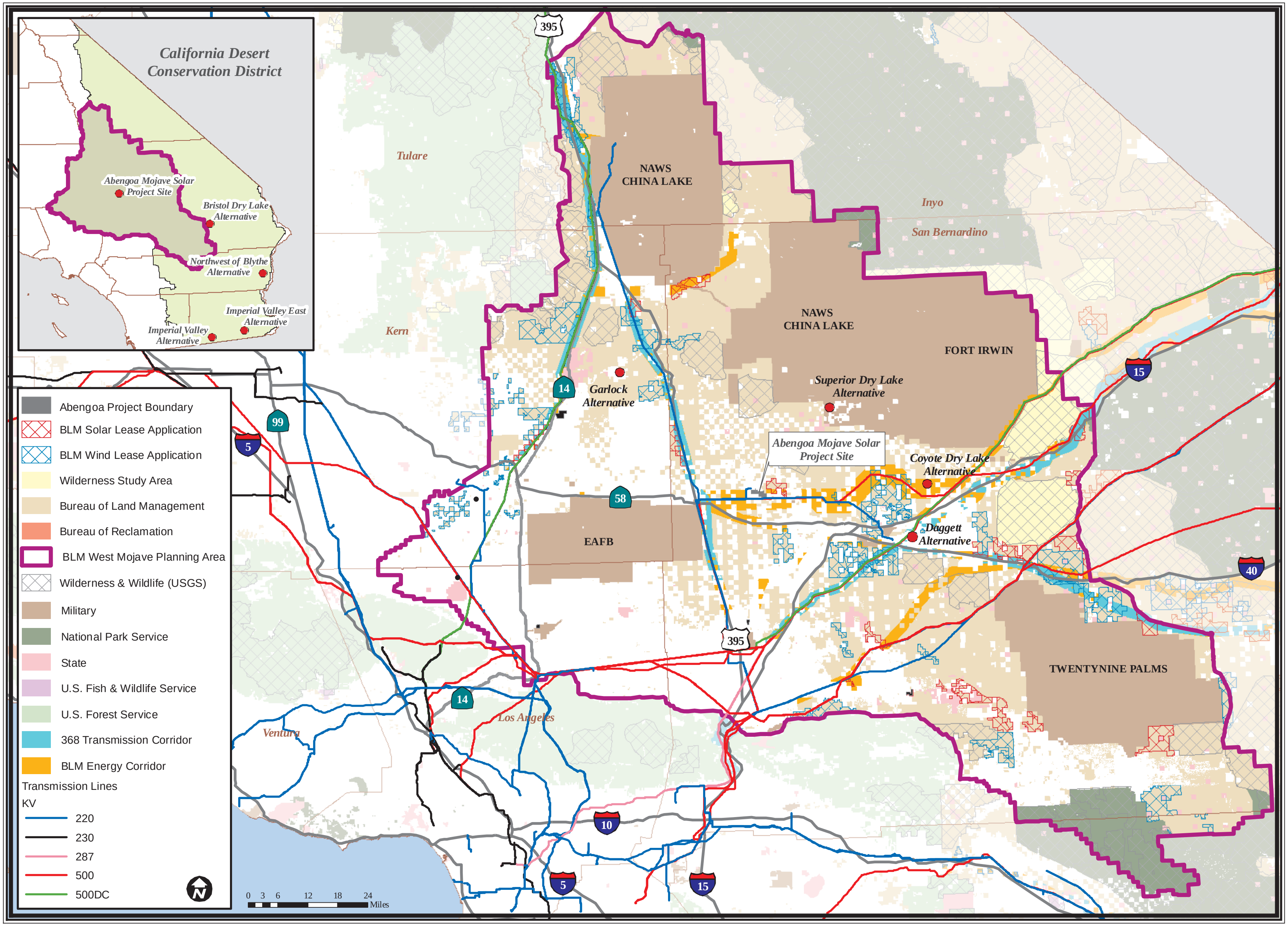
ALTERNATIVES - FIGURE 1

Abengoa Mojave Solar Project - Alternative Sites Overlaid on Constraints

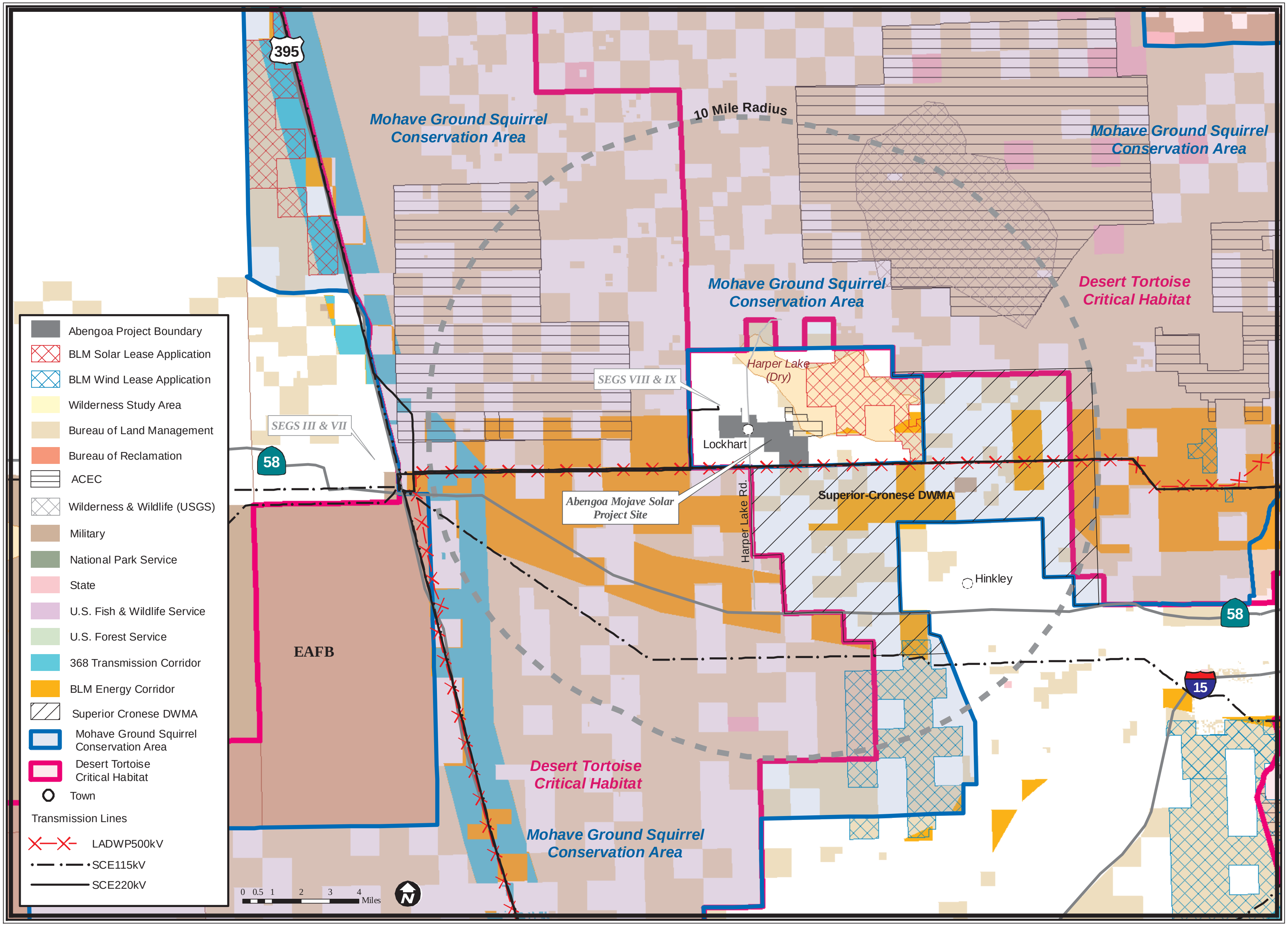


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: California Energy Commission, Bureau of Land Management

ALTERNATIVES - FIGURE 2

Abengoa Mojave Solar Project - Constraints in the Project Vicinity



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

SOURCE: California Energy Commission, Bureau of Land Management

ALTERNATIVES - FIGURE 3

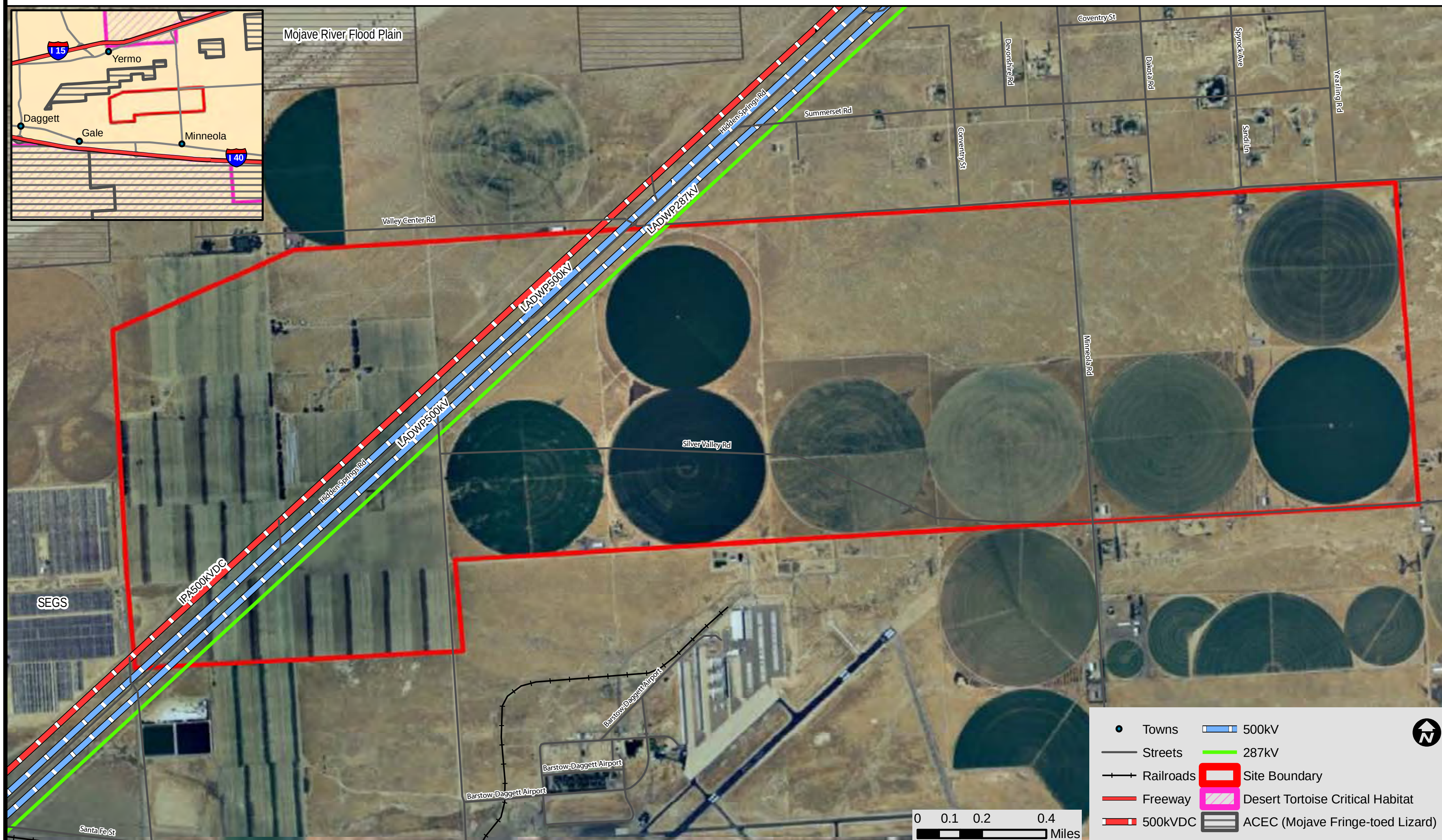
Abengoa Mojave Solar Project - Garlock Road Alternative Site

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

SOURCE: California Energy Commission, NAIP 2005

ALTERNATIVES - FIGURE 4

Abengoa Mojave Solar Project - Daggett Alternative Site



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

SOURCE: California Energy Commission, NAIP 2005

GENERAL CONDITIONS INCLUDING COMPLIANCE MONITORING AND CLOSURE PLAN

Testimony of Chris Davis

INTRODUCTION

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 and specified in the written decision on the Application for Certification or otherwise required by law.

The Compliance Plan is composed of elements that:

- Set forth the duties and responsibilities of the Compliance Project Manager (CPM), the project owner, delegate agencies, and others;
- Set forth 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 that are necessary to verify the compliance status for all Energy Commission approved conditions of certification;
- Establish requirements for facility closure plans; and
- Specify conditions of certification for each technical area containing the measures required to mitigate any and all potential adverse project impacts associated with construction, operation and closure below a level of significance. Each specific condition of certification also includes a verification provision that describes the method of assuring that the condition has been satisfied.

DEFINITIONS

The following terms and definitions are used to establish when Conditions of Certification are implemented.

PRE-CONSTRUCTION SITE MOBILIZATION

Site mobilization is limited preconstruction activities at the site to allow for the installation of fencing, construction trailers, construction trailer utilities, and construction trailer parking at the site. Limited ground disturbance, grading, and trenching associated with the above mentioned pre-construction activities is considered part of site mobilization. Walking, driving or parking a passenger vehicle, pickup truck and light vehicles is allowable during site mobilization.

CONSTRUCTION

Onsite work to install permanent equipment or structures for any facility.

Ground Disturbance

Construction-related ground disturbance refers to activities that result in the removal of top soil or vegetation at the site beyond site mobilization needs, and for access roads and linear facilities.

Grading, Boring, and Trenching

Construction-related grading, boring, and trenching refers to activities that result in subsurface soil work at the site and for access roads and linear facilities, e.g., alteration of the topographical features such as leveling, removal of hills or high spots, moving of soil from one area to another, and removal of soil.

Notwithstanding the definitions of ground disturbance, grading, boring and trenching above, construction does **not** include the following:

1. The installation of environmental monitoring equipment;
2. A soil or geological investigation;
3. A topographical survey;
4. Any other study or investigation to determine the environmental acceptability or feasibility of the use of the site for any particular facility; and
5. Any work to provide access to the site for any of the purposes specified in “Construction” 1, 2, 3, or 4 above.

START OF COMMERCIAL OPERATION

For compliance monitoring purposes, “commercial operation” begins after the completion of start-up and commissioning, when the power plant has reached reliable steady-state production of electricity at the rated capacity. At the start of commercial operation, plant control is usually transferred from the construction manager to the plant operations manager.

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 Energy Commission Decision;
2. Resolving complaints;
3. Processing post-certification changes to the conditions of certification, project description (petition to amend), and ownership or operational control (petition for change of ownership) (See instructions for filing petitions);

4. Documenting and tracking compliance filings; and

5. Ensuring that compliance files are maintained and accessible.

The CPM is the contact person for the Energy Commission and will consult with appropriate responsible agencies, Energy Commission, and staff when handling disputes, complaints, and amendments.

All project compliance submittals are submitted to the CPM for processing. Where a submittal required by a condition of certification requires CPM approval, the approval will involve all appropriate Energy Commission staff and management. All submittals must include searchable electronic versions (pdf or word files).

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. The purpose of these meetings is to assemble both the Energy Commission's and project owner's technical staff to review the status of all pre-construction or pre-operation requirements, contained in the Energy Commission's conditions of certification. This is to confirm that all applicable conditions of certification have been met, or if they have not been met, to ensure that the proper action is taken. In addition, these meetings ensure, to the extent possible, that Energy Commission conditions will not delay the construction and operation of the plant due to oversight and to preclude any last minute, unforeseen issues from arising. 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 shall maintain the following documents and information as a public record, in either the Compliance file or Dockets file, for the life of the project (or other period as required):

- All documents demonstrating compliance with any legal requirements relating to the construction and operation of the facility;
- All monthly and annual compliance reports filed by the project owner;
- All complaints of noncompliance filed with the Energy Commission; and
- All petitions for project or condition of certification changes and the resulting staff or Energy Commission action.

PROJECT OWNER RESPONSIBILITIES

The project owner is responsible for ensuring that the compliance conditions of certification and all other conditions of certification that appear in the Commission Decision are satisfied. The compliance conditions regarding post-certification changes specify measures that the project owner must take when requesting changes in the project design, conditions of certification, or ownership. Failure to comply with any of the conditions of certification or the compliance conditions may result in reopening of the case and revocation of Energy Commission certification; an administrative fine; or other action as appropriate. A summary of the Compliance Conditions of Certification is included as **Compliance Table 1** at the conclusion of this section.

COMPLIANCE CONDITIONS OF CERTIFICATION

Unrestricted Access (COMPLIANCE-1)

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.

Compliance Record (COMPLIANCE-2)

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.

Compliance Verification Submittals (COMPLIANCE-3)

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 CEC 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:

> **Chris Davis, CPM**
> **(09-AFC-5C)**
> **California Energy Commission**
> **1516 Ninth Street (MS-2000)**
> **Sacramento, CA 95814**
> **CMDavis@energy.state.ca.us**

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.

Pre-Construction Matrix and Tasks Prior to Start of Construction (COMPLIANCE-4)

Prior to commencing construction, a compliance matrix addressing only 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.

Compliance Matrix (COMPLIANCE-5)

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; and
7. The compliance status of each condition, e.g., "not started," "in progress" or "completed" (include the date).
8. If the condition was amended, the date of the amendment.

Satisfied conditions shall be placed at the end of the matrix.

Monthly Compliance Report (COMPLIANCE-6)

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. The Key Events List Form is found at the end of this section.**

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 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 resolution of the resolved actions, and the status of any unresolved actions.

All sections, exhibits, or addendums shall be separated by tabbed dividers or as acceptable by the CPM.

Annual Compliance Report (COMPLIANCE-7)

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 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 the resolution of any resolved matters, and the status of any unresolved matters.

Confidential Information (COMPLIANCE-8)

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.

Annual Energy Facility Compliance Fee (COMPLIANCE-9)

Pursuant to the provisions of Section 25806(b) of the Public Resources Code, the project owner is required to pay an annual compliance fee, which is adjusted annually. Current Compliance fee information is available on the Energy Commission's website http://www.energy.ca.gov/siting/filing_fees.html. You may also contact the CPM for the current fee information. The initial payment is due on the date the Energy Commission adopts the final decision. All subsequent payments are due by July 1 of each year in which the facility retains its certification. The payment instrument shall be made payable to the California Energy Commission and mailed to: Accounting Office MS-02, California Energy Commission, 1516 9th St., Sacramento, CA 95814.

Reporting of Complaints, Notices, and Citations (COMPLIANCE-10)

Prior to the start of construction, the project owner must send a letter to property owners living within one 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 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).

FACILITY CLOSURE

At some point in the future, the project will cease operation and close down. At that time, it will be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts. Although the project setting for this project does not appear, at this time, to present any special or unusual closure problems, it is impossible to foresee what the situation will be in 30 years or more when the project ceases operation. Therefore, provisions must be made that provide the flexibility to deal with the specific situation and project setting that exist at the time of closure. Laws, Ordinances, Regulations and Standards (LORS) pertaining to facility closure are identified in the sections dealing with each technical area. Facility closure will be consistent with LORS in effect at the time of closure.

There are at least three circumstances in which a facility closure can take place: planned closure, unplanned temporary closure and unplanned permanent closure.

CLOSURE DEFINITIONS

Planned Closure

A planned closure occurs when the facility is closed in an anticipated, orderly manner, at the end of its useful economic or mechanical life, or due to gradual obsolescence.

Unplanned Temporary Closure

An unplanned temporary closure occurs when the facility is closed suddenly and/or unexpectedly, on a short-term basis, due to unforeseen circumstances such as a natural disaster or an emergency.

Unplanned Permanent Closure

An unplanned permanent closure occurs if the project owner closes the facility suddenly and/or unexpectedly, on a permanent basis. This includes unplanned closure where the owner implements the on-site contingency plan. It can also include unplanned closure where the project owner fails to implement the contingency plan, and the project is essentially abandoned.

COMPLIANCE CONDITIONS FOR FACILITY CLOSURE

Planned Closure (COMPLIANCE-11)

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 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 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-12)

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-13)

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-14)

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.

Amendment

The project owner shall petition the Energy Commission, pursuant to Title 20, California Code of Regulations, Section 1769(a), when proposing modifications to the project (including linear facilities) design, operation, or performance requirements. If a proposed modification results in deletion or change of a condition of certification, or makes changes that would cause the project not to comply with any applicable laws, ordinances, regulations or standards, the petition will be processed as a formal amendment to the final decision, which requires public notice and review of the Energy Commission staff analysis, and approval by the full Commission. The petition shall be in the form of a legal brief and fulfill the requirements of Section 1769(a). Upon request, the CPM will provide you with a sample petition to use as a template.

Change of Ownership

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). Upon request, the CPM will provide you with a sample petition to use as a template.

Staff Approved Project Modification

Modifications that do not result in deletions or changes to conditions of certification, that are compliant with laws, ordinances, regulations and standards and will not have significant environmental impacts may be authorized by the CPM as a staff approved project modification pursuant to section 1769(a) (2). This process usually requires minimal time to complete, and it requires a 14-day public review of the Notice of Petition to Amend that includes staff's intention to approve the proposed project modification unless substantive objections are filed. These requests must also be submitted in the form of a "petition to amend" as described above.

Verification Change

A verification may be modified by the CPM without requesting an amendment to the decision if the change does not conflict with the conditions of certification and provides an effective alternate means of verification.

CBO DELEGATION AND AGENCY COOPERATION

In performing construction and operation monitoring of the project, Energy Commission staff acts as, and has the authority of, the Chief Building Official (CBO). Energy Commission staff may delegate CBO responsibility to either an independent third party contractor or the local building official. Energy Commission staff retains CBO authority when selecting a delegate CBO, including enforcing and interpreting state and local codes, and 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 environmental protection when conducting project monitoring.

ENFORCEMENT

The Energy Commission's legal authority to enforce the terms and conditions of its Decision is specified in Public Resources Code sections 25534 and 25900. The Energy Commission may amend or revoke the certification for any facility, and may impose a civil penalty for any significant failure to comply with the terms or conditions of the Energy Commission Decision. The specific action and amount of any fines the Energy Commission may impose would take into account the specific circumstances of the incident(s). This would include such factors as the previous compliance history, whether the cause of the incident involves willful disregard of LORS, oversight, unforeseeable events, and other factors the Energy Commission may consider.

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 noncompliance can be resolved by using the informal dispute resolution process. Both the informal and formal complaint procedure, as described in current State law and regulations, are described below. They shall be followed unless superseded by future law or regulations.

Informal Dispute Resolution Process

The following procedure is designed to informally resolve disputes concerning the interpretation of compliance with the requirements of this compliance plan. The project owner, the Energy Commission, or any other party, including members of the public, may initiate an 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 more formal complaint and investigation procedure specified in Title 20, California Code of Regulations, section 1237, but is not intended to be a substitute for, or prerequisite to it. This informal procedure may not be used to change the terms and conditions of certification as approved by the Energy Commission, although the agreed upon resolution may result in a project owner, or in some cases the Energy Commission staff, proposing an amendment.

The process encourages all parties involved in a dispute to discuss the matter and to reach an agreement resolving the dispute. 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.

Request for Informal Investigation

Any individual, group, or agency may request the Energy Commission to conduct an informal investigation of alleged noncompliance with the Energy Commission's terms and conditions of certification. All requests for informal investigations shall be made to the designated CPM.

Upon receipt of a request for informal investigation, the CPM shall promptly notify the project owner of the allegation by telephone and letter. All known and relevant information of the alleged noncompliance shall be provided to the project owner and to the Energy Commission staff. The CPM will evaluate the request and the information to determine if further investigation is necessary. If the CPM finds that further investigation is necessary, the project owner will be asked to promptly investigate the matter. Within seven working days of the CPM's request, provide a written report to the CPM of the results of the investigation, including corrective measures proposed or undertaken. Depending on the urgency of the noncompliance matter, the CPM may conduct a site visit and/or request the project owner to also provide an initial verbal report, within 48 hours.

Request for Informal Meeting

In the event that either the party requesting an investigation or the Energy Commission staff is not satisfied with the project owner's report, investigation of the event, or corrective measures proposed or undertaken, either party may submit a written request to the CPM for a meeting with the project owner. Such request shall be made within 14 days of the project owner's filing of its written report. Upon receipt of such a request, the CPM shall:

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;

3. Conduct such meeting in an informal and objective manner so as to encourage the voluntary settlement of the dispute in a fair and equitable manner;

4. After the conclusion of such a meeting, promptly prepare and distribute copies to all in attendance and to the project file, a summary memorandum that fairly and accurately identifies the positions of all parties and any understandings reached. If an agreement has not been reached, the CPM shall inform the complainant of the formal complaint process and requirements provided under Title 20, California Code of Regulations, section 1230 et seq.

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.

KEY EVENTS LIST

PROJECT: ____________________

DOCKET #: ____________________

COMPLIANCE PROJECT MANAGER: ____________________

EVENT DESCRIPTION	DATE
Certification Date	
Obtain Site Control	
Online Date	
POWER PLANT SITE ACTIVITIES	
Start Site Mobilization	
Start Ground Disturbance	
Start Grading	
Start Construction	
Begin Pouring Major Foundation Concrete	
Begin Installation of Major Equipment	
Completion of Installation of Major Equipment	
First Combustion of Gas Turbine	
Obtain Building Occupation Permit	
Start Commercial Operation	
Complete All Construction	
TRANSMISSION LINE ACTIVITIES	
Start T/L Construction	
Synchronization with Grid and Interconnection	
Complete T/L Construction	
FUEL SUPPLY LINE ACTIVITIES	
Start Gas Pipeline Construction and Interconnection	
Complete Gas Pipeline Construction	
WATER SUPPLY LINE ACTIVITIES	
Start Water Supply Line Construction	
Complete Water Supply Line Construction	

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-1	Unrestricted Access	The project owner shall grant Energy Commission staff and delegate agencies or consultants unrestricted access to the power plant site.
COMPLIANCE-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.
COMPLIANCE-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.
COMPLIANCE-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: • property owners living within one mile of the project have been notified of a telephone number to contact for questions, complaints or concerns, • a pre-construction matrix has been submitted identifying only those conditions that must be fulfilled before the start of construction, • all pre-construction conditions have been complied with, • the CPM has issued a letter to the project owner authorizing construction.
COMPLIANCE-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.
COMPLIANCE-6	Monthly Compliance Report including a 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.
COMPLIANCE-7	Annual Compliance Reports	After construction ends and throughout the life of the project, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports.

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-8	Confidential Information	Any information the project owner deems confidential shall be submitted to the Energy Commission's Dockets Unit with a request for confidentiality.
COMPLIANCE-9	Annual fees	Payment of Annual Energy Facility Compliance Fee
COMPLIANCE-10	Reporting of Complaints, Notices and Citations	Within 10 days of receipt, the project owner shall report to the CPM, all notices, complaints, and citations.
COMPLIANCE-11	Planned Facility Closure	The project owner shall submit a closure plan to the CPM at least 12 months prior to commencement of a planned closure.
COMPLIANCE-12	Unplanned Temporary Facility Closure	To ensure that public health and safety and the environment are protected in the event of an unplanned temporary closure, the project owner shall submit an on-site contingency plan no less than 60 days prior to commencement of commercial operation.
COMPLIANCE-13	Unplanned Permanent Facility Closure	To ensure that public health and safety and the environment are protected in the event of an unplanned permanent closure, the project owner shall submit an on-site contingency plan no less than 60 days prior to commencement of commercial operation.
COMPLIANCE-14	Post-certification changes to the Decision	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 of operational control of the facility.

Complaint Log Number:____________________ Docket Number:____________________

Project Name:____

ATTACHMENT 1
COMPLAINT REPORT/RESOLUTION FORM

COMPLAINTANT 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 COMPLAINTANT CONTACTED TO DISCUSS FINDINGS:______________________________________

DESCRIPTION OF CORECTIVE MEASURES TAKEN OR OTHER COMPLAINT RESOLUTION:___________

____

____

DOES COMPLAINTANT AGREE WITH PROPOSED RESOLUTION? ☐ YES ☐ NO

IF NOT, EXPLAIN:____

____

CORRECTIVE ACTION

IF CORRECTIVE ACTION NECESSARY, DATE COMPLETED:______________________________________

DATE FIRST LETTER SENT TO COMPLAINTANT (COPY ATTACHED):_______________________________

DATE FINAL LETTER SENT TO COMPLAINTANT (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)

PREPARATION TEAM

ABENGOA MOJAVE SOLAR
09-AFC-5
PREPARATION TEAM

Executive Summary .... Craig Hoffman

Introduction .... Craig Hoffman

Project Description .... Craig Hoffman

Cumulative Analysis .... Suzanne Phinney

Air Quality .... Tao Jiang and William Walters P.E.

Biological Resources .... Heather Blair

Cultural Resources .... Kathleen Forrest

Hazardous Materials Management .... Alvin J. Greenberg, Ph.D.

Land Use .... Negar Vahidi and Susanne Huerta

Noise and Vibration .... Shahab Khoshmashrab

Public Health .... Alvin J. Greenberg, Ph.D.

Socioeconomic Resources .... Scott Debauche

Soils and Water Resources .... Christopher Dennis, John Fio, Eugene (Gus) Yates, and Mike Conway

Traffic and Transportation .... Steven Brown

Transmission Line Safety and Nuisance .... Obed Odoemelam, Ph.D.

Visual Resources .... Thomas Packard, William Kanemoto, James Jewell and William Waters P.E.

Waste Management .... Ellie Townsend-Hough

Worker Safety and Fire Protection .... Alvin J. Greenberg, Ph.D.

Facility Design .... Erin Bright

Geology and Paleontology .... Michael Lindholm

Power Plant Efficiency .... Erin Bright

Power Plant Reliability .... Erin Bright

Transmission System Engineering .... Ajoy Guha, P.E. and Mark Hesters

Alternatives .... Suzanne Phinney

General Conditions .... Chris Davis

Project Assistant .... April Albright

Staff Counsel .... Christine Hammond

DECLARATION OF
Craig Hoffman

I, Craig Hoffman, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as a Project Manager (Planner I).

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Executive Summary, Introduction** and **Project Description** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 2/16/10 Signed: Original signed by C. Hoffman

At: Sacramento, California

CRAIG D. HOFFMAN

EDUCATION

Master of Rural and Town Planning May 1997
California State University, Chico

Bachelor of Arts in History; Minor in Planning and Development May 1995
California State University, Chico

PROFESSIONAL EXPERIENCE

California Energy Commission June 2009 to Present
Siting, Transmission and Environmental Protection Division

Project Manager
Responsible for the day-to-day management of the certification process for thermal power plants of 50 megawatts or greater along with transmission lines, fuel supply lines, and related facilities to serve them. Works as a team leader on the coordination of activities and work product of technical specialists in 20 environmental and engineering disciplines. Coordinates project calendaring, public notices, workshops and public hearing meetings, the preparation of a preliminary staff assessment (draft EIR) and final staff assessment (final EIR). Responsible for identifying key technical and process issues and notifying management team of issues and process concerns. Recommends actions, policies and procedures affecting projects and program direction in order to ensure that needed energy facilities were authorized in an expeditious, safe and environmentally acceptable manner, consistent with the requirements of the Warren-Alquist Act and the California Environmental Quality Act (CEQA).

Trinity Investment Partners December 2008 to June 2009

Senior Associate
Was involved in project site investigation, due diligence, feasibility reports, budgets, funding source books and presentations to financial investors and institutions. Projects ranged in complexity and were typically impaired brownfield developments. Interacted with local jurisdiction community development staff to determine appropriate project land use mix and determine design feature limitations. The selection of project sites and land use assumptions were important to gain funding and financial backing to move

forward with the entitlement and development of projects. Prepared CEQA screening studies in order to determine potential impacts and provide the jurisdictions base line information for preparation of CEQA environmental reviews.

RCH Group / The Hodgson Company November 2007 to December 2008

Project Manager
Provided a full-range of real estate consulting and advisory services in mixed-use land development, entitlement processing, urban design and project management. These services included a range of legal, strategic, management and political advisory services - from advocating a project property before government agencies to resolving conflicts among project participants. Was the project manager for several large specific plans in the Sacramento region. This included coordination with owners groups, consultants, city and county jurisdictions, preparation of budgets, time lines and process charts and interaction with public and jurisdictional groups. Coordinated the preparation of EIRs and EIS's for projects along with securing proposals from various consultants to prepare technical studies for the environmental document. Also prepared numerous property evaluation and feasibility reports for lending institutions on foreclosed properties including large development entitlements.

Dunmore Communities / Dunmore Capital April 2005 to September 2007

Project Manager
As a project manager, was involved in project development from the acquisition of undeveloped property to the ultimate development of a successful project. These projects included the entitlement of large land parcels for master planned communities, commercial developments and residential subdivisions. Prepared due diligence, feasibility reports, and budgets; interacted with local jurisdiction staff; was involved in the layout and development of land plans; worked on design charettes; presented projects at public hearings; processed construction documents and helped facilitate building contracts and activities. Coordinated the preparation of EIRs and EIS's for projects along with securing proposals from various consultants to prepare technical studies for the environmental document. Prepared CEQA screening studies in order to determine potential impacts and provide the jurisdictions base line information for preparation of CEQA environmental reviews.

Pacific Municipal Consultants January 2000 to April 2005

Associate and Senior Planner
As a public agency contract planner, provided current, long range and environmental planning services to numerous city and county jurisdictions. Work efforts included the processing of General Plan Amendments, Specific Plans, Rezones, Williamson Act Contracts, Annexations, Vesting Tentative Subdivision Maps, Tentative Subdivision

Maps, Use Permits, Design Review for large scale residential master plans, commercial centers, multi-family projects, and mixed-use sites, policy document preparation, and appropriate environmental documentation for projects consistent with the requirements of CEQA. Presentations to community groups, Planning Commissions, City Councils and Board of Supervisors were routine activities and an integral part of public hearing process.

Was a senior planner from 2001 to 2003 and was the lead current planner for the City of Elk Grove from 2003 to 2005. Was responsible for the management of projects that were complicated, had the potential for public scrutiny and the city needed the projects to move forward. Was the lead planner on the Laguna Ridge Specific Plan and coordinated the planning process, the EIR and all approval documents.

Sierra County Planning Department October 1997 to January 2000

Planner II

Responsible for current planning functions including review, recommendation, and presentation to Planning Commission and Board of Supervisors. Evaluation of land-use and development applications, including general plan amendments, zone amendments, zone variances, special use permits, site plan review, reclamation plans, and tentative parcel map review, for consistency with County and State regulations. Prepared environmental documents as required by CEQA for development projects. A typical environmental document was the preparation of a mitigated negative declaration with attached technical studies. Review of building applications for consistency with General Plan, Zoning Ordinance and other County policies. Answer public inquiries regarding county planning and building issues, demographics and statistics.

DECLARATION OF
Suzanne L. Phinney, D.Env.

I, Suzanne L. Phinney, declare as follows:

1. I am presently employed by Aspen Environmental Group, consultant to the California Energy Commission's Facilities Siting Office of the Systems Assessments and Facilities Siting Division as a Senior Associate.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony and errata on **Alternatives** for the **Abengoa Mojave Solar project** based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony and errata is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and errata and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 2/18/2010 Signed: Original signed by Suzanne Phinney

At: Sacramento, California

Aspen
Environmental Group

SUZANNE L. PHINNEY

Senior Associate, Energy and Infrastructure

ACADEMIC BACKGROUND

Doctorate, Environmental Science & Engineering (D.Env.), University of California, Los Angeles, 1981
M.S., Marine Biology, Dalhousie University, Halifax, Nova Scotia, Canada, 1975
B.A., Biological Sciences, University of California, Berkeley, 1973

PROFESSIONAL EXPERIENCE

Dr. Phinney has 30 years of experience in the environmental and energy field, providing technical and policy support in energy analysis, environmental assessment, environmental remediation, air and water quality assessments, risk assessment, regulatory compliance, permitting, and project/program management. Her particular emphasis is energy and infrastructure with projects addressing climate change, alternative energy generation technologies, liquefied natural gas, petroleum infrastructure, advanced transportation vehicles and fuels, land use and energy, and power plant siting. Prior to employment at Aspen, Dr. Phinney worked for 16 years with Aerojet, where she oversaw all environmental and safety issues.

Aspen Environmental Group — 2001 to present

Dr. Phinney manages energy and infrastructure projects for Aspen and provides environmental support on major projects. She has provided energy and environmental expertise to the following clients:

California Energy Commission (CEC). Dr. Phinney has supported CEC staff since 2001. She has prepared analyses for multiple power plants throughout the State, and has authored or contributed to over a dozen special studies. She is currently Deputy Program Manager for planning studies conducted by the Aspen team. Her major efforts for the CEC include the following.

- **Power Plant Siting, CEC, Project Management/Technical Support (2001 – Present).** Dr. Phinney prepared the alternatives analysis for the following list of power plants under review by the Energy Commission. The Alternatives analysis considers renewable technologies, including utility-scale and distributed PV.
  - **Palomar Energy Project –** 500 MW combined-cycle natural gas facility in Escondido, San Diego County
  - **Russell City Energy Center –** 600 MW combined-cycle natural gas facility in Hayward, Alameda County
  - **Eastshore Energy Center -** 115.5 MW simple-cycle natural gas facility in Hayward, Alameda County
  - **Carrizo Energy Solar Farm –** 177 MW solar thermal (Compact Linear Fresnel Reflector) plant in the Carrizo Plain, San Luis Obispo County
  - **CPV Sentinel Energy Project –** 850 MW natural gas plant in the Coachella Valley, Riverside County
  - **Marsh Landing Generating Station-** 930 MW natural gas plant within the existing Contra Costa Power Plant in Antioch, Contra Costa County
  - **Orange Grove Project –** 96 MW natural-gas peaking facility near Pala, San Diego County
  - **Willow Pass Generating Station –** 550 MW natural gas plant within the existing Pittsburg Power Plant in Pittsburg, Contra Costa County

- **Almond 2 Peaking Power Plant Project** – 174 MW natural-gas peaking facility near Ceres, Stanislaus County
- **Abengoa Mojave Solar Project** – 250 MW solar thermal (parabolic trough) plant near Harper Dry Lake, San Bernardino County
- **Ridgecrest Solar Power Project** – 250 MW solar thermal (parabolic trough) plant on 3,920 acres of BLM land near Ridgecrest, Kern County
- **Rice Solar Energy Project** – 150 MW solar thermal (power tower) plant with molten salt storage in Riverside County

Dr. Phinney prepared the waste management assessments of power plant licensing applications:

- **Eastshore Energy Center –** 115.5 MW natural gas simple-cycle plant in Hayward, Alameda County
- **Carrizo Energy Solar Farm –** 177 MW solar thermal (Compact Linear Fresnel Reflector) plant in the Carrizo Plain, San Luis Obispo County
- **Palmdale Hybrid Power Project –** 570 MW natural gas-solar thermal (parabolic trough) hybrid plant in Palmdale, Los Angeles County
- **SES Solar Two Siting Case –** 750 MW solar thermal (Stirling dish) plant on 6,500 acres of mostly BLM land in Imperial County
- **Hanford Energy Park Peaker Plant –** 120 MW simple-cycle, natural gas facility in Hanford, Kings County
- **Ridgecrest Solar Power Project** – 250 MW solar thermal (parabolic trough) plant on 3,920 acres of BLM land near Ridgecrest, Kern County
- **Blythe Solar Power Project** – 1,000 MW solar thermal (parabolic trough) plant on 9,400 acres of BLM land near Blythe, Riverside County
- **Palen Solar Power Project** – 500 MW solar thermal (parabolic trough) plant on 5,200 acres of BLM land in the Chuckwalla Valley, Riverside County

Dr. Phinney also coordinated the study of cooling water alternatives for the Tesla and Tracy natural gas, combined-cycle power plants.

Energy Policy Studies, CEC, Project Management/Technical Support (2001 – Present). Dr.Phinney prepared the policy reports and provided expert support to the Energy Commission on the following projects:

- **RETI Stakeholder Steering Committee Support, CEC, Project Team (2010)**. Dr. Phinney is supporting state agency coordination of and stakeholder input to support California ISO and publicly-owned utility planning of initial Competitive Renewable Energy Zone (CREZ)-transmission projects and update CREZ and conceptual transmission plan to facilitate project applications and permitting approvals beyond 2010.
- **Energy Aware Facility Planning and Siting Guide, CEC, Project Manager (2009-2010).** Dr. Phinney is updating a 1997 version of the Energy Aware Guide to help local governments plan for and permit electricity generation facilities and transmission lines that will be needed in the upcoming years. The Guide informs planners, decision makers and the public about what, how, and why electricity infrastructure may be developed.
- **Environmental Screening Tool for Out-of-State Renewable Energy Facilities, CEC, Project Manager (2009).** Dr. Phinney prepared an environmental screening tool/analysis allowing CEC to determine quickly whether out-of-state renewable facilities requesting RPS certification met California laws, ordinances, regulations and standards.
- **Advanced Energy Pathways, CEC, Project Manager (2006 – 2008).** Dr. Phinney provided project management support for a 3-year study evaluating the effects of advanced transportation technologies and fuels (out to 2050) on California's natural gas and electricity systems. This report involved the

development of baseline and alternative energy demand and supply scenarios, in-depth technical analysis of advanced transportation technologies and fuels, and the development of an energy-rich model.

- **Environmental Performance Report, CEC, Project Manager/Technical Support (2001, 2003, 2005)**.Dr. Phinney was Project Manager for Aspen's technical contributions, graphics and production efforts for the 2001 Environmental Performance Report (EPR) which detailed the current and historical air, water and biological impacts from in-state generation facilities. She provided support to the water resources discussion in the 2003 EPR and managed the analysis of out-of-state generation facilities for the 2005 EPR.
- **Advanced Electric Generation Technologies, CEC, Project Manager (2001 - 2002).** Dr. Phinney served as Project Manager for a report defining the technical development, developmental capacity, commercial status, costs and deployment constraints of selected alternative electric generation technologies. Technologies included geothermal, fuel cell, solar thermal, solar photovoltaic, wind and hydro. The focus was on development and application of the technology in California. Two page fact sheets on each technology and a matrix comparing all technologies was developed. Finally, an updated discussion of renewable technologies was developed for insertion into the alternatives section of Staff Assessments for power plant applications.
- **Liquefied Natural Gas Support, CEC, Technical Author (2002 – 2007**). Dr. Phinney has been instrumental in the preparation of numerous safety and policy reports on liquefied natural gas (LNG). She authored the Commission document: *International and National Efforts to Address the Safety and Security of Importing Liquefied Natural Gas: A Compendium*. This report reviewed national and international LNG regulations, standards and guidelines, reviewed risk assessment techniques, and identified, compiled and reviewed LNG safety/risk studies. Dr. Phinney helped organize LNG Access Workshops held in June 2005 and prepared a 40 page summary of presentations made at the workshops. She developed over 30 fact sheets on LNG subject areas for distribution to the public. Dr. Phinney compiled state and local comments on a proposed LNG terminal at the Port of Long Beach; these were presented in the *Safety Advisory Report on the Proposed Sound Energy Solutions Natural Gas Terminal at the Port of Long Beach, California*, which was delivered to the Federal Energy Regulatory Commission within the mandated 30-day period imposed by the 2005 federal Energy Bill. She provided technical review for the report *The Outlook for Global Trade in Liquefied Natural Projections to the year 2020.*
- **Natural Gas Market Assessment Support, CEC, Technical Author/Editorial Support (2005 –** 2007). Dr. Phinne**y c**ontributed to natural gas supply and demand analyses for the Commission document, *Natural Gas Assessment Update*. She provided technical and editorial support to the 2005 and 2007 Integrated Energy Policy Report (IEPR) documents, *Preliminary (and subsequently the Revised report) Reference Case in Support of the 2005 Natural Gas Market Assessment* and *2007 Natural Gas Market Assessment.* She edited the Commission document *Natural Gas Quality: Power Turbine Performance During Heat Content Surges.*
- **Petroleum Infrastructure Environmental Performance Report, CEC, Project Manager (2005)**. Dr. Phinney served as Project Manager for the 2005 IEPR document *Petroleum Infrastructure Environmental Performance Report.* In addition to managing preparation of the report and workshop presentations, she prepared responses to comments and provided policy recommendations.
- **Hydropower and Global Climate Change, CEC, Technical Author (2005)**. Dr. Phinney coauthored the document *Potential Changes in Hydropower Production from Global Climate Change in California and the Western United States*. This report investigated the effects of climate change on hydropower production in the West and compared impacts and policy actions in California, the Pacific Northwest, and the Southwest.
- **Land Use and Energy, CEC, Project Manager/Technical Author (2006** – **2008).** Dr. Phinney authored a CEC report on the linkages between land use and energy, which ultimately became one of

the two chapters presented in the 2006 IEPR Update. The report highlighted how energy can be better integrated in land use planning, and how efforts such as smart growth can help the state meet its energy and greenhouse gas emission reduction goals. She organized a full-day workshop involving over a dozen speakers representing state agencies, local governments, research entities, environmental groups, utilities, and non-profits. Dr. Phinney was one of the authors of the 2007 land use and energy follow-up report which further defined the role of land use in meeting California's energy and climate change goals. She helped synthesize the report into a chapter for the 2007 IEPR. Dr. Phinney helped edit the Land Use Subgroup of the Climate Action Team report prepared for submission to the California Air Resources Board AB 32 Scoping Plan.

- **AB 1632 Nuclear Power Plant Assessment, CEC, Technical Author (2007 – 2008).** Dr. Phinney was a key member of a team evaluating nuclear power issues in the state in response to AB 1632 legislation. She managed and prepared report sections regarding the impacts to local communities and the environmental issues and costs associated with alternatives, including renewables, to the state's two nuclear facilities. These sections were incorporated in the report *An Assessment of California's Nuclear Power Plants.*

California Public Utilities Commission. Dr. Phinney has managed several environmental assessments for the CPUC and has been heavily involved in editorial support of many other CPUC documents prepared by Aspen.

- **Looking Glass Network Initial Study/Mitigated Negative Declaration, CPUC, Project Manager (2002 – 2003).** Dr. Phinney served as Project Manager for the preparation of Initial Study/Mitigated Negative Declarations (IS/MND) for this telecommunication project that involved construction in the San Francisco Bay Area and the Los Angeles Basin to allow fiber optic connections in numerous locations.
- **Williams Communications Sentry Marysville Project IS/MND, CPUC, Project Manager (2002 – 2003).** Dr. Phinney served as Project Manager for the installation of fiber optic connection to a Beale Air Force Base in Yuba County.
- **Kirby Hills II Natural Gas Storage Facility IS/MND, CPUC, Project Manager (2007).** Dr. Phinney managed an IS/MND for expansions at a natural gas storage facility in Solano County.
- **Multiple EIR Documents, CPUC, Technical Editor (2004 - 2008).** Dr. Phinney provided editorial and QA/QC review for the Diablo Canyon Steam Generator Replacement EIR, the Miguel Mission 230 kV Transmission Line EIR and the Sunrise Powerlink EIR/EIS.

California Institute of Technology/University of California. Dr. Phinney provided project management support to the following project.

- **Combined Array for Research in Millimeter-wave Astronomy EIS/EIR**, **U.S. Forest Service and the University of California (2001 – 2002).** Dr. Phinney was the Project Manager for this EIS/EIR for a radio telescope antenna array to be placed at a high altitude site in the Inyo National Forest. The evaluation of alternatives was especially contentious, and Aspen's field analyses of several potential sites were pivotal in the ultimate selection of one of these alternative sites.

Western Area Power Administration. Dr. Phinney provided editorial and QA/QC support to the following projects.

- **North Area ROW Maintenance Project Environmental Assessment, Western, Technical Editor/QA/QC (2006-2008).** Dr. Phinney provided technical editing and QA/QC support for all documents relating to the development of 800 miles of transmission lines in Northern California.
- **Sacramento Area Voltage Support Supplemental EIS/EA, Technical Editor/QA/QC (2006 – 2008).** Dr. Phinney provided technical editing and QA/QC support for all environmental

documentation and permitting for new construction and reconstruction of transmission lines in the greater Sacramento area.

Vermont Yankee Nuclear Power Plant Report, Vermont Department of Public Service, Project Manager (December 2008 to January 2009). Dr. Phinney was the Project Manager and provided technical support for the environmental analysis of the continued operation of the Vermont Yankee Nuclear Power Station in Vernon, Vermont. The report assessed the environmental impacts to land, water and air resources (including climate change), soil and seismicity, on-site and off-site storage and disposal of high-level and low-level nuclear waste.

GenCorp 1999 to 2000

- As Vice President, Environmental and Regulatory Affairs, Dr. Phinney held primary responsibility for coordinating the company's aerospace and automotive environmental activities with various federal, State, and local regulatory agencies. Her specific responsibilities included: working with external groups and entities to develop responsible environmental legislation, regulations, and standards and the implementation of sound public policy; developing stakeholder base and strategy to ensure that company objectives were achieved; facilitating company and regulatory agency discussions to achieve more comprehensive and quicker remediation of sites; and spearheading a stakeholder group to develop and fund scientific studies on selected chemicals of concern.

Aerojet General Corporation 1984 to 1999

As Vice President, Environmental Health and Safety, Dr. Phinney ensured that programs were in place to meet all regulatory requirements and company initiatives. Her responsibilities included: providing strategic direction and management of all superfund-related investigation and remediation activities; developing environmental management plans; communicating environmental requirements, concerns, and successes to both internal and external audiences, including the board of directors, investment banking, and the analyst community; and participating as a member of the leadership council in defining company-wide business objectives and targets.

- Dr. Phinney created the first corporate EHS department, defining and staffing key functional areas. She managed a $20,000,000 annual budget and oversaw a staff of up to 30 professionals. Select accomplishments include: the development of remediation technologies that resulted in the cleanup of over 50 billion gallons of contaminated groundwater; development of the world's first groundwater treatment facility for perchlorate; significant reductions in emissions and hazardous waste generation; representation on numerous legislative and regulatory task forces and leadership positions on external business and community EHS committees and councils; and extensive public outreach efforts.

PREVIOUS EXPERIENCE, 1976 TO 1984

Jacobs Engineering Group. Dr. Phinney conducted toxicological, ecological, and air and water quality assessments.

Department of Environmental Science and Engineering at the University of California, **Los Angeles.** Dr. Phinney analyzed legal, economic, public health, and administrative barriers to waste water reuse. She also conducted an analysis of ecological and institutional factors in coastal siting of power plants.

Southwest Los Angeles Junior College. Dr. Phinney taught lecture and laboratory courses in general science.

TRAINING

- Certificate, Executive Program, University of California, Davis, 1989
- Expert Witness Training, California Energy Commission, 2001

HONORS AND AWARDS

- Who's Who of American Women, 18th Edition
- YWCA Outstanding Woman of the Year (Sciences) Award, 1992
- Woman of Achievement Award, Downtown Capitol Business and Professional Women, 1993
- Individual Award for Outstanding Contribution in Air Quality, 1995
- Sacramento Safety Center Incorporated, Eagle Award for Safety, 1998
- Regional Award for Outstanding Contribution in Air Quality, 2003

ACTIVITIES AND ASSOCIATIONS

- Editorial Board, The Environmental Professional, 1987-1989
- City of Sacramento Toxic Substances Commission, 1986-1988
- Sacramento Environmental Commission, 1988-1991
- Board of Directors, League of Women Voters of Sacramento, 1989-1999; President 1996-1997; Co-President 1997-1998; 2003-2005; Energy Study Committee 2005; Moderator/Facilitator of Debates and Forums (e.g., climate change, the SACOG's MTP, and flood control)
- Toxics Consultant, League of Women Voters of Sacramento, 1988-1989
- Member, Advisory Committee on AB 3777 (Risk Management Prevention Programs)
- Board of Directors, American Lung Association of Sacramento-Emigrant Trails, 1992-2000; President 1998-1999;
- Board of Directors, Sacramento Metropolitan Chamber of Commerce, 1992-1997; Vice President, Public Policy, 1996-1997
- Board of Directors, Air and Waste Management Association, 1991-1994
- Steering Committee Chair, Cleaner Air Partnership, 1993-1996, 2000-2001; Executive Committee 1993 to present
- Co-chair, TCE Issues Group, 1994-2000
- Sacramento Water Forum, 1995-2000
- Rate Advisory Committee, Sacramento Municipal Utility District, 1999-2001

SELECTED PUBLICATIONS/PRESENTATIONS

Phinney, S.L., Panel Moderator, Climate Change Initiatives for California, AEP Annual Conference, Shell Beach, California, 2007.

Phinney, S.L., Panel Moderator, Is there a Need for LNG in California, AEP Annual Conference, Shell beach, California, 2007.

Phinney, S.L., "LNG Safety Analysis in California – Federal, State and Local Processes" Presented at California Foundation on the Environment and the Economy, 2005.

Phinney, S.L., "Energy Basics" Presented at League of Women Voters of California Annual Convention, 2005.

Phinney, S.L., Presentation to U.S. Department of Justice, Office of the U.S. Attorney, on Women and Equality, 2004.

Phinney, S.L., "Trends in Industrial Waste Generation and Management" Presented at National Ground Water Association Conference, Las Vegas, Nevada, 1996.

Phinney, S.L., "Effective Management of an RI/FS to Reduce Financial Exposure," Manufacturers Alliance Environmental Management Council, Washington, D.C., 1995.

Phinney, S.L., "Knowing Your Compliance Challenge," 7th Annual California Statewide Community Awareness and Emergency Response (CAER) Conference, Sacramento, California, 1995.

Phinney, S.L., "Industry's Role in Broadening the Use of Alternative Fuels in America," Clean Cities Ceremony, Sacramento, California, 1994.

Phinney, S.L., "Aerospace Industry Perspective on Defense Conversion," AAAS Annual Meeting, San Francisco, California, 1994.

Phinney, S.L., "Aerojet's Waste Reduction Successes," Business for the Environment Conference, Sacramento, California, 1993.

Phinney, S.L., "Company Worker Trip Reduction Programs Under the Clean Air Act Amendments." MAPI Hazardous Materials Management Council, Washington, D.C., 1993.

Phinney, S.L., Testimony Before House Government Operations Subcommittee, 1993.

Phinney, S.L., Moderator, The Clean Air Act, A Public Forum, Sacramento, California, 1993.

Phinney, S.L., Plenary Session Chairperson and Speaker, "Business and the Environment: Must You Sacrifice One for the Other?" National Association of Environmental Professionals Conference, Seattle, Washington, 1992.

Phinney, S.L., "Facing the Challenge: The New California EPA." HazMat Northern California Conference, San Jose, California, 1992.

Phinney, S.L., "Understanding the Client Perspective." Environmental Business Conference, Pasadena, California, 1991.

Phinney, S.L., Panelist – Women of Science: Secrets of Success. Workshop, AAAS Annual Meeting, Washington, D.C., 1991.

Phinney, S.L., Keynote Address, ADPA International Symposium on Compatibility and Processing, San Diego, California, 1991.

Phinney, S.L., Keynote Address, Women in Science and Technology Conference, Jackson, Mississippi, 1991.

Phinney, S.L., Guest Speaker, Sacramento County Bar Association, Environmental Law Section, Sacramento, California, 1991.

Phinney, S.L., "Managing CERCLA Compliance from the Corporate Perspective." Hazardous Materials Management Conference/West, Long Beach, California, 1988.

Phinney, S.L., and C.A. Fegan, "Identifying a Feasible, Effective Treatment Method for an Unusual Chemical of Concern." Proceedings, American Defense Preparedness Association 16th Environmental Symposium, New Orleans, Louisiana, 1988.

Phinney, S.L., "A Proactive Superfund Cleanup by Industry." Proceedings of the 4th Annual Hazardous Materials Management Conference/West, Long Beach, California, 1988.

Thompson, C.H., S.L. Phinney and F.R. McLaren, "Aerojet: A Regional Site Program – Problem Definition." Proceedings of the Hazardous Waste and Environmental Emergencies Conference, Cincinnati, Ohio, 1985.

Kahane S.W., S.L. Phinney and A. Wright, "The Tightening Environmental Regulatory Climate for Hazardous Waste Management – Current Mandates and Future Directions for Industrial Compliance." Proceedings of the 1984 AlChE Summer National Meeting, Philadelphia, Pennsylvania, 1984.

Bachrach, A., D.M. Morycz, S.L. Phinney and S.W. Kahane, "Regulation and Offshore Oil and Gas Facilities." In: Emerging Energy/Environmental Trends and the Engineer. Eds. R.D. Nuefeld and R.W. Goodwins, 1983.

Lindberg, R.G., S.L. Phinney, J. Daniels and J. Hastings (eds)., "Environmental Assessment of the U.S. Department of Energy's Solar Thermal Technology Program." Prepared for the U.S. Department of Energy, June 1982.

Kahane, S.W., S.L. Phinney, J.A. Hill and R.C. Sklarew, "Key Considerations in Assessing the Air Impacts of Projected Outer Continental Shelf Oil and Gas Development," presented at the 74th Annual Air Pollution Control Association Meeting, Philadelphia, Pennsylvania, 1981

Phinney, S.L., "The U.S. Environmental Protection Agency's Pesticide Registration Program: A Case Study – Chloramben." Doctoral Dissertation, Environmental Science and Engineering Program, University of California, Los Angeles, California, 1981.

Phinney, S.L., (contributing author) et al. "Institutional Barriers to Wastewater Reuse in Southern California." Environmental Science and Engineering Report Prepared for the Office of Water Research and Technology, U.S. Department of the Interior, 1979.

Phinney, S.L., "Area-Restricted Feeding in American Plaice." Masters Thesis. Dalhousie University, Halifax, Nova Scotia, Canada, 1975.

DECLARATION OF
Testimony of William Walters, P.E.

I**, William Walters,** declare as follows:

1. I am presently employed by Aspen Environmental Group, a contractor to the California Energy Commission’s Siting,Transmission and Environmental Protection Division, as a senior associate in engineering and physical sciences.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Air Quality/Greenhouse Gases**, and prepared the **Visual Resources VR-2 Appendix** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: March 3, 2010 Signed: Original signed by W. Walters

At: Agoura Hills, California

WILLIAM WALTERS, P.E.
Air Quality Specialist

ACADEMIC BACKGROUND
B.S., Chemical Engineering, 1985, Cornell University

PROFESSIONAL EXPERIENCE

Mr. Walters has over 20 years of technical and project management experience in environmental compliance work, including environmental impact reports, emissions inventories, source permitting, energy and pollution control research RCRA/CERCLA site assessment and closure, site inspection, and source monitoring,.

Aspen Environmental Group 2000 to present

Responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- **Engineering and Environmental Technical Assistance to Conduct Application for Certification Review for the California Energy Commission:**
  - Preparation and project management of the air quality section of the Staff Assessment and/or Initial Study and the visual plume assessment for the following California Energy Commission (CEC) licensing projects: Hanford Energy Park; United Golden Gate, Phase I; Huntington Beach Modernization Project (including Expert Witness Testimony); Woodland Generating Station 2; Ocotillo Energy Project, Phase I; Magnolia Power Project; Colusa Power Project; Inland Empire Energy Center; Rio Linda/Elverta Power Plant Project; Roseville Energy Center; Henrietta Peaker Project; Tracy Peaking Power Plant Project (including Expert Witness Testimony); Avenal Energy Project; San Joaquin Valley Energy Center (including expert witness testimony); Salton Sea Unit 6 Project (including expert witness testimony); Modesto Irrigation District Electric Generation Station (including expert witness testimony); Walnut Energy Center (including expert witness testimony); Riverside Energy Resource Center (including expert witness testimony); Pastoria Energy Facility Expansion; Panoche Energy Center; Starwood Power Plant; and Riverside Energy Resource Center Units 3 and 4 Project (in progress).
  - Preparation and project management of the visual plume assessment for the following California Energy Commission (Energy Commission) licensing projects: Metcalf Energy Center Power Project (including Expert Witness Testimony); Contra Costa Power Plant Project (including Expert Witness Testimony); Mountainview Power Project; Potrero Power Plant Project; El Segundo Modernization Project; Morro Bay Power Plant Project; Valero Cogeneration Project; East Altamont Energy Center (including expert witness testimony); Russell City Energy Center; SMUD Cosumnes Power Plant Project (including expert witness testimony); Pico Power Project; Blythe Energy Project Phase II; City of Vernon Malburg Generating Station; San Francisco Electric Reliability Project; Los Esteros Critical Energy Facility Phase II; Roseville Energy Park; City of Vernon Power Plant; South Bay Replacement Project; Walnut Creek Energy Park; Sun Valley Energy Project; Highgrove Power Plant; Colusa Generating Station; Russell City Energy Center; Avenal Energy Project; Carlsbad Energy Center; Community Power Project; Panoche Energy Center; San Gabriel Generating Station; Sentinel Energy Project; and Victorville 2 Hybrid Power Project.
  - Assistance in the aircraft safety review of thermal plume turbulence for the Riverside Energy Resources Center; Russell City Energy Center Amendment (including expert witness testimony); Eastshore Energy Power Plant (including expert witness testimony); Carlsbad Energy Center (in progress), Riverside Energy Resource Center Units 3 and 4 Project; Victorville 2 Hybrid Power Project; and the Blythe Energy Power

Plant and Blythe Energy Project Phase II (including expert witness testimony) siting cases. Assistance in the aircraft safety review of thermal and visual plumes of the operating Blythe Energy Power Plant. Preparation of a white paper on methods for the determination of vertical plume velocity determination for aircraft safety analyses.

- Preparation and instruction of a visual water vapor plume modeling methodology class for the CEC.
- Preparation and project management of the public health section of the Initial Study for the Woodland Generating Station 2 Energy Commission licensing project.
- Preparation of project amendment or project compliance assessments, for air quality or visual plume impacts, for several licensed power plants, including: Metcalf Energy Center; Pastoria Power Plant; Elk Hills Power Plant; Henrietta Peaker Project; Tracy Peaker Project; Magnolia Power Project; Delta Energy Center; SMUD Cosumnes Power Plant; Walnut Energy Center; San Joaquin Valley Energy Center; City of Vernon Malburg Generating Station; Otay Mesa Power Plant; Los Esteros Critical Energy Facility; Pico Power Project; Riverside Energy Resource Center; Blythe Energy Project Phase II; Inland Empire Energy Center; Salton Sea Unit 6 Project; and Starwood Power-Midway Peaking Power Plant.
- Preparation of the air quality section of the staff paper “A Preliminary Environmental Profile of California’s Imported Electricity” for the Energy Commission and presentation of the findings before the Commission.
- Preparation of the draft staff paper “Natural Gas Quality: Power Turbine Performance During Heat Content Surge”, and presentation of the preliminary findings at the California Air Resources Board Compressed Natural Gas Workshop and a SoCalGas Technical Advisory Committee meeting.
- Preparation of the staff paper “Emission Offsets Availability Issues” and preparation and presentation of the Emission Offsets Constraints Workshop Summary paper for the Energy Commission.
- Preparation of information request and data analysis to update the Energy Commission’s Cost of Generation Model capital and operating cost factors for combined and simple cycle gas turbine projects. Additionally, performed a review of the presentation for the revised model as part of the CEC’s 2007 Integrated Energy Policy Report workshops, and attended the workshop and answering Commissioner questions on the data collection and data analysis.

- For the **Los Angeles Department of Water and Power (LADWP)**:
  - Preparation of the Air Quality Inventory for the LADWP River Supply Pipeline Project EIR.
  - Project management and preparation of the Air Quality Section for the LADWP Valley Generating Station Stack Removal IS/MND support project.
- For the **U.S. Army Corps of Engineers (Corps)**:
  - Preparation of the Air Quality Section and General Conformity Analysis for the Matilija Dam Ecosystem Restoration Project EIS/R for the Corps.
  - Preparation of emission inventory and General Conformity Analysis of the Murrieta Creek Flood Control Project and the Joint Red Flag exercise to be conducted in the Nevada Test and Training Range.
  - Emission inventory for the construction activities forecast for the San Jose/Old San Jose Creeks Ecosystem Restoration project for the Corps.
- Other Projects:
  - Preparation of the Air Quality Section of the LAUSD New School Construction Program EIR and provided traffic trip and VMT calculation support for the Traffic and Transportation Section.

- Preparation of the draft staff paper “Natural Gas Quality: Power Turbine Performance During Heat Content Surge”, and presentation of the preliminary findings at the California Air Resources Board Compressed Natural Gas Workshop and a SoCalGas Technical Advisory Committee meeting.
- Preparation of the Air Quality Section of the Environmental Information Document in support of the Coastal Consistency Determinations for the suspension of operation requests for undeveloped units and leases off the Central California Coast.
- Preparation of comments on the Air Quality, Alternatives, Marine Traffic, Public Safety, and Noise section of the Cabrillo Port Liquefied Natural Gas Deepwater Port Draft EIS/EIR for the City of Oxnard.
- Preparation of the emission estimates used in the Air Quality Sections for the DWR Tehachapi Second Afterbay Project Initial Study and EIR.

Camp Dresser & McKee, Inc. 1998 to 2000

Mr. Walters was responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- Preparation of emission inventories and dispersion modeling for criteria and air toxic pollutants for the Los Angeles International Airport Master Plan (LAXMP) EIS/EIR.
- Project Manager/Technical lead for the completion of air permit applications and air compliance audits for two Desa International fireplace accessory manufacturing facilities located in Santa Ana, California.
- Project manager/technical lead for the completion of Risk Management Plans (RMPs) for four J.R. Simplot food processing facilities in Oregon, Idaho, and Washington and the Consolidated Reprographics facility located in Irvine, California.

Planning Consultants Research 1997 to 1998

Mr. Walters was responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- Project Manager for a stationary source emission audit of the entire Los Angeles International Airport complex for Los Angeles World Airports (LAWA) in support of the LAXMP.
- Review of the Emission Dispersion Modeling System (EDMS) and preparation of a report with findings to the Federal Aviation Administration for LAWA in support of the LAXMP.
- Project manager for the ambient air monitoring and deposition monitoring studies performed for LAWA in support of the LAXMP, including the selection of the monitoring sites and specialty sub-contractor, and review of all monitoring data.

Aspen Environmental Group/Clean Air Solutions 1995 to 1996

Mr. Walters was responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- Manager of the Portland, Oregon, office of Clean Air Solutions from March 1995 to December 1995, with responsibilities including Project Management, Business Development, and Administration.
- Control technology assessment, engineering support and Notice of Intent to construct preparation for J.R. Simplot’s Hermiston, Oregon, food processing facility. Review and revision of an Air Contaminant Discharge Permit application, Title V permit application, and PSD modeling analysis for J.R. Simplot's Hermiston facility.

- Air quality compliance report including an air emission inventory, regulation and permit compliance determination, and recommendations for compliance for Lumber Tech, Inc.'s Lebanon, Oregon, wood products facility.

Fluor Daniel, Inc. 1990 to 1995 and 1996 to 1997

Mr. Walters was responsible as lead technical or project manager for major environmental projects for both government and private clients. His projects included:

- Prepared several air permit applications for the ARCO Los Angeles Refinery Polypropylene Plant Project; Phase I environmental assessments for properties located in Southern California; and a site investigation and RCRA closure plan for a hazardous waste storage site in Vernon, California.
- Project manager of the Anaconda Smelter site for the U.S. Environmental Protection Agency's (EPA) Alternative Remedial Contract System (ARCS) project during the conclusion of technical activities and project closeout. Prepared a cost recovery report for the project.
- Performed environmental analysis for the Bonneville Power Authority, including air pollution BACT analysis, wastewater analysis, and evaluation of secondary environmental effects of electric power producing technologies.

Jacobs Engineering Group 1988 to 1990

Mr. Walters was responsible for a wide range of air pollution regulatory and testing projects, including the following:

- Project manager of air toxic emission inventory reports prepared for U.S. Borax's boron mining and refining facility and the Naval Aviation Depot (N. Island Naval Base, San Diego, California).
- Prepared air permit applications and regulatory correspondence for several facilities including the U.S. Department of Energy's Feed Material Production Center uranium processing facility in Fernald, Ohio; Evaluation of a sludge dewatering process at Unocal's Wilmington, California, Refinery; and United Airlines blade repair facility at the San Francisco Airport.
- Characterized and quantified air emissions for offshore oil and gas development activities associated with Federal oil and gas Lease Sale 95, offshore southern California, for the U.S. Minerals Management Service.

CERTIFICATIONS

- Chemical Engineer, California License 5973
- CARB, Fundamentals of Enforcement Seminar
- EPA Methods 1-8, 17; Training Seminar

AWARDS

- California Energy Commission Outstanding Performance Award 2001

DECLARATION OF
Tao Jiang

I, Tao Jiang, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as an Air Resources Engineer.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Air Quality** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: February 26, 2010 Signed: Original signed by T. Jiang

At: Sacramento, California

Tao Jiang, Ph.D.

Professional Experience

Air Resources Engineer ***(Jan. 2009 – Present)***

California Energy Commission, Siting Transmission and Environmental Protection Division

Currently acting as air quality technical staff on Siting projects filed with the Energy Commission including Abengoa Mojave Solar, Ridgecrest Solar Millennium and Almond 2 Power Plant, and compliance projects including 42 power plants in construction and operation. Specific responsibilities include the following:

- Analyze the impacts of the construction and operation of large power generation projects on air quality, Green House Gas and climate change
- Determine the conformance to applicable U.S. EPA, CARB and local air district regulations and standards
- Investigate and recommend appropriate emission mitigation measures
- Prepare air quality staff assessments and technical testimony
- Develop and monitor air quality compliance plans
- Review and evaluate U.S. EPA, CARB, and local air district air quality rules and regulations
- Collect, analyze and evaluate data for the effects of air pollutants and power plant emissions on human health, vegetation, wildlife, water resources and the environment
- Develop, recommend, and implement statewide planning and policy initiatives for the Energy Commission and Governor

Research assistant ***(Sep. 2004 – Dec. 2008)***

University of California, Riverside, Chemical & Environmental Engineering

- Investigated phase behavior of air colloidal particles
- Study mediated colloidal interactions in the air particle dispersions
- Construct and evaluate models for gas molecules and air particulate matters
- Perform computer simulation and modeling for gas molecules and air particulate matters

Education

PhD	Chemical & Environmental Engineering, University of California, Riverside (August, 2008)
ME	Materials Science and Engineering, Beijing University of Chemical Technology (June, 2003)
BE	Materials Science and Engineering, Beijing University of Chemical Technology (June, 2000)

DECLARATION OF
Heather Blair

I, Heather Blair, declare as follows:

1. I am presently employed as a consultant to the California Energy Commission in the Siting, Transmission and Environmental Protection Division.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Biological Resources** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/26/10 Signed: Original signed by H. Blair

At: Sacramento, California

Aspen Environmental Group

HEATHER BLAIR
Environmental Scientist

ACADEMIC BACKGROUND

M.S., Conservation Biology, Sacramento State University, In Progress
B.S., Ecology, San Diego State University, 2004

PROFESSIONAL EXPERIENCE

Heather Blair is an Environmental Scientist experienced in a range of natural resource investigations and environmental impact analysis including botanical and wildlife research, inventory, and survey techniques; technical writing; and data analysis. She has experience preparing environmental documents pursuant to applicable federal, state and local environmental regulations, including the California Environmental Quality Act, National Environmental Policy Act, and the California and federal Endangered Species Acts.

Aspen Environmental Group 2004 to present

Selected project experience at Aspen includes the following:

Power Generation and Transmission Interconnection Projects

- **California Energy Commission.** Aspen has a multi-year contract to provide support to the Energy Facility Planning and Licensing Programs. Under this contract Ms. Blair has participated in the following projects:
  - **Biological Resources Assessment for the Abengoa Mojave Solar Project.** Ms. Blair is currently serving as the lead technical staff for the analysis of impacts to biological resources from the 250 MW power plant in the Mojave Desert. Important biological issues include impacts to Harper Dry Lake from potentially decreased water availability, desert tortoise, and Mojave ground squirrel.
  - **Biological Resources Assessment for the San Joaquin Solar 1&2 Hybrid Project.** Ms. Blair is currently serving as the lead technical staff for the analysis of impacts to biological resources from the 107 MW solar thermal/biomass hybrid power plant. Important biological issues include potential impacts to San Joaquin kit fox habitat and movement corridor connectivity.
  - **Biological Resources Assessment for the Genesis Solar Energy Project.** Ms. Blair is currently serving as the assistant technical staff for the analysis of impacts to biological resources from the 250 MW power plant in an undeveloped area of the Sonoran Desert. Important biological issues include direct and indirect (downstream) impacts to ephemeral drainages from site development and indirect impacts to sand dune dependent vegetation and wildlife communities from disruption of Aeolian processes.
  - **Biological Resources Assessment for the Carlsbad Energy Center.** Ms. Blair is currently serving as the lead technical staff for the analysis of impacts to biological resources from the 540 MW CECP. Important biological issues include potential impacts to Agua Hedionda Lagoon and consistency with the Carlsbad Habitat Management Plan. Ms. Blair recently testified as an expert witness in biological resources during Evidentiary Hearings before the Commission.
  - **Biological Resources Assessment for the CPV Sentinel Project.** Ms. Blair served as the lead technical staff for the analysis of impacts to biological resources from the 850 MW CPV Sentinel project. Important biological issues include potential impacts from groundwater drawdown to the mesquite hummock plant community and the special-status species it supports.
  - **Biological Resources Assessment for the CPV Vaca Station Project.** Ms. Blair is currently serving as the lead technical staff for the analysis of impacts to biological resources from the 660 MW CPVVS.

Important biological issues include potential impacts to giant garter snake from reduced flows in Old Almao Creek and loss of Swainson's hawk foraging habitat.

  - **Biological Resources Assessments for the Marsh Landing and Willow Pass Generating Stations.** Ms. Blair is currently serving as the lead technical staff for the analysis of impacts to biological resources from the 930 MW MLGS and 550 MW WPGS. Important biological issues include potential indirect impacts to listed plant species in the Antioch Dunes National Wildlife Refuge from nitrogen deposition.
  - **Biological Resources Assessments for the Panoche and Starwood Energy Centers.** Ms. Blair served as the lead technical staff for the analysis of impacts to biological resources from the 400 MW Panoche Energy Center and 120 MW Starwood Project. These projects required coordination with USFWS and CDFG regarding impacts to the State and federally listed San Joaquin kit fox.

- **Northern California CO2 Storage Pilot, Confidential Client, CEQA and NEPA compliance, (2008).** Contributed to the preparation of Department of Energy NEPA environmental questionnaire to comply with Category Exclusion requirements and preparation of the Initial Statement under CEQA for the proposed CO_2 sequestration pilot test site in Montezuma Hills, California. Ms. Blair conducted focused nesting surveys of the State-threatened Swainson's hawk (*Buteo swansonii*).
- **Arizona Utilities CO_2 Storage Pilot, CEC and University of California, NEPA compliance, (2007).** Contributed to the preparation of Department of Energy NEPA environmental questionnaire to comply with Category Exclusion requirements for the proposed CO_2 sequestration pilot test site near Joseph City, Arizona. Ms. Blair conducted focused surveys of the federally endangered Peebles Navajo cactus (*Pediocactus peeblesianus* var. *peeblesianus*).
- **Environmental Screening Tool for Out-of-State Renewables, KEMA and CEC, Staff (2009).** Assessed the potential for California laws, ordinance, regulations and standards to be impacted by out-of-state renewable facilities seeking RPS certification. Ms. Blair prepared the assessment of impacts associated with geothermal projects.
- **Nuclear Power Plant Assessment (Assembly Bill 1632).** Ms. Blair managed the preparation of and was a contributing author for a major Appendix to the Nuclear Power Plan Assessment Report for the Energy Commission. This report evaluated nuclear power issues in the state in response to recent legislation (AB 1632), including environmental issues associated with alternatives (including renewable) to the state's two nuclear facilities.
- **Diablo Canyon Power Plant Steam Generator Replacement Project.** Ms. Blair supported the management team in preparing the project description, alternatives and supporting sections of the Draft and Final EIR.

<u>Transmission Line and Substation Projects</u>

- **Sunrise Powerlink Transmission Line Project.** Under contract to the California Public Utilities Commission (CPUC), Aspen prepared an EIR/EIS for a 150-mile proposed transmission line from Imperial Valley Substation, near El Centro, California, to Peñasquitos Substation in northwestern San Diego County. The Proposed Project would potentially deliver renewable resources from the Imperial Valley via a 500 kV transmission line to a new 500/230 kV substation, and from the new substation to western San Diego via 230 kV overhead and underground transmission lines. Ms. Blair analyzed the impacts to wilderness and recreation. Additionally, she wrote the project description and assisted with overall project support.
- **TANC Transmission Project.** Aspen was awarded a contract with the Transmission Agency of Northern California (TANC) for CEQA/NEPA and environmental permitting support for 600-miles of proposed 500 and 230 kV transmission lines between Lassen County and Santa Clara County, California. The project included evaluation of over 600 additional miles of alternative routes, six new substations, and modifications to six existing substations. Ms. Blair was the Deputy Project Manager, responsible for coordinating the biological and cultural resource field surveys. The project was cancelled in July 2009.

- **Sacramento Area Voltage Support Project.** Under contract to Western Area Power Administration (Western) and in cooperation with SMUD, Aspen prepared an SEIS and EIR for a double-circuit 230 kV circuit between Western's O'Banion/Sutter Power Plant and Elverta Substation/Natomas Substation. Ms. Blair was part of the project management team and managed the wetland delineation, Biological Survey Report, and Biological Evaluation.

- **North Area ROW Maintenance Project**. Under contract to Western, Ms. Blair is currently providing project support to prepare an Environmental Assessment and Operation and Maintenance Program associated with the operation and maintenance procedures along Western's transmission line ROWs between Sacramento (Sutter/Yuba County line) and the Oregon border. This project also includes a detailed survey of the biological and cultural resources along 434 miles of North Area ROW, 342 miles of COTP ROW, and several hundred miles of access and maintenance roads. Ms. Blair is working closely with project management and resource specialists to coordinate and execute over 800 miles of surveys. She conducted wildlife inventory and surveyed portions of ROW for sensitive species and recorded habitat types, jurisdictional waters and infrastructure using a Trimble GeoXT GPS unit. Additionally, Ms. Blair was integrally involved in the management and development of the North Area O&M GIS database.

- **Categorical Exclusions for Routine Operation and Maintenance.** Under contract to Western, Ms. Blair has prepared multiple CXs for routine maintenance activities along Western's CVP, PACI, and COTP transmission line ROWs and access roads. She has developed a streamlined and highly efficient system to use the results and analysis for the North Area ROW Maintenance Project to complete these documents.

- **GIS Data Verification and Resource Database Development for the Trinity County PUD Direct Interconnection Project.** Under contract to Western, Ms. Blair was the Deputy Project Manager for this project and also be coordinated and conducted biological resources in support of the development of an O&M GIS database, which included identification of sensitive resources and associated project conservation measures for this new segment of Western's CVP transmission system.

- **Seventh Standard Substation Project.** Under contract to the CPUC, Ms. Blair prepared the biological resource section of an Initial Study/Mitigated Negative Declaration for a proposed 4.9 acre 115/21 kV substation and transmission interconnection in northwest Bakersfield, Kern County, California. Important biological issues included impacts to the State and federally listed San Joaquin kit fox and western burrowing owl (a California species of special concern), as well as compliance with the Metropolitan Bakersfield Habitat Conservation Plan.

- **Atlantic–Del Mar Reinforcement Project Mitigated Negative Declaration**. Under contract to the CPUC, Ms. Blair served as an assistant environmental monitor during the construction of four miles of overhead transmission towers and lines and approximately 1.3 miles of underground lines. The project involved trenching, horizontal drilling and blasting and requires avoidance of several wetlands, seasonal pools and threatened and endangered species.

- **Miguel-Mission 230 kV #2 Project EIR Addendum**. Under contract to the CPUC, Ms. Blair helped to prepare a detailed addendum associated with engineering design changes for the Miguel-Mission 230 kV #2 Project.

<u>Other Infrastructure, Resource Management, and Monitoring Projects</u>

- **Hazardous Fuels and Vegetation Management for Angeles National Forest.** Under contract to the U.S. Forest Service, Ms. Blair conducted botanical and wildlife surveys at approximately 100 sites ranging from one to 2500 acres throughout the Angeles National Forest. Modifications to current fuel management practices were proposed in response to increased frequency and intensity of wildfire resulting from climate change. She prepared 75 Biological Evaluations/Biological Assessments that assessed the biological impacts of proposed fuel management practices throughout the forest.

- **Rare Plant Surveys for the East Branch Extension Pipeline Project.** Under contract to the Department of Water Resources, Ms. Blair conducted rare plant surveys of the endangered Santa Ana River wooly star (*Eriastrum densifolium* ssp. *sanctorum*) and the state and federally endangered slender horned spine flower (*Dodecahema leptoceras*) in response to the proposed construction of a water pipeline through San Bernardino and Riverside Counties.

- **Upper San Antonio Creek Watershed Giant Reed Removal Project.** Ms. Blair prepared the biological resource analysis of an Initial Study to remove invasive plant species from the Upper San Antonio Creek Watershed. Required field survey and development of impact avoidance measures for several special-status species, including California red-legged frog, southern steelhead, and riparian nesting birds.

- **Least Tern Monitoring for the Montezuma Slough Tidal Wetlands Restoration Project**. Under contract to EcoBridges Environmental, Ms. Blair monitored the nesting success of three nesting colonies of the federally and State endangered least tern. This effort involved counting and mapping the nest sites and tern chicks once a week for two years.

- **Endangered Species Monitoring for the Lomita Canal Vegetation Clearing Project**. Monitored the federally threatened California Red-legged frog and the state- and federally endangered San Francisco Giant Garter Snake during vegetation clearing activities along the Lomita Canal at the San Francisco International Airport. Involved identification of these species, relocation of California red-legged frogs, and re-direction of work in the event a SF Garter Snake was spotted.

PREVIOUS EXPERIENCE

Soil Ecology and Restoration Group ***January to May 2004***

Research Assistant. Ms. Blair assisted in managing the greenhouse where native seeds were germinated and propagated. In this role, she collected seeds from native plants and analyzed the composition of the soil present in their native habitat to ensure seedling viability. The plants were subsequently used in the restoration of degraded habitat as contracted by the U.S. Army Corps of Engineers and others.

DECLARATION OF
Kathleen A. Forrest

I, Kathleen A. Forrest, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as a Planner II.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Cultural Resources Section** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 2/25/10 Signed: Original signed by K. Forrest

At: Sacramento, California

Kathleen A. Forrest

PROFESSIONAL EXPERIENCE

Associate Planner, Preservation Office, City of Sacramento, Development Services Department
Sacramento, CA, July 2006-July 2009
Cultural resource specialist in City's Preservation Office responsible for a wide range of complex cultural resources programs, policies and project reviews.

Development Project Application Review & Management

- Interpret the Secretary of the Interior's Standards and negotiate with developers, property owners, design professionals, contractors and other city staff to reach design solutions that achieved development project objectives
- Analyzed 36 development proposals for consistency with the Secretary of the Interior's Standards
- Managed Certified Local Government Program grant-funded survey project, including RFQ and consultant selection process, contract negotiations, schedule, review of consultant work, and reporting requirements to State Office of Historic Preservation
- Led multi-disciplinary Matrix review teams to facilitate a timely, seamless and predictable development review for the applicant through planning and building permit processes
- Worked with City Council members and staff on politically sensitive issues

Environmental Review

- Reviewed and provided comments on adequacy of Cultural Resources sections of CEQA and NEPA documents, including identification of cultural resources, project-related impacts, and mitigations
- Prepared 430 recommendations to the Preservation Director and Planning staff regarding potential cultural resources eligibility for ministerial and discretionary projects

Historic Resource Nomination & Management

- Presentations to the City Council, Preservation Commission, Preservation Director, community groups and staff regarding Landmark and Historic District nominations and preservation programs, including preparation of staff reports, informational handouts and visual presentations
- Managed Preservation Commission's Historic Resources Survey Committee
- Updated and maintained the Sacramento Register of Historic and Cultural Resources

Historic Compliance Coordinator, Presidio Trust, San Francisco, CA, January 2004-July 2006
Monitored and assisted in discharging the agency's responsibilities for historic structures within the Presidio of San Francisco

NEPA and Section 106 Review

- Communicated with Presidio Trust personnel regarding NEPA and Section 106 compliance responsibilities and internal procedures to ensure that the required review & consultation occurred
- Collected, analyzed and interpreted information for all Section 106 documentation (determinations of no effect and no adverse effect by the Federal Preservation Officer) for weekly NHPA/NEPA compliance meeting, including preparation of annual report
- Carried out mitigation monitoring of commercial and residential real estate development projects
- Led organization-wide training and compliance on NHPA the Secretary of the Interior's Standards for the Treatment of Historic Properties
- Represented the Presidio Trust at public and partner agency meetings
- Managed preservation compliance files and database
- Assisted FPO in formal consultation for undertakings outside the Programmatic Agreement

Project Management

- Facilitated a successful relationship with trades crews and technical personnel to affect positive historic preservation projects. Began in non-communicative situation and built trust and open communication with those Operations and Maintenance employees that are essential to preservation projects
- Managed building preservation studies and residential rehabilitation projects
- Visited project sites to advise project managers and trades people during project planning and implementation regarding compliance requirements and mitigations

Special Project: Volunteer Coordinator, California Preservation Foundation Conference Steering Committee, 2004.

- Recruited 80 volunteers to staff the 29th annual California Preservation Foundation Conference (2004) at the Presidio of San Francisco from local and state-wide historical associations, local neighborhood associations, regional parks, and interested individuals. Joined Steering Committee halfway through the planning process with no volunteers in place; recruited most volunteers in history of conference to that date
- Coordinated and trained volunteers based on availability, interest and need

Architectural Conservator, Carey & Co., San Francisco, CA. April 2002-December 2003
Staff architectural conservator conducting laboratory analysis and historic research and documentation.

- Performed conditions assessments of historic structures, including identification of character-defining features, finishes analysis of historic paint samples, and treatment recommendations
- Supervised on-site product testing for effectiveness and consistency with the Secretary of the Interior's Standards
- Conducted historical assessments of prospective development project areas to identify potential historic resources
- Prepared historic structures reports, including historic research, surveys, identification of significant features and characteristics, and treatment recommendations

Bandelier National Monument, Los Alamos, NM. June 2000 and June-September 2001
Architectural conservation intern and seasonal employee. Conducted historical research and documentation of cliff dwellings.

Mesa Verde National Park, Mesa Verde, CO. July 2000
Architectural conservation intern. Carried out documentation and on-site treatment at Cliff Palace site.

RELEVANT EDUCATION AND TRAINING

Graduate Program in Historic Preservation, University of Pennsylvania, Philadelphia, PA
Master of Science, May 2001
Emphasis on conservation of architectural materials, conditions assessment methodology and technological applications in documentation, architectural history and archival and site documentation.

University of Massachusetts, Amherst, MA
Bachelor of Arts, cum laude, May 1999.
Major, History. Minor, Anthropology.
Junior semester abroad, University College London, London, England

Environmental Impact Analysis: CEQA and NEPA, Spring 2007, CSU Sacramento
Review of legislative and judicial requirements for environmental impact analysis.

NEPA Workshop. March 28, 2004. UC Santa Cruz Extension
One-day workshop in NEPA policy.

DECLARATION OF
Alvin J. Greenberg, Ph.D.

I**, Alvin J. Greenberg, Ph.D.** declare as follows:

1. I am presently a consultant to the California Energy Commission, Energy Facilities Siting and Environmental Protection Division.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on the **Public Health, Hazardous Materials Management, and Worker Safety/Fire Protection** sections for the **Abengoa Mojave Solar Project Application** based on my independent analysis of the amendment petition, supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: Feb. 8, 2010 Signed: Original signed by A. Greenberg

At: Sacramento, California

Risk Science Associates

121 Paul Dr., Suite A, San Rafael, Ca. 94903-2047
415-479-7560   fax 415-479-7563
e-mail   agreenberg@risksci.com

Name & Title: **Alvin J. Greenberg, Ph.D., FAIC, REA, QEP**
Principal Toxicologist

Dr. Greenberg has had over two decades of complete technical and administrative responsibility as a team leader in the preparation of human and ecological risk assessments, air quality assessments, hazardous materials handling and risk management/prevention, infrastructure vulnerability assessments, occupational safety and health, hazardous waste site characterization, interaction with regulatory agencies in obtaining permits, and conducting lead surveys and studies. He has particular expertise in the assessment of dioxins, lead, diesel exhaust, petroleum hydrocarbons, mercury, the intrusion of subsurface contaminants into indoor air, and the preparation and review of public health/public safety sections of EIRs/EISs. Dr. Greenberg's expertise in risk assessment has led to his appointment as a member of several state and federal advisory committees, including the California EPA Advisory Committee on Stochastic Risk Assessment Methods, the US EPA Workgroup on Cumulative Risk Assessment, the Cal/EPA Peer Review Committee of the Health Risks of Using Ethanol in Reformulated Gasoline, the California Air Resources Board Advisory Committee on Diesel Emissions, the Cal/EPA Department of Toxic Substances Control Program Review Committee, and the DTSC Integrated Site Mitigation Committee. Dr. Greenberg is the former Chair of the Bay Area Air Quality Management District Hearing Board, a former member of the State of California Occupational Health and Safety Standards Board (appointed by the Governor), and former Assistant Deputy Chief for Health, California OSHA. And, since the events of 9/11, Dr. Greenberg has been the lead person for developing vulnerability assessments, power plant security programs, and conducting safety and security audits of power plants for the California Energy Commission and has assisted the CEC in the assessment of safety and security issues for proposed LNG terminals. In addition to providing security expertise to the State of California, Dr. Greenberg was the Team Leader and main consultant to the State of Hawaii on the updating of their Energy Emergency Preparedness Plan.

Years Experience: 26

Education:

B.S. 1969 Chemistry, University of Illinois Urbana

Ph.D. 1976 Pharmaceutical/Medicinal Chemistry, University of California, San Francisco

Postdoctoral Fellowship 1976-1979 Pharmacology/Toxicology, University of California, San Francisco

Postgraduate Training 1980 Inhalation Toxicology, Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM

Professional Registrations:

Board Certified as a Qualified Environmental Professional (QEP)
California Registered Environmental Assessor - I (REA)
Fellow of the American Institute of Chemists (FAIC)

Professional Affiliations:

Society for Risk Analysis
Air and Waste Management Association
American Chemical Society
American Association for the Advancement of Science
National Fire Protection Association

Technical Boards and Committee Memberships - Present:

Squaw Valley Technical Review Committee
(appointed 1986)

Technical Boards and Committee Memberships - Past:

July 1996 – March 2002
Member, Bay Area Air Quality Management District Hearing Board
(Chairman 1999-2002)

September 2000 – February 2001
Member, State Water Resources Control Board Noncompliant Underground Tanks Advisory Group

January 1999 – June 2001
Member, California Air Resources Board Advisory Committee on Diesel Emissions

January 1994 - September 1999
Vice-Chairman, State Water Resources Control Board Bay Protection and Toxic Cleanup Program Advisory Committee

September 1998
Member, US EPA Workgroup on Cumulative Risk Assessment

April 1997 - September 1997
Member, Cal/EPA Private Site Manager Advisory Committee

January 1986 - July 1996
Member, Bay Area Air Quality Management District Advisory Council
(Chairman 1995-96)

January 1988 - June 1995
Member: California Department of Toxic Substance Control Site Mitigation Program Advisory Group

January 1989 - February 1995
Member: Department of Toxics Substances Control Review Committee, Cal-EPA

October 1991 - February 1992

Chair: Pollution Prevention and Waste Management Planning Task Force of the Department of Toxics Substances Control Review Committee, Cal-EPA

September 1990 - February 1991

Member: California Integrated Waste Management Board Sludge Advisory Committee

September 1987 - September 1988

ABAG Advisory Committee on Regional Hazardous Waste Management Plan

March 1987 - September 1987

California Department of Health Services Advisory Committee on County and Regional Hazardous Waste Management Plans

January 1984 - October 1987

Member, San Francisco Hazardous Materials Advisory Committee

March 1984 - March 1987

Member, Lawrence Hall of Science Toxic Substances and Hazardous Materials Education Project Advisory Board

Jan. 1, 1986 - June 1, 1986

Member, Solid Waste Advisory Committee, Governor's Task Force on Hazardous Waste

Jan. 1, 1983 - June 30, 1985

Member, Contra Costa County Hazardous Waste Task Force

Sept. 1, 1982 - Feb. 1, 1983

Member, Scientific Panel to Address Public Health Concerns of Delta Water Supplies, California Department of Water Resources

Present Position

January 1983- present

Owner and principal with Risk Sciences Associates, a Marin County, California, environmental consulting company specializing in multi-media human health and ecological risk assessment, air pathway analyses, hazardous materials management-infrastructure security, environmental site assessments, review and evaluation of EIRs/EISs, preparation of public health and safety sections of EIRs/EISs, and litigation support for toxic substance exposure cases.

Previous Positions

Jan. 2, 1983 - June 12, 1984

Member, State of California Occupational Safety and Health Standards Board (Cal/OSHA), appointed by the Governor

Aug. 1, 1979 - Jan. 2, 1983

Assistant Deputy Chief for Health, California Occupational Safety and Health Administration

Feb. 1, 1979 - Aug. 1, 1979

Administrative Assistant to Chairperson of Finance Committee, Board of Supervisors, San Francisco

Jan. 1, 1976 - Feb. 1, 1979
Research Pharmacologist and Postdoctoral Fellow, Department of Pharmacology and Toxicology, School of Medicine, University of California, San Francisco

Jan. 1, 1975 - Dec. 31, 1975
Acting Assistant Professor, Department of Pharmaceutical Chemistry, University of California, San Francisco

Experience

General

Dr. Greenberg has been a consultant in Hazardous Materials Management and Security, Human and Ecological Risk Assessment, Occupational Health, Toxicology, Hazardous Waste Site Characterization, and Toxic Substances Control Policy for over 26 years. He has broad experience in the identification, evaluation and control of health and environmental hazards due to exposure to toxic substances. His experience includes Community Relations Support and Risk Communication through experience at high-profile sites and presentations at professional society meetings.

He has considerable experience in the review and evaluation of exposure via the air pathway - particularly to emissions from power plants, refineries, and diesel exhaust - and a thorough knowledge of the regulatory requirements through his experience at Cal/OSHA, the BAAQMD Hearing Board, as a consultant to the California Energy Commission, and in preparing such assessments for local government and industry. He has assessed exposures to diesel exhaust during construction and operations of stationary and mobile sources and has testified at evidentiary hearings numerous times on this subject.

He is presently assisting the California Energy Commission in assessing the risks to workers and the public of proposed power plants and LNG terminals in the state. His experience in hazard identification, exposure assessment, risk assessment, occupational safety and health, emergency response, and Critical Infrastructure Protection has made him a valuable part of the CEC team addressing this issue. He has reviewed and commented on the DEIS/DEIR for the proposed SES LNG Port of Long Beach terminal, focusing on security issues for the CEC and on safety matters for the City of Long Beach. He has presented technical information and analysis to the State of California Interagency LNG Working Group on thermal radiation public exposure criteria and safety/security at an east coast urban LNG terminal. (Both presentations are confidential owing to the nature of the material.) He has conducted numerous evaluations of the safety and hazards of natural gas pipelines for the CEC and has presented his findings and recommendations at public meetings and evidentiary hearings.

He served for over five years as the Vice-chair of the California State Water Resources Control Board Advisory Committee convened to address toxic substances in sediments in bays, rivers, and estuaries. He has been a member of the Squaw Valley Technical Review Committee since 1986 establishing chemical application management plans at golf courses to protect surface and groundwater quality. He has also conducted numerous ecological risk assessments and characterizations, including those for marine and terrestrial habitats.

Dr. Greenberg has extensive experience in data collection and preparation of human and ecological risk assessments on numerous military bases and industrial sites with Cal/EPA DTSC and RWQCB oversight. He has also been retained to provide technical services to the Cal/EPA Department of Toxic Substances Control (preparation of human health risk assessments) and the Office of Environmental Health Hazard Assessment (review and evaluation of air toxics health risk assessments and preparation of profiles describing the acute and chronic toxicity of toxic air contaminants). He has also conducted several surveys of sites containing significant lead contamination from various sources including lead-based paint, evaluated potential occupational exposure to lead dust and fumes in industrial settings, prepared numerous human health risk assessments of lead exposure, and prepared safety and health plans for remedial investigation of lead contaminated soils. Dr. Greenberg is also a recognized expert on the requirements of California's Proposition 65 and has served as an expert on Prop. 65 litigation.

Sites with EPA, RWQCB and/or DTSC Oversight

Dr. Greenberg has specific experience in assessing human health and ecological risks at contaminated sites at the land/water interface, including petroleum contaminants, metals, mercury, and VOCs at several locations in California including Oxnard, Richmond, Avila Beach, Mare Island Naval Shipyard, San Diego, Hollister, San Francisco, Hayward, Richmond, the Port of San Francisco, and numerous other locations. He has used Cal/EPA methods, US EPA methods, and ASTM Risk Based Corrective Action (RBCA) and Cal/Tox methodologies. He is extremely knowledgeable about SWRCB and SF Bay RWQCB regulations on underground storage tank sites and with ecological issues presented by contaminated sediments including sediment analysis, toxicity testing, tissue analysis, and sediment quality objectives. Dr. Greenberg served on the State Water Resources Control Board Bay Protection and Toxic Cleanup Program Advisory Committee from 1994 until the end of the program in 1999.

Dr. Greenberg experience on many of these contaminated sites has been as a consultant to local governments, state agencies, and citizen groups. He assisted the City and County of San Francisco in developing local ordinance requiring soil testing (Article 20, Maher ordinance) and hazardous materials use reporting (Article 21, Walker ordinance). He served as the City of San Rafael's consultant to provide independent review and evaluation of the site characterization and remedial action plan prepared for a former coal gasification site. He was a consultant to a citizen group in northern California regarding exposure and risks due to accidental releases from a petroleum refinery and assisted in the assessment of risks due to crude petroleum contamination of a southern California beach. He has prepared a number of risk assessments addressing crude petroleum, diesel and gasoline contamination, including coordinating site investigations, environmental monitoring, and health risk assessment for the County of San Luis Obispo regarding Avila Beach subsurface petroleum contamination. That high-profile project lasted for over one year and Dr. Greenberg managed a team of experts with a budget of $750,000. Another high-profile project included the preparation of an extensive comprehensive human and ecological risk assessment for the Hawaii Office of Space Industry on rocket launch impacts and transportation/storage of rocket fuels at the southern end of the Big Island of Hawaii. Dr. Greenberg's risk assessments were part of the EIS for the project. Dr. Greenberg also worked on another high-profile project conducting Air Pathway Analysis of off-site and on-site impacts from landfill gas constituents, including indoor and outdoor air measurements, air dispersion modeling, flux chamber investigations, and health risk assessment for the County of Santa Barbara. Dr. Greenberg has conducted RI/FS work, prepared health risk assessments, evaluated hazardous waste sites and hazardous materials use at numerous locations in California, Hawaii, Oregon, Minnesota, Michigan, and New York. He has considerable experience in the development of clean-up standards and the development of quantitative risk assessments for site RI/FS work at CERCLA sites, as well as site closures, involving toxic substances and petroleum hydrocarbon wastes. He is experienced in working with both Region IX EPA and the State of California DTSC in negotiating clean-up standards based on the application of both site-specific and non site-specific health and ecological based clean-up criteria. He has significant experience in the development of site chemicals of concern list, quantitative data quality levels, site remedial design, the site closure process, the design and execution of data quality programs and verification of data quality prior to its use in the decision making process on large NPL sites.

Examples

The Avila Beach Health Study Phase 1: Reconnaissance Sampling Findings, Conclusions, and Recommendations. (July 1997) Volume 1: Baseline Human Health Risk Assessment. (May 1998)
The Avila Beach Health Study Phase 1, Volume 2: Environmental Monitoring. (May 1998)

Health Risk Assessment and Air Pathway Analysis for the Ballard Canyon Landfill, Santa Barbara County, Ca. (March 1999)

Screening Human Health Risk Assessment, Calculation of Soil Clean-up Levels, and Aquatic Ecological Screening Evaluation, Galilee Harbor, Sausalito, Ca. (May 1998)

Health Risk Assessment Due to Diesel Train Engine Emissions, Oakland, Ca. (June 1999)

Health Risk Assessment for Residual Mercury at the Deer Creek Facility, 3475 Deer Creek Road, Palo Alto, California. (July 1997)

Phase 2 Human Health Risk Assessment, Teledyne Inc., San Diego, Ca. (February 1997)

Human Health Risk Assessment, Teledyne Ryan Aeronautical, McCormick Selph Ordnance. Hollister, California. (December 1996)

Initial Phase Human Health Risk Assessment, Teledyne Inc., San Diego, Ca. (October 1996)

Human Health Risk Assessment, Ecological Screening Evaluation, and Development of Proposed Remediation Goals for the Flair Custom Cleaners Site, Chico, California (January 1996)

Human Health Risk Assessment for the X-3 Extrudate Project at Criterion Catalyst, Pittsburg, Ca. (November 1994)

Screening Health Risk Assessment and Development of Proposed Soil Remediation Levels at Hercules Plant #3, Culver City, Ca. (July 1993)

Ecological Screening Evaluation for the Altamont Landfill, Alameda County, Ca. (June, 1993)

Focused Ecological Risk Characterization, Hawaiian Electric Company, Keahole Generating Station Expansion, Hawaii (June 1993)

Human Health Risk Assessment for the Proposed Palima Point Space Launch Complex, prepared for the Hawaii Office of Space Industry (April 1993)

Ecological Risk Assessment for the Proposed Palima Point Space Launch Complex, prepared for the Hawaii Office of Space Industry (March 1993)

Human Health Risk Assessment for Current and Proposed Expanded Class II and Class III Operations at the Altamont Sanitary Landfill, Alameda County, Ca.
(March, 1993)

Screening Health Risk Assessment for the Proposed Expansion of the West Marin Sanitary Landfill, Point Reyes Station, Ca.
(March, 1993)

Health Risk Assessment for the Proposed Expansion of the Forward, Inc. Landfill, Stockton, Ca. (September 14, 1992)

Health Risk Assessment for the Rincon Point Park Project, San Francisco, Ca. Prepared for Baseline Environmental Consulting and the San Francisco Redevelopment Agency.
(August 10, 1992)

Health Risk Assessment for the South Beach Park Project, San Francisco, Ca. Prepared for Baseline Environmental Consulting and the San Francisco Redevelopment Agency.
(August 10, 1992)

Screening Health Risk Assessment and Development of Proposed Soil and Groundwater Remediation Levels, Kaiser Sand and Gravel, Mountain View, Ca. Prepared for Baseline Environmental Consulting (January 30, 1992)

Development of Proposed Soil Remediation Levels for the Marine Corps Air-Ground Combat Center, 29 Palms, California (May 30, 1991)

Preliminary Health Risk Assessment for the City of Pittsburg Redevelopment Agency, Pittsburg, California (May 29, 1991)

Military Bases

Dr. Greenberg has experience in conducting assessments at DOD facilities, including RI/FS work, preparation of health risk assessments, evaluation of hazardous waste sites and hazardous materials use at the following Navy sites in California: San Diego Naval Base; Marine Corps Air-Ground Combat Center, 29 Palms; Mare Island Naval Shipyard, Vallejo; Treasure Island Naval Station, San Francisco, Hunters Point Naval Shipyard, San Francisco, and the Marine

Corps Logistics Base, Barstow. He worked with the U.S. Navy and the U.S. EPA in the implementation of Data Quality Objectives (DQO's) at MCLB, Barstow.

Examples

Review and Evaluation of the Remedial Investigation Report and Human Health Risk Assessment for the U. S. Naval Station at Treasure Island, Ca. (June 1999)

Screening Health Risk Assessment for the Proposed San Francisco Police Department's Helicopter Landing Pad at Hunters Point Shipyard, San Francisco, Ca. (September 1997)

Development of Proposed Soil Remediation Levels for the Marine Corps Air-Ground Combat Center, 29 Palms, California (May 30, 1991)

Health Risk Assessment for the Chrome Plating Facility, Mare Island Naval Shipyard, Vallejo, California (October 24, 1988)

Background Levels and Health Risk Assessment of Trace Metals present at the Naval Petroleum Reserve No.1, 27R Waste Disposal Trench Area, Lost Hills, California (August 12, 1988)

RCRA Facility Investigation (RFI) Work Plan of Lead Oxide Contaminated Areas, Mare Island Naval Shipyard, Vallejo, California. Prepared in conjunction with Kaman Sciences Corp. (August 14, 1989)

Hazardous Waste and Solid Waste Audit and Management Plan, Mare Island Naval Shipyard, Vallejo, California. Prepared in conjunction with Kaman Sciences Corp. (July 3, 1989)

Water Quality Solid Waste Assessment Test (SWAT) Proposal RCRA Landfill, Mare Island Naval Shipyard, Vallejo, California. Prepared in conjunction with Kaman Sciences Corp. (October 31, 1988)

Waste Disposal Facilities, Waste Haulers, Waste Recycling Facilities Report, Mare Island Naval Shipyard, Vallejo, California. Prepared in conjunction with Kaman Sciences Corp. (September 22, 1988)

Sampling and Analysis Plan, Health and Safety Plan, Site Characterization of Lead Oxide Contaminated Areas, Mare Island Naval Shipyard, Vallejo, California. Prepared in conjunction with Kaman Sciences Corp. (September 2, 1988)

Air Quality Solid Waste Assessment Test (SWAT) Proposal, Mare Island Naval Shipyard, Vallejo, California. Prepared in conjunction with Kaman Sciences Corp. (August 25, 1988)

<u>Liquefied Natural Gas (LNG)</u>

Dr. Greenberg assisted the CEC in the preparation of the "background" report on the risks and hazards of siting LNG terminals in California ("LNG in California: History, Risks, and Siting" July 2003) and consulted for the City of Vallejo on a proposed LNG terminal and storage facility at the former Mare Island Naval Shipyard. He has also conducted an evaluation and prepared comments on the risks, hazards, and safety analysis of the DEIS/DEIR for the City of Long

Beach on a proposed LNG terminal at the Port of Long Beach (POLB) and conducted an analysis on vulnerability and critical infrastructure security for the CEC on this same proposed LNG terminal. He currently advises the CEC on the POLB LNG proposal on risks, hazards, human thresholds of thermal exposure, vulnerability, security, and represented the CEC at a U.S. Coast Guard briefing on the Waterway Suitability Assessment that included the sharing of SSI (Sensitive Security Information). He has presented technical information and analysis to the State of California LNG Interagency Working Group on thermal radiation public exposure criteria and safety/security at an east coast urban LNG terminal. (Both presentations are confidential owing to the nature of the material.) He has conducted numerous evaluations of the safety and hazards of natural gas pipelines for the CEC and has presented his findings and recommendations at public meetings and evidentiary hearings.

Infrastructure Security

Since 2002, Dr. Greenberg has been trained by and is working with the Israeli company SB Security, LTD, the most experienced and tested security planning and service company in the world. Since the events of 9/11, Dr. Greenberg has been the lead person for developing vulnerability assessments and power plant security programs for the California Energy Commission (CEC). In taking the lead for this state agency, Dr. Greenberg has interfaced with the California Terrorism Information Center (CATIC) and provided analysis, recommendations, and testimony at CEC evidentiary hearings regarding the security of power plants within the state. These analyses include the assessment of Critical Infrastructure Protection, threat assessments, criticality assessments, and the preparation of vulnerability assessments and off-site consequence analyses addressing the use, storage, and transportation of hazardous materials, recommendations for security to reduce the threat from foreign and domestic terrorist activities, perimeter security, site access by personnel and vendors, personnel background checks, management responsibilities for facility security, and employee training in security methods. Dr. Greenberg is the lead person in developing a model power plant security plan, vulnerability assessment matrix, and a security training manual for the CEC. The model security plan is used by power plants in California as guidance in developing and implementing security measures to reduce the vulnerability of California's energy infrastructure to terrorist attack. He has testified at several evidentiary hearings for the CEC on power plant security issues. He also leads an audit team conducting safety and security audits at power plants throughout California that are under the jurisdiction of the CEC. In addition to providing security expertise to the State of California, in August 2004, a team of experts led by Dr. Greenberg was awarded an 18-month contract by the State of Hawaii to update and improve the state's Energy Emergency Preparedness Plan and make recommendations for increased security of critical energy infrastructure on this isolated group of islands.

Air Pathway Analysis

Dr. Greenberg has prepared numerous Air Pathway Analyses and human health risk assessments, evaluating exposure at numerous locations in California, Hawai'i, Oregon, Minnesota, Michigan, and New York. He is experienced in working with Region IX EPA, the State of California DTSC, and the Hawai'i Department of Health Clean Air Branch in the application of both site-specific and non site-specific health risk assessment criteria.

Examples

Human Health Risk Assessment for the Open Burn/Open Detonation Operation at McCormick Selph, Inc., Hollister, Ca. (June 2003)

Air Quality and Human Health Risk Assessment for the Royal Oaks Industrial Complex, Monrovia, Ca. (January 2003)

Human Health Risk Assessment and Indoor Vapor Intrusion Assessment for the former Pt. St. George Fisheries Site, Santa Rosa, Ca. (October 2002)

Human Health Risk Assessment for the former Sargent Industries Site, Huntington Park, Ca. (July 2001)

Health Risk Assessment Due to Diesel Train Engine Emissions, Oakland, Ca. (June 1999)

The Avila Beach Health Study Phase 1: Reconnaissance Sampling Findings, Conclusions, and Recommendations. (July 1997) Volume 1: Baseline Human Health Risk Assessment. (May 1998)

The Avila Beach Health Study Phase 1, Volume 2: Environmental Monitoring. (May 1998)

Health Risk Assessment and Air Pathway Analysis for the Ballard Canyon Landfill, Santa Barbara County, Ca. (March 1999)

Human Health Risk Assessment, Teledyne Ryan Aeronautical, McCormick Selph Ordnance. Hollister, California. (December 1996)

Initial Phase Human Health Risk Assessment, Teledyne Inc., San Diego, Ca. (October 1996)

Human Health Risk Assessment for Current and Proposed Expanded Class II and Class III Operations at the Altamont Sanitary Landfill, Alameda County, Ca.
(March, 1993)

Focused Ecological Risk Characterization, Hawaiian Electric Company, Keahole Generating Station Expansion, Hawai'i (June 1993)

Human Health Risk Assessment for the Proposed Palima Point Space Launch Complex, prepared for the Hawai'i Office of Space Industry (April 1993)

Ecological Risk Assessment for the Proposed Palima Point Space Launch Complex, prepared for the Hawai'i Office of Space Industry (March 1993)

Human Health Risk Assessment Due to Emissions from a Medical Waste Incinerator, prepared for Kauai Veterans Memorial Hospital, Kauai, Hawai'i (1994)

Cancer Risk Assessment for the H-Power Generating Station, Campbell Industrial Park, Oahu, Hawai'i (1988)

<u>Hazardous Materials Assessments, Waste Management Assessments, Worker Safety and Fire Protection Assessments, and Public Health Impacts Assessments</u>

Dr. Greenberg also has significant experience as a consultant and expert witness for the California Energy Commission providing analysis, recommendations, and testimony in the areas of hazardous materials management, process safety management, waste management, worker safety and fire protection, and public health impacts for proposed power plant/cogeneration facilities. These analyses include the evaluation and/or preparation of the following:

- Off-site consequence analyses of the handling, use, storage, and transportation of hazardous materials,
- Risk Management Plans (required by the Cal-ARP) and Business Plans (required by H&S Code section 25503.5),
- Safety Management Plans (required by 8 CCR section 5189),
- Natural gas pipeline safety,
- Solid and hazardous waste management plans,
- Phase I and II Environmental Site Assessments,
- Construction and Operations Worker Safety and Health Programs,
- Fire Prevention Programs,
- Human health risk assessment from stack emissions and from diesel engines, and
- Mitigation measures to address PM exposure, including diesel particulates

Examples

- Almond 2 Power Plant Project, City of Ceres, Ca. 2009 – present. Public health.
- Watson Cogeneration Steam and Electric Reliability Project, Carson, Ca. 2009 – present. Public health.
- Hanford Combined-Cycle Power Plant (amendment), Kings County, Ca. 2008 – present. Public health.
- Henrietta Combined-Cycle Power Plant (amendment), Kings County, Ca. 2008 – present. Public health.
- Lodi Energy Center, Lodi, Cal. 2008 – present. Hazardous materials management, worker safety/fire protection.
- Marsh Landing Generating Station, City of Antioch, Ca. 2008 – present. Hazardous materials management, worker safety/fire protection.
- Palmdale Hybrid Power Plant, Palmdale, Ca. 2008 – present. Hazardous materials management, worker safety/fire protection, public health.
- Stirling Energy Systems Solar 1 Project, San Bernardino County, Ca. 2008 – present. Public health.
- Stirling Energy Systems Solar 2 Project, Imperial County, Ca. 2008 – present. Public health.
- San Joaquin Solar 1&2, Fresno County, Ca. 2008 – present. Hazardous materials management, worker safety/fire protection, public health.
- GWF Tracy Combined Cycle Power Plant, Tracy, Ca. 2008 – present. Hazardous materials management, worker safety/fire protection, public health.
- CPV Vaca Station Power Plant, Vacaville, Ca. 2008 – present. Hazardous materials management, worker safety/fire protection.

- Willow Pass Generating Station, Pittsburg, Ca. 2008 – present. Hazardous materials management, worker safety/fire protection, waste management.
- Avenal Energy Power Plant, Avenal, Ca. 2008 – 2009. Worker safety/fire protection, public health.
- Orange Grove Energy, San Diego County, Ca. 2008-2009. Public health.
- Riverside Energy Resource Center Units 3&4, Riverside, Ca. 2008 – 2009. Hazardous materials management.
- Canyon Power Plant, Anaheim, Ca. 2007 – present. Hazardous materials management, worker safety/fire protection, public health.
- Carlsbad Energy Center, Carlsbad, Ca. 2007 – present. Hazardous materials management, worker safety/fire protection, public health.
- Ivanpath Solar Electric Generating System, San Bernardino County, Ca. 2007 – present. Public health.
- Kings River Conservation District Community Power Project, City of Parlier, Ca. 2007 – 2009. Hazardous materials management, worker safety/fire protection.
- Chula Vista Energy Upgrade Project, Chula Vista, Ca. 2007 – 2009. Hazardous materials management, worker safety/fire protection.
- Chevron Richmond Power Plant Replacement Project, Richmond, Ca. 2007 – 2008. Hazardous materials management, public health.
- Humboldt Bay Generating Station, Eureka, Ca. 2006 – 2008. Hazardous materials management, worker safety/fire protection, waste management.
- El Centro Power Plant – Unit 3 Repower Project, El Centro, Ca. 2006 – 2007. Public health.
- San Francisco Energy Reliability Project, San Francisco, Ca. 2004 – 2006. Hazardous materials management, worker safety/fire protection, waste management, public health
- Inland Empire Energy Center, Romoland, Ca. 2002-3. hazardous materials, worker safety/fire protection, waste management, public health
- Malburg Generating Station Project, City of Vernon, Ca. 2002-3. hazardous materials, worker safety/fire protection, waste management, public health
- Blythe II, Blythe, Ca. 2002-3. hazardous materials, worker safety/fire protection,
- Palomar Energy Center, Escondido, Ca. 2002-3. hazardous materials, worker safety/fire protection, waste management, public health
- Cosumnes Power Project, Rancho Seco, Ca. 2002-3. hazardous materials, worker safety/fire protection, waste management, public health
- Tesla Power Project, Tesla, Ca. 2002-3. hazardous materials, worker safety/fire protection, waste management, public health
- San Joaquin Valley Energy Center, San Joaquin, Ca. 2002-3. hazardous materials, worker safety/fire protection, waste management
- Morro Bay Power Plant, Morro Bay, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management
- Potrero Power Plant Unit 7, San Francisco, Ca., 2001-2: hazardous materials, worker safety/fire protection
- El Segundo Power Redevelopment Project, El Segundo, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management
- Rio Linda Power Project, Rio Linda, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health

- Pastoria II Energy Facility Expansion, Grapevine, Ca., 2001: hazardous materials, worker safety/fire protection
- East Altamont Energy Center, Byron, Ca., 2001-2: hazardous materials, worker safety/fire protection
- Magnolia Power Project, Burbank, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Russell City Energy Center, Hayward, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management
- Woodbridge Power Plant, Modesto, Ca., 2001: hazardous materials, worker safety/fire protection, waste management
- Colusa Power Plant Project, Colusa County, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Valero Refinery Cogeneration Project, Benicia, Ca., 2001: hazardous materials, worker safety/fire protection
- Ocotillo Energy Project, Palm Springs, Ca., 2001: hazardous materials, worker safety/fire protection
- Gilroy Energy Center Phase II Project, Gilroy, Ca., 2001-2: hazardous materials, worker safety/fire protection
- Los Esteros Critical Energy Facility, San Jose, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Roseville Energy Facility, Roseville, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Spartan Power, San Jose, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Inland Empire Energy Center, Romoland, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- South Star Cogeneration Project, Taft, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Tesla Power Plant, Eastern Alameda County, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Tracy Peaker Project, Tracy, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Henrietta Peaker Project, Kings County, Ca., 2001: hazardous materials, worker safety/fire protection, waste management, public health
- Central Valley Energy Center, San Joaquin, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Cosumnes Power Plant, Rancho Seco, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Los Banos Voltage Support Facility, Western Merced County, Ca., 2001-2: waste management, public health
- Palomar Energy Project, Escondido, Ca., 2001-2: hazardous materials, worker safety/fire protection, waste management, public health
- Metcalf Energy Center, San Jose, Ca., 2000-1: hazardous materials
- Blythe Power Plant, Blythe, Ca., 2000-1: hazardous materials
- San Francisco Energy Co. Cogeneration Project, San Francisco, Ca., 1994-5: hazardous materials

- Campbell Soup Cogeneration Project, Sacramento, Ca., 1994: hazardous materials
- Proctor and Gamble Cogeneration Project, Sacramento, Ca., 1993-4: hazardous materials
- San Diego Gas and Electric South Bay Project, Chula Vista, Ca., 1993: hazardous materials
- SEPCO Project, Rio Linda, Ca., 1993: hazardous materials
- Shell Martinez Manufacturing Complex Cogeneration Project, Martinez, Ca., 1993: hazardous materials and review and evaluation of EIR

Occupational Safety and Health/Health and Safety Plans/Indoor Air Quality

Dr. Greenberg has significant experience in occupational safety and health, having directed the development, adoption, and implementation of over 50 different Cal/OSHA regulations, including airborne contaminants (>450 substances), lead, asbestos, confined spaces, and worker-right-to-know (MSDSs). He has conducted numerous occupational health surveys and has extensive experience in the sampling and analysis of indoor air quality at residences, workplaces, and school classrooms. He is currently the team leader conducting safety and security audits at power plants throughout California for the California Energy Commission. Safety issues audited include compliance with regulations addressing several safety matters, including but not limited to, confined spaces, lockout/tagout, hazardous materials, and fire prevention/suppression equipment.

Examples

Review and Evaluation of Public and Worker Safety Issues at the proposed SES LNG Facility, Port of Long Beach. prepared for the City of Long Beach. (November 2005)

Confidential safety and security audit reports for 18 power plants in California. prepared for the California Energy Commission. (January 2005 through March 2006)

Report on the Accidental release and Worker Exposure to Anhydrous Ammonia at the BEP I Power Plant, Blythe, Ca. prepared for the California Energy Commission. (October 2004)

Investigation of a Worker Death in a Confined Space, La Paloma Power plant. prepared for the California Energy Commission. (July 2004)

Preliminary Report on Indoor Air Quality in Elementary School Portable Classrooms, Marin County, Ca. (December 1999)

Health Risk Assessment Due to Diesel Train Engine Emissions, Oakland, Ca. (June 1999)

Air Pathway Analysis for the Ballard Canyon Landfill. Submitted to the County of Santa Barbara, (March 1999)

Review and Evaluation of the Health Risk Assessment for Outdoor and Indoor Exposures at the Former Golden Eagle Refinery Site, Carson, Ca. (May 1998)

The Avila Beach Health Study Phase 1: Reconnaissance Sampling Findings, Conclusions, and Recommendations. (July 1997) Volume 1: Baseline Human Health Risk Assessment. (May 1998)

The Avila Beach Health Study Phase 1, Volume 2: Environmental Monitoring. (May 1998)

Phase 2 Human Health Risk Assessment, Teledyne Inc., San Diego, Ca. (February 1997)

Determination of Occupational Lead Exposure at a Tire Shop in Placerville, Ca. (April 1993)

Development of an Environmental Code of Regulations for Hazardous Waste Treatment Facilities on La Posta Indian Tribal lands, San Diego County, Ca. (August 1992)

Sampling and Analysis Plan, Health and Safety Plan, Site Characterization of Lead Oxide Contaminated Areas, Mare Island Naval Shipyard, Vallejo, California. Prepared in conjunction with Kaman Sciences Corp. (September 2, 1988)

Mercury Contamination

Dr. Greenberg has prepared and/or reviewed several human health and ecological risk assessments regarding mercury contamination in soils, sediments, and indoor surfaces. Dr. Greenberg served on the State Water Resources Control Board Bay Protection and Toxic Cleanup Program Advisory Committee from 1994 until the end of the program in 1999.

Examples

Review and evaluation of a human health risk assessment of ingestion of sport fish caught from San Diego Bay and which contain tissue levels of mercury and PCBs (November 2004 – present)

Screening Human Health Risk Assessment, Calculation of Soil Clean-up Levels, and Aquatic Ecological Screening Evaluation, Galilee Harbor, Sausalito, Ca. (May 1998)

Health Risk Assessment for Residual Mercury at the Deer Creek Facility, 3475 Deer Creek Road, Palo Alto, California. (July 1997)

Human Health Risk Assessment Due to Emissions from a Medical Waste Incinerator, prepared for Kauai Veterans Memorial Hospital, Kauai, Hawai’i (1994)

DECLARATION OF
Testimony of Negar Vahidi

I**, Negar Vahidi,** declare as follows:

1. I am presently employed by Aspen Environmental Group, a contractor to the California Energy Commission, Systems Assessment and Facilities Siting Division, as a **Senior Project Manager/Senior Land Use Technical Specialist** .

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Land Use** for the **Abengoa Mojave Solar Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 26, 2010 Signed: Original signed by N. Vahidi

At: Agoura Hills, California

NEGAR VAHIDI

Senior Associate
Land Use, Policy Analysis, and Socioeconomics

ACADEMIC BACKGROUND

Master of Public Administration, University of Southern California, 1993
B.A. (with Highest Honors), Political Science, University of California, Irvine, 1991

PROFESSIONAL EXPERIENCE

Ms. Vahidi is an environmental planner with over 15 years of experience managing and preparing a variety of federal and State of California environmental, planning, and analytical documents for large-scale infrastructure and development projects. Ms. Vahidi brings the experience of being both a public and private sector planner, specializing in the integration and completion of NEPA and CEQA documentation, joint documentation, land use, socioeconomic, and public policy analysis, environmental justice analysis, and public and community involvement programs. Her diversity and experience in preparing NEPA, CEQA, and NEPA/CEQA joint documentation can be shown through a sample of her projects.

Aspen Environmental Group **1992 to 1998 and 2001 to present**

Ms. Vahidi has participated in CEQA and NEPA analyses of major utility development projects, providing public policy and land use expertise as well as managing Public Participation Programs. She has conducted land use analyses for major environmental assessments, including identification of ownership and land use types and identification of sensitive land uses and sensitive receptors. She has also gathered and analyzed information on State, federal and local laws, policies and regulations relevant to land uses and public policy. Her specific projects are described below.

- **TANC Transmission Project (TTP), several Northern California Counties.** Ms. Vahidi is currently serving as the Deputy Project Manager in charge of preparation of the EIR/EIS and guiding the CEQA/NEPA analysis. The Transmission Agency of Northern California (TANC) and Western Area Power Administration (Western), an agency of the U.S. Department of Energy (DOE), are the CEQA lead agency and NEPA lead agency, respectively. The TTP generally would consist of approximately 600 miles of new and upgraded 500 kilovolt (kV) and 230 kV transmission lines, substations, and related facilities generally extending from northeastern California near Ravendale in Lassen County to the California Central Valley through Sacramento and Contra Costa Counties and westward into the San Francisco Bay Area. Ms. Vahidi worked with TANC and Western to initiate the scoping process, including preparation of the NOP, preparing for scoping meetings, frameworking the EIR/EIS document, etc. She also led the preparation of the project scoping report.
- **Littlerock Reservoir Sediment Removal Project EIS/EIR, Palmdale, CA.** Ms. Vahidi is the Project Manager for this joint EIS/EIR evaluating the impacts of sediment removal alternatives for the Littlerock Reservoir and Dam on USFS Angeles National Forest (NEPA Lead Agency) lands in Los Angeles County. The Palmdale Water District (District) [CEQA Lead Agency] proposes to remove approximately 540,000 cubic yards of sediment from the reservoir (behind the dam) and haul it to off-site commercial gravel pits located 6 miles north of the dam site in the community of Littlerock. The project involves impacts to the arroyo toad, extensive coordination with USFWS for a Section 7 consultation, incorporation of new Forest Service Plan updates and requirements into the

analysis, preparation of the Forest Service required BE/BA, and analysis of compliance with federal air quality conformity requirements. Under Ms. Vahidi's direction, Aspen developed six different project alternatives for sediment removal, involving detailed hydraulics analysis and preparation of a hydraulics technical report. The most feasible of these alternatives (grade control structure) was chosen by the PWD as their proposed project to be evaluated in the EIS/EIR. In addition, the PWD is currently considering an additional alternative (use of a slurry line for sediment removal) presented by Aspen. Aspen is currently working on the Administrative Draft EIR/EIS and assisting the PWD with portions of their Proposition 50 grant application to the DWR.

- **El Casco System Project, Riverside, CA.** Ms. Vahidi is serving as the Project Manager for this EIR being prepared for the CPUC to evaluate SCE's application for a Permit to Construct (PTC) the El Casco System Project. The Proposed Project would be located in a rapidly growing area of northern Riverside County, which includes the Cities of Beaumont, Banning, and Calimesa. A 115 kV subtransmission line begins at Banning Substation and extends westward toward the proposed El Casco Substation site within the existing Banning to Maraschino 115 kV subtransmission line and Maraschino–El Casco 115 kV subtransmission line ROWs. Major issues of concern include impacts to existing and residential land uses, which have led to the development of a partial underground alternative and a route alternative different than the project route proposed by SCE (the Applicant). The 1,200-page Draft EIR was released for a 45-day public review and comment on December 12, 2007, and evaluates project alternatives at the same level of detail as the Proposed Project analysis.

- **Sacramento Area Voltage Support Supplemental Environmental Impact Statement (SEIS), Western Area Power Administration.** Ms. Vahidi served as the task leader for several social science sections for the SEIS for a double-circuit 230 kV circuit between Western's O'Banion/Sutter Power Plant and Elverta Substation/Natomas Substation. New transmission lines and transmission upgrades are needed to mitigate transmission line overload, reduce the frequency of automatic generation and load curtailment during the summer peak load periods, and help maintain reliability of the interconnected system operation. Ms. Vahidi directed the preparation of the land use, aesthetics, socioeconomics, and environmental justice sections of the SEIS.

- **Sunset Substation and Transmission and Distribution Project CEQA Documentation, Banning, CA.** The City of Banning proposes to construct the Sunset Substation and supporting 33-kilovolt (kV) transmission line that would interconnect with the City's existing distribution system. The purpose of this new substation and transmission is to relieve the existing overloads that are occurring within the City's electric system and to accommodate projected growth in the City. Ms. Vahidi served as the Environmental Project Manager for the initial stages of CEQA documentation prepared for the City's Utility Department.

- **San Onofre Nuclear Generating Station (SONGS) Steam Generator Replacement Project, San Clemente, CA.** Ms. Vahidi served as the Technical Senior in charge of developing the methodology and guiding the analysis for the Land Use and Recreation Section of this EIR. This project EIR addressed the environmental effects of SCE's proposed replacement of Steam Generator Units 2 & 3 at the SONGS Nuclear Power Plant located entirely within the boundaries of the U.S. Marine Corps Base Camp (MCBCP) Pendleton. Issues of concern included potential conflicts resulting from the transport of the large units through sensitive recreation areas such as beaches, and the San Onofre State Park.

- **Diablo Canyon Power Plant (DCPP) Steam Generator Replacement Project, San Luis Obispo County, CA.** Ms. Vahidi served as the Technical Senior in charge of developing the methodology and guiding the analysis for the Land Use and Recreation Section of this EIR. The EIR addressed impacts associated with the replacement of the eight original steam generators (OSGs) at DCPP Units 1 and 2 due to degradation from stress and corrosion cracking, and other maintenance difficulties. The Proposed Project would be located at the DCPP facility, which occupies 760 acres within PG&E's 12,000-acre owner-controlled land on the California coast in central San Luis Obispo County. Land use issues of concern include impacts to agricultural lands, recreational resources, and potential Coastal Act inconsistencies.

- **Cabrillo Port Liquefied Natural Gas (LNG) Deepwater Port, Ventura County, CA.** Under contract to the City of Oxnard, Aspen was tasked to review the Draft EIS/EIR for this the proposed construction and operation of an offshore floating storage and regasification unit (FSRU) that would be moored in Federal waters offshore of Ventura County. As proposed, liquefied natural gas (LNG) from the Pacific basin would be delivered by an LNG Carrier to and offloaded onto, the FSRU; re-gasified; and delivered onshore via two new 21.1-mile (33.8-kilometer), 24-inch (0.6-meter) diameter natural gas pipelines laid on the ocean floor. These pipelines would come onshore at Ormond Beach near Oxnard, California to connect through proposed new onshore pipelines to the existing Southern California Gas Company intrastate pipeline system to distribute natural gas throughout the Southern California region. Ms. Vahidi reviewed the document for technical adequacy and assisted the City in preparing written comments for the following sections of the EIS/EIR: Aesthetics, Land Use, Recreation, Socioeconomics, and Environmental Justice.
- **Long Beach LNG Import Project, Long Beach, CA.** Under contract to the City of Long Beach, Aspen was tasked to review the Draft EIS/EIR for the proposed construction and operation of this onshore LNG facility to be located at the Port of Long Beach. Ms. Vahidi reviewed the document for technical adequacy and assisted the City in preparing written comments for the following sections of the EIS/EIR: Aesthetics, Land Use, Recreation, Socioeconomics, Environmental Justice, and Port Master Plan Amendment.
- **Post-Suspension Activities of the Nine Federal Undeveloped Units and Lease OCS-P 0409, Off-shore Southern California**. Aspen assisted the U.S. Department of the Interior, Minerals Manage-ment Service (MMS) to prepare an Environmental Information Document (EID) evaluating the potential environmental effects associated with six separate suspensions for undeveloped oil and gas leases Pacific Outer Continental Shelf (OCS) located offshore Southern California. These undevel-oped leases lie between 3 and 12 miles offshore Santa Barbara, Ventura and southern San Luis Obispo Counties and are grouped into nine units, with one individual lease that is not unitized. As the Senior Aspen social scientist, Ms. Vahidi guided the analysis of community characteristics and tourism resources, recreation, visual resources, social and economic environment, and military operations.
- **Otay River Watershed Management Plan (ORWMP) and Special Area Management Plan (SAMP) in San Diego County, CA.** Ms. Vahidi served as a Technical Senior for social science and land use issues. The ORWMP focused on developing strategies to protect and enhance beneficial uses within this watershed and thereby comply with the San Diego Region's NPDES permit, and the SAMP intended to achieve a balance between reasonable economic development and aquatic resource preservation, enhancement, and restoration in this 145-square-mile (93,000 acres) area through the issuance of Corps and CDFG programmatic permits.

California Energy Commission (CEC)

In response to California's power shortage, Aspen has assisted the CEC in evaluating the environmental and engineering aspects of new power plant applications throughout the State under three separate contracts. Ms. Vahidi has served as Technical Senior for land use (since 2001), and a specialist for socio-economics and environmental justice, and alternatives analyses and special studies. Her specific projects are listed below.

- Technical Assistance in Application for Certification Review (Contract # 700-99-014; 3/6/2000 through 12/31/2003)
  - **Woodland Generation Station No. 2, Modesto, CA**. As the land use Technical Specialist, prepared the Land Use and Recreation, and Agricultural Resources Staff Assessments of this 80-megawatt nominal, natural gas-fired power generating facility and associated linear facilities (i.e., gas and water pipeline and

transmission line. The Staff Assessment evaluated potential impacts on nearby residential, recreational, and agricultural land uses, including important farmlands being traversed by linear faculties.

- **Valero Cogeneration Project, Benicia, CA**. Prepared the Socioeconomics Staff Assessment for a proposed cogeneration facility at the Valero Refinery in Benicia. Issues addressed included impacts on public services and other project-related population impacts such as school impact fees.
- **Rio Linda/Elverta Power Project, Sacramento, CA**. Prepared the Socioeconomics Staff Assessment for a 560-megawatt natural gas power plant in the northern Sacramento County. Issues of importance included environmental justice and impacts on property values.
- **Magnolia Power Project, Burbank, CA**. As the Socioeconomics technical specialist, prepared the Staff Assessment for this nominal 250-megawatt natural gas combined-cycle fired electrical generating facility to be located at the site of the existing City of Burbank power plant. Environmental justice issues and potential impacts on local economy and employment were evaluated
- **Potrero Power Plant Project, San Francisco, CA**. Prepared the land use portion of the Alternatives Staff Assessment for this proposed nominal 540 MW natural gas-fired, combined cycle power generating facility. Analysis included review of several alternative sites for development of the power plant and the comparative merits of those alternatives with the proposed site located on the San Francisco Bay.
- **Los Esteros Critical Energy Facility, San Jose, CA.** Technical Senior for the Land Use Staff Assessment of this 180-megawatt natural-gas-fired simple cycle peaking facility. Issues included potential impacts resulting from loss of agricultural land, and impacts associated with the project’s non-compliance with local General Plan land use and zoning designations.
- **East Altamont Energy Center, Alameda County, CA.** Technical Specialist for the Land Use Assessment for a 1,100-megawatt nominal, natural gas-fired power plant and associated linear facilities. Provided expert witness testimony on Land Use Staff Assessment. Major issues addressed in the Staff Assessment included loss of Prime Farmlands, recommendation of land preservation mitigation, and the project’s non-compliance with local General Plan land use and zoning designations.
- **Tracy Peaker Project, Tracy, CA.** Technical Senior for the Land Use Staff Assessment of this 169-megawatt simple-cycle peaking facility in an unincorporated area of San Joaquin County. Provided expert witness testimony on Land Use Staff Assessment. Issues included potential impacts resulting from loss of agricultural land under Williamson Act Contract, and evaluation of cumulative development in the fast-growing surrounding area.
- **Avenal Energy Project, Kings County, CA.** Socioeconomics Technical Specialist for this 600-megawatt combined cycle electrical generating facility, and associated linear facilities.
- **Tesla Power Project, Alameda County, CA.** Land Use Technical Senior and Alternatives Technical Specialist in charge of preparation of two Staff Assessments for this project. The project will be a nominal 1,120-MW electrical generating power plant with commercial operation planned for third quarter of 2004. The Tesla Power Project will consist of a natural gas-fired combined cycle power generator, with 0.8 miles of double-circuit 230-kilovolt transmission line connected to the Tesla PG&E substation, 24-inch 2.8-mile natural gas pipeline, and 1.7-mile water line constructed along Midway Road.
- **Sacramento Municipal Utility District Consumes Power Plant Project, Sacramento, CA.** Socioeconomics and Alternatives Technical Specialist in charge of preparation of two Staff Assessments for this nominal 1,000-megawatt (MW) combined-cycle natural gas facility. Provided expert witness testimony on Socioeconomics Staff Assessment. The project would include the construction and operation of a natural gas power plant at the Rancho Seco Nuclear Plant, 25 miles southeast of the City of Sacramento, in Sacramento County. The project would be located on a 30-acre portion of an overall 2,480-acre site owned by SMUD.
- **Inland Empire Energy Center, Riverside County, CA.** Technical Specialist for the Land Use Assessment for a 670-megawatt natural gas-fired, combined-cycle electric generating facility and associated linear facilities including, a new 18-inch, 4.7-mile pipeline for the disposal of non-reclaimable wastewater, and a new 20-inch natural gas pipeline. Provided expert witness testimony on Land Use Staff Assessment. The project would be located on approximately 46-acres near Romoland, within Riverside County. Major issues addressed in the Staff Assessment included potential loss of agricultural lands, impacts to planned school uses, and the project’s potential non-compliance with local General Plan land use and zoning designations.

- **Senior Technical Lead, Land Use Resources.** The California Energy Commission (CEC) requested that the Aspen Team provide Technical Seniors for the Land Use Resources area in order to help coordinate and review Land Use Resource Assessments. As a Technical Senior, Negar Vahidi was responsible for the technical review of Land Use sections for various power plants assigned to them.
- **Legislative Bill Review.** As a Land Use Technical Senior for the CEC, Ms. Vahidi conducted legislative bill review related to energy facilities siting. She conducted portions of the CEC Systems Assessment & Facilities Siting Division analysis of Senate Bill 1550 which was intended to give the Superintendent of Public Instruction/CDE approval authority over siting of power plants within one mile of existing or proposed K-12 school sites by requiring the CDE (in coordination with the State Architect, and the commission) to develop appropriate siting guidelines.

- Engineering & Environmental Technical Assistance to Support the Energy Facility Planning and Licensing Program Contract (Contract # 700-02-004; 6/30/03 through 3/30/06)
  - **Environmental Performance Report (EPR).** Ms. Vahidi managed the preparation of the Socioeconomics chapter of the EPR for the California Energy Commission, which eventually became part of the State of California's Integrated Energy Policy Report (IEPR). The Socioeconomics chapter addressed: the importance of reliable and affordable electricity supply power plant construction and operation impacts, including labor force, taxation, etc.; and trends in the energy section, including renewable power sources such as wind and solar. She also conducted the analysis of a new portion of the Land Resources Chapter, which addressed the siting and land use issues associated with renewable power. This new portion of the land use analysis compared the land use and siting constraints associated with renewable power infrastructure such as wind and solar versus other forms of power infrastructure, such as gas pipelines, transmission lines, LNG facilities, and power plants.
  - **Coastal Plant Study.** Ms. Vahidi served as the Social Sciences Task Manager for this special study being conducted as part of Aspen's contract with the California Energy Commission. The study included identification and evaluation of potential issues associated with the possible modernization, re-tooling, or expansion of California's 25 coastal power plants including: northern California power plants such as Humboldt, Potrero, Hunter's Point, Pittsburg, and Oakland; central coast power plants such as Contra Costa, Diablo Canyon Nuclear, Morro Bay, Moss Landing, Elwood, Mandalay, and Ormond Power Plants; and southern California power plants such as the Alamitos, Long Beach, Los Angeles Harbor, Haynes, Redondo Beach, Scattergood, El Segundo, Huntington Beach, Encina, Silver Gate, South Bay, and San Onofre Nuclear. As Task Manager her responsibilities included, identification of potential political, social, community, and physical land use impacts that may arise from the potential increased output of energy from plants in highly sensitive coastal communities. The intent of the study is to identify red flag items for the Energy Commission in order to streamline future licensing processes. Her task as the Social Science Task Manager also included a thorough review of applicable Local Coastal Plans, and Coastal Commission regulations associated with Coastal Development Permits and Consistency Determinations.
  - **Natural Gas Market Outlook Report (NGMOR**). Ms. Vahidi assisted the CEC's Natural Gas Unit as a technical editor in their preparation and publication of the NGMOR. She managed Aspen's efforts, including format and graphics, to edit technical sections prepared by Natural Gas Unit Staff under a condensed time frame. The Preliminary NGMOR was released for public review in June 2003.

- Peak Workload Support for the Energy Facility Siting Program and the Energy Planning Program (Contract #700-05-002; 4/11/06 through 3/30/09)
  - **Chula Vista Energy Upgrade Project, Chula Vista, CA.** Senior Technical Specialist for the Land Use Staff Assessment for MMC Energy, Inc.'s Application for Certification (AFC) to construct and operate replacements and upgrades of equipment at the Chula Vista Power Plant, located on a 3.8-acre parcel in the City of Chula Vista's Main Street Industrial Corridor and within the City's Light Industrial zoning district. Issues of concern include the impacts of the power plant on adjacent residential and open space land uses, and compliance with applicable local LORS. Provided expert witness testimony on Land Use Staff Assessment.
  - **Ivanpah Solar Electric Generating System Project, San Bernardino County, CA.** Senior Technical Specialist for the Socioeconomics Staff Assessment/BLM EIS for a 400-megawatt solar thermal electric power generating system. The project's technology would include heliostat mirror fields focusing solar energy on power tower receivers producing steam for running turbine generators. Related facilities would

include administrative buildings, transmission lines, a substation, gas lines, water lines, steam lines, and well water pumps. The proposed project would be developed entirely in the Mojave Desert region of San Bernardino County, California. The document was prepared in compliance with both NEPA and CEQA requirements.

- **Sentinel Energy Project, Riverside County, CA.** Senior Technical Specialist for the Land Use Staff Assessment for CPV Sentinel's Application for Certification (AFC) to construct and operate an 850-megawatt (MW) peaking electrical generating facility near SCE's Devers Substation. The proposed project site consists of 37 acres of land situated approximately eight miles northwest of the center of the City of Palm Springs with portions of the construction laydown area and natural gas pipeline within the Palm Springs city limits. Land use issues of concern include the project's compliance with local LORS.
- **Carrizo Energy Solar Farm, San Luis Obispo County, CA.** Senior Technical Specialist for the Land Use Staff Assessment for Carrizo Energy, LLC's Application for Certification (AFC) to build the Carrizo Energy Solar Farm (CESF), which will consist of approximately 195 Compact Linear Fresnel Reflector (CLFR) solar concentrating lines, and associated steam drums, steam turbine generators (STGs), air-cooled condensers (ACCs), and infrastructure, producing up to a nominal 177 megawatts (MW) net. The CESF is located in an unincorporated area of eastern San Luis Obispo County, west of Simmler and northwest of California Valley, California. The CESF includes the solar farm site, a minimal offsite transmission system connection, and construction laydown area. The CESF site will encompass approximately 640 acres of fenced area in an area zoned for agricultural uses as specified in the San Luis Obispo County General Land Use Plan. Issues of concern include the impacts of the power plant on adjacent land uses and compliance with applicable local LORS.
- **Carlsbad Energy Center Project, Carlsbad, CA.** Senior Technical Specialist for the Land Use and Alternatives Staff Assessments for Carlsbad Energy Center, LLC's Application for Certification (AFC) to build the Carlsbad Energy Center Project (CECP), which will consist of a 558 MW gross combined-cycle generating facility configured using two units with one natural-gas-fired combustion turbine and one steam turbine per or unit. Issues of concern include major incompatibilities with local LORS, and cumulative impacts from widening of I-5.
- **Marsh Landing Generating Station, Contra Costa County, CA.** Senior Technical Specialist for the Land Use Staff Assessment for the Mirant Marsh Landing, LLC AFC for a 930 MW natural gas-fired power plant, which would be would be sited adjacent to the existing Contra Costa Power Plant in unincorporated Contra Costa County, near the City of Antioch.
- **Canyon Power Plant, Anaheim, CA.** Senior Technical Specialist for the Socioeconomics Staff Assessments for a nominal 200 megawatt (MW) simple-cycle plant, using four natural gas-fired combustion turbines and associated infrastructure proposed by Southern California Public Power Authority (SCPPA). This project is a peaking power plant project located within the City of Anaheim, California.
- **Willow Pass Generating Station, Pittsburg, CA.** Senior Technical Specialist for the Land Use Staff Assessment for a new, approximately 550-megawatt (MW) dry-cooled, natural gas-fired electric power facility proposed by Mirant. Development of Willow Pass would entail the construction of two generating units and ancillary systems including, adjacent electric and gas transmission lines, and water and wastewater pipelines.
- **Marsh Landing Generating Station, Contra Costa County, CA.** Senior Technical Specialist for the Land Use Staff Assessment for a new, 930-megawatt (MW) gas-fired electric generating facility proposed by Mirant. Delta. The proposed 27-acre Project site would be located at the existing Contra Costa Power Plant.
- **Stirling Energy Systems Solar One, San Bernardino County, CA.** Senior Technical Specialist for the Land Use Staff Assessment/BLM EIS for a nominal 850-megawatt (MW) Stirling engine project, with construction planned to begin late 2010. The primary equipment for the generating facility would include the approximately 30,000, 25-kilowatt solar dish Stirling systems (referred to as SunCatchers), their associated equipment and systems, and their support infrastructure. Major issues of concern include the conversion of approximately 8,230 acres of open space to industrial uses, compliance with BLM's CDCA Plan, etc.
- **Stirling Energy Systems Solar Two, Imperial County, CA.** Senior Technical Specialist for the Land Use Staff Assessment/BLM EIS for a nominal 750-megawatt (MW) Stirling engine project, with construction

planned to begin either late 2009 or early 2010. The primary equipment for the generating facility would include the approximately 30,000, 25-kilowatt solar dish Stirling systems (referred to as SunCatchers), their associated equipment and systems, and their support infrastructure. Major issues of concern include conversion of 6,500 acres of public recreation land used for OHV use and camping, and compliance with the BLM's CDCA plan..

- **GWF Tracy Combined Cycle Power Plant, San Joaquin County, CA.** Senior Technical Specialist for the Land Use Staff Assessment for GWF's proposal to modify the existing TPP (see description above), a nominal 169-megawatt (MW) simple-cycle power plant, by converting the facility into a combined-cycle power plant with a nominal 145 MW, net, of additional generating capacity.
- **City of Palmdale Hybrid Power Plant Project, Palmdale, CA.** Senior Technical Specialist for the Land Use Staff Assessment for the Palmdale Hybrid Power Project (PHPP) proposed by the City of Palmdale. The PHPP consists of a hybrid of natural gas-fired combined-cycle generating equipment integrated with solar thermal generating equipment to be developed on an approximately 377-acre site in the northern portions of the City of Palmdale (City).
- **Lodi Energy Center, Lodi, CA.** Senior Technical Specialist for the Socioeconomics Staff Assessment for a combined-cycle nominal 225-megawatt (MW) power generating facility.
- **Abengoa Mojave Solar One Project, San Bernardino County, CA.** Senior Technical Specialist for the Land Use Staff Assessment of a nominal 250 megawatt (MW) solar electric generating facility to be located near Harper Dry Lake in an unincorporated area of San Bernardino County. Issues of concern include the impacts associated with the conversión of 1,765 acres of open space lands.
- **Genesis Solar Energy Project, Riverside County, CA.** Senior Technical Specialist for the Land Use Staff Assessment/BLM EIS for two independent solar electric generating facilities with a nominal net electrical output of 125 megawatts (MW) each, for a total net electrical output of 250 MW. Electrical power would be produced using steam turbine generators fed from solar steam generators. The project is located approximately 25 miles west of the city of Blythe. Major issues of conern include conversión of 4,460 acres of BLM lands to an industrial use.
- **Contra Costa Generating Station, Contra Costa County, CA.** Senior Technical Specialist for the Land Use Staff Assessment for a natural gas-fired, combined-cycle electrical generating facility rated at a nominal generating capacity of 624 megawatts (MW). The project would be located in the City of Oakley.

- **Topaz Solar Project EIR, San Luis Obispo County, CA.** (Applicant: First Solar). Aspen is managing preparation of an EIR for this 500 MW solar photovoltaic project in the Carrizo Plain area. A major issue of concern is the conversion of approximately 6,000 acres of open space (60 percent of which are under land preservation contracts) to an industrial use. Ms. Vahidi is the Senior in charge of developing the methodology, approach, and thresholds of significance for analysis of impacts related to agricultural land conversion using the CA Department of Conservation LESA Model. One major issue of concern related to agricultural resources is impacts to lands under Williamson Act contracts. She will be guiding the analysis.
- **California Valley Solar Ranch EIR, San Luis Obispo County, CA.** (Applicant: SunPower). Aspen is managing preparation of an EIR for this 250 MW solar photovoltaic project in the Carrizo Plain area. A major issue of concern is the conversion of approximately 4,000 acres of open space to an industrial use. Ms. Vahidi is the Senior in charge of developing the methodology, approach, and thresholds of significance for analysis of impacts related to agricultural land conversion using the CA Department of Conservation LESA Model. She will be guiding the analysis.
- **Santa Ana Valley Pipeline Repairs Project, San Bernardino and Riverside Counties, CA.** Under Aspen's on-going environmental services contract with the DWR, Ms. Vahidi served as the project manager for CEQA documentation and permitting efforts related to the repair of 12 sites along the pipeline portion of the East Branch of the California Aqueduct. The repair of the 12 sites was crucial because, eight of the Priority 1 sites included areas of the pipeline that were under high stress and subject to rupture. Issues of concern included, potential impacts to special status species, sensitive receptors, and traffic. As the DWR's CEQA consultant, Ms. Vahidi determined that the proposed SAPL Repairs Project would qualify for a CEQA Categorical Exemption, and recommended the preparation

of a Technical Memorandum to justify this exemption. The Technical Memorandum and supporting documentation, including a Biological Constraints Report, and analyses of proposed project potential construction-related air quality, noise, and traffic impacts, were prepared and presented to DWR as one packet to support both a Class 1 and Class 2 CEQA Exemption. Subsequent to preparation of this packet, DWR filed a Notice of Exemption on June 13, 2003 for their repair activities.

- **Piru Creek Erosion Repairs and Bridge Seismic Retrofit Project, Northern Los Angeles County, CA.** Under Aspen's on-going environmental services contract with the DWR, Ms. Vahidi served as the project manager for CEQA documentation for this project. An IS/MND was prepared to evaluate the impacts of the project, which proposed to maintain four access routes to DWR's facilities along the West Branch of the California Aqueduct downstream of the Pyramid Dam. Repair and improvement activities would occur on Osito Canyon (an intermittent tributary to Piru Creek) at Osito Adit, adjacent to Old Highway 99 at North Adit (or access tunnel), alongside an eroded section of Old Highway 99 along Piru Creek, and at Pyramid Dam Bridge. Repair activities would serve to improve conditions of access routes, as well as strengthening and reinforcing them against seismic or flood events. Project-related construction could result in potentially significant impacts to biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, noise, and transportation and traffic.
- **Pyramid Lake Repairs and Improvements Project, northern Los Angeles County.** Under Aspen's on-going environmental services contract with the DWR, Ms. Vahidi served as the project manager for CEQA documentation, ADA (Americans with Disabilities Act) compliance, and permitting efforts for this project. DWR and the Department of Boating and Waterways (DBW) are planning repairs and improvements at various recreational sites at Pyramid Lake, which is located on the border between Los Padres National Forest and Angeles National Forest; recreation is managed by Angeles National Forest. The lake is also part of Federal Energy Regulatory Commission Project 2426. Aspen worked with DWR and DBW to determine ADA compliance components at each site. CEQA documentation in support of a Class 1 and 2 Categorical Exemption was prepared to evaluate the potential impacts of the repairs and improvements, and provide CEQA clearance for filing of required permit applications, including but not necessarily limited to 404, 401, and 1602 permits. In addition to the CEQA documentation and preparation of permit applications, Aspen coordinated DWR and DBW's efforts with the USFS, and the permitting agencies (i.e., CDFG, RWQCB, and USACE). Through coordination with the USAC, Aspen prepared the NEPA EA for Corps 404 permit process, and reviewed and coordinated revisions to the 1602 with CDFG.
- **Mulholland Pumping Station and Lower Hollywood Reservoir Outlet Chlorination Station Project, Los Angeles, CA.** Under Aspen's on-going environmental services contract with the City of Los Angeles Department of Water and Power (LADWP), Ms. Vahidi served as the Project Manager for preparation of CEQA documentation for this project. LADWP proposed to replace the existing historic pumping/chlorination station building as well as the existing lavatory and unoccupied Water Quality Laboratory buildings with a new single structure pumping/chlorination station within the LADWP's Hollywood Reservoir Complex located in the Hollywood Hills section of the City Los Angeles. These improvements were required due to the age and deterioration of the facility and the potential risk of seismic damage to existing structures. An Initial Study was prepared in support of a City of Los Angeles General Exemption.
- **River Supply Conduit (RSC) Upper Reach Project EIR, Los Angeles and Burbank, CA.** Under Aspen's on-going environmental services contract with the City of Los Angeles Department of Water and Power (LADWP), Ms. Vahidi served as the Task Leader for land use issues and is in charge of development and analysis of project alternatives for the CEQA document for this project. The RSC is a major transmission pipeline in the LADWP water distribution system. The existing RSC pipeline's purpose is to transport large amounts of water from the Los Angeles Reservoir Complex and local ground water wells to reservoirs and distribution facilities located in the central areas within of the City of Los Angeles. The LADWP proposed a new larger RSC pipeline to replace and realign the

Upper and Lower Reaches of the existing RSC pipeline, which would involve the construction of approximately 69,600 linear feet (about 13.2 miles) of 42-, 48-, 60-, 66-, 72-, 84-, and 96-inch diameter welded steel underground pipeline.

- **Valley Generating Station Site Survey & Documentation Report, Los Angeles, CA.** Ms. Vahidi managed the preparation of a comprehensive report (over 150 pages) documenting all of the structures and facilities located at the Valley Generating Station (VGS). The report includes exhibits that illustrate locations of each structure at the VGS, a detailed appendix of color photos of each structure, and a written description of each structure. The report also provides a general discussion of the history and background of the VGS and its development to provide a context for the structures on site.
- **Taylor Yard Water Recycling Project (TYWRP), Los Angeles and Glendale, CA.** Under Aspen's on-going environmental services contract with the City of Los Angeles Department of Water and Power (LADWP), Ms. Vahidi served as the Project Manager for preparation of CEQA documentation for this project. LADWP proposed to construct the TYWRP in order to provide recycled water produced by the Los Angeles–Glendale Water Reclamation Plant (LAGWRP) to the Taylor Yard. An important part of the City of Los Angeles' expanding emphasis on water conservation is the concept that water is a resource that can be used more than once. Because all uses of water do not require the same quality of supply, the City has been developing programs to use recycled water for suitable landscaping and industrial uses. The project is located in the southernmost part of the City of Glendale and northeastern part of the City of Los Angeles. The IS/MND was adopted in the Summer of 2007.
- **Devers–Palo Verde 500 kV Transmission Line Project EIS/EIR, southern California/western Arizona.** For this EIR/EIS prepared by U.S. Bureau of Land Management and CPUC, Ms. Vahidi served as the Deputy Project Manager and Social Sciences Issue Area Coordinator for SCE's proposed 250-mile transmission line project from the Palo Verde Nuclear power plant in Arizona to the northern Palm Springs area in California. Major issues of concern include EMF and visual impacts on property values, impacts on the area's vast recreational resources and tribal lands, and the development and evaluation of several route alternatives, including the Devers-Valley No. 2 Route Alternative, which eventually was approved by the CPUC.
- **Antelope-Pardee 500 kV Transmission Line Project EIR/EIS, Los Angeles County, CA.** For this EIR/EIS prepared by USFS, Angeles National Forest and CPUC, Ms. Vahidi is served as the Deputy Project Manager and Social Sciences Issue Area Coordinator for SCE's proposed 25-mile transmission line project from the Antelope Substation in the City of Lancaster, through the ANF, and terminating at SCE's Pardee Substation in Santa Clarita. Major issues of concern included impacts to biological, recreational, and cultural resources within Forest lands, EMF and visual impacts on property values, impacts on residences in the urbanized southern regions of the route, and the development and evaluation of several route alternatives.
- **Antelope Transmission Project, Segments 2 & 3 EIR, Los Angeles and Kern Counties, CA.** For this EIR being prepared by the CPUC, Ms. Vahidi served as the Deputy Project Manager and Social Sciences Issue Area Coordinator. The proposed Project includes both Segment 2 and Segment 3 of the Antelope Transmission Project, and involves construction of new transmission line infrastructure from the Tehachapi Wind Resource Area in southern Kern County, California, to SCE's existing Vincent Substation in Los Angeles County, California. The Tehachapi Wind Resource Area is one of the State's greatest potential sources for the generation of wind energy. A variety of wind energy projects are currently in development for this region. Major issues of concern include EMF and visual impacts on property values, impacts on residences and agricultural resources, and the development and evaluation of several substation and route alternatives.
- **Tehachapi Renewable Transmission Project (TRTP) EIR/EIS, Kern, Los Angeles, and San Bernardino Counties, CA.** For this EIR/EIS prepared by USFS, Angeles National Forest and CPUC,

Ms. Vahidi is served as the Deputy Project Manager in the early stages (i.e., during Scoping) of the project for SCE's proposal to construct, use, and maintain a series of new and upgraded high-voltage electric transmission lines and substations to deliver electricity generated from new wind energy projects in eastern Kern County. Approximately 46 miles of the project would be located in a 200- to 400-foot right-of-way on National Forest System land (managed by the Angeles National Forest) and approximately three miles would require expanded right-of-way within the Angeles National Forest. The proposed transmission system upgrades of TRTP are separated into eight distinct segments: Segments 4 through 11. Segments 1 (Antelope-Pardee) and Segments 2 and 3 (Antelope Transmission Project) were evaluated in separate CEQA and NEPA documents as described above.

- **Jefferson-Martin 230 kV Transmission Line Project EIR, San Francisco Bay Area, CA.** Ms. Vahidi served as the Issue Area Coordinator for the Social Science issues of the EIR, and was responsible for preparation of the socioeconomics, recreation, and public utilities sections of the EIR prepared on behalf of the California Public Utilities Commission (CPUC) to evaluate a proposed 27-mile transmission line in San Mateo County. Major issues of concern included EMF and visual impacts on property values, impacts on the area's vas recreational resources, and evaluation of several route alternatives.
- **Miguel-Mission 230 kV #2 Project EIR, San Diego, CA.** Ms. Vahidi conducted the land use, recreation, socioeconomics, and environmental justice analyses for this EIR for a proposed 230 kV circuit within an existing transmission line ROW between Miguel and Mission substations in San Diego County. The proposed project included installing a new 230 kV circuit on existing towers along the 35-mile ROW, as well as relocate 69 kV and 138 kV circuits on approximately 80 steel pole structures. In addition, the Miguel Substation and Mission Substation would be modified to accommodate the new 230 kV transmission circuit.
- **Viejo System Project, Orange County, CA.** Ms. Vahidi served as the Deputy Project Manager for the project's CEQA documentation, including and Initial Study, prepared on behalf of the CPUC to evaluate Southern California Edison's (SCE) Application for a Permit to Construct the Viejo System Project, which was in SCE's forecasted demand of electricity and goal of providing reliable electric service in southern Orange County. The Viejo System Project would serve Lake Forest, Mission Viejo, and the surrounding areas. Components of the project included, construction of the new 220/66/12 kilovolt (kV) Viejo Substation, installation of a new 66 kV subtransmission line within an existing SCE right-of-way, replacement of 19 double-circuit tubular steel poles with 13 H-frames structures, and minor modification to other transmission lines. Major issues of concern include visual impacts of transmission towers, EMF effects, and project impacts on property values.
- **MARS EIR/EIS, Monterey, CA.** Ms. Vahidi served as the technical specialist in charge of preparing the Environmental Justice analysis for this EIR/EIS, which would evaluate the effects associated with the installation and operation of the proposed Monterey Accelerated Research System (MARS) Cabled Observatory Project (Project) proposed by Monterey Bay Aquarium Research Institute (MBARI)[NEPA Lead Agency]. The goal of the Project was to install and operate, in State and Federal waters, an advanced cabled observatory in Monterey Bay that would provide a continuous monitoring presence in the Monterey Bay National Marine Sanctuary (MBNMS) as well as serve as the test bed for a state-of-the-art regional ocean observatory, currently one component of the National Science Foundation (NSF) Ocean Observatories Initiative (OOI). The Project would provide real-time communication and continuous power to suites of scientific instruments enabling monitoring of biologically sensitive benthic sites and allowing scientific experiments to be performed. The environmental justice analysis evaluated the potential for any disproportionate project impacts to both land-based populations and fisheries workers. The CEQA Lead Agency was CSLC.
- **Kinder Morgan Concord-Sacramento Pipeline EIR**. Ms. Vahidi prepared the environmental justice and utilities and service systems sections of an EIR evaluating a proposed 70-mile petroleum products pipeline for the California State Lands Commission. Analysis included consideration of potential impacts of pipeline accidents in Contra Costa, Solano, and Yolo Counties.

- **Shore Marine Terminal Lease Consideration Project EIR, Contra Costa County, CA.** Served as Aspen's Project Manager (under contract to Chambers Group, Inc.) in charge of conducting the preparation of the Land Use, Recreation, Air Quality, and Noise sections of this EIR evaluating Shore Terminal, LLC's application to the California State Lands Commission (CLSC) to exercise the first of two 10-year lease renewal options, with no change in current operations. Shore Terminals operations comprise the marine terminal and on-land storage facilities in an industrial part of the city of Martinez. The marine terminal is on public land leased from the CSLC with the upland storage facilities located on private land.
- **Looking Glass Networks Fiber Optic Cable Project IS/MND, northern and southern California.** As part of Aspen's ongoing contract with the CPUC for review of Telecommunications projects, this document encompassed the evaluation of project impacts and network upgrades in the San Francisco Bay Area and the Los Angeles Basin Area. Ms. Vahidi served as the Deputy Project Manager and Study Area Manager for the Los Angeles Basin for this comprehensive CEQA document reviewing the potential impacts of hundreds of miles of newly proposed fiber optic lines throughout northern and southern California, including Los Angeles and Orange Counties. Issues of concern focused on potential construction impacts of linear alignments in highly urbanized rights-of-way, and resultant land use, traffic and utilities conflicts.
- **U.S. Army Corps of Engineers, Los Angeles District.** Ms. Vahidi is responsible for managing Delivery Orders and conducting the analyses of the social science issue areas for 16 projects throughout southern California and Arizona as part of two environmental services contracts. Delivery orders have included:
  - **Northeast Phoenix Drainage Area Alternatives Analysis Report, Phoenix and Scottsdale, AZ.** As the project manager guided the preparation of an alternatives analysis report that evaluated the potential environmental impacts associated with channel and detention basin alternatives to control flooding problems resulting from fast rate of development in the northeast Phoenix area.
  - **Imperial Beach Shore Protection EIS/EIR, Imperial Beach, CA.** Responsible for preparing the affected environment and environmental consequences sections for the land use, recreation, aesthetics, and socioeconomics issue areas. This EIS will analyze the impacts of shore protection measures along a 4.7-mile stretch of beach in southwest San Diego County.
  - **U.S. Food and Drug Administration Laboratory EIS/EIR, Irvine, CA.** Prepared the land use and recreation; socioeconomics, public services, and utilities; and visual resources/aesthetics analyses for this proposed "mega-laboratory" on the University of California Irvine Campus. Also developed the cumulative projects scenario for analyses of cumulative impacts. As the Public Participation Coordinator for the EIS/EIR review process, prepared the NOP, set up the scoping meeting and public hearing, prepared meeting handouts, and developed the project mailing list.
  - **San Antonio Dam EIS, Los Angeles and San Bernardino Counties, CA.** Responsible for preparing the cultural resources, land use and recreation, and aesthetics sections for the analysis of impacts resulting from the re-operation of San Antonio Dam to increase flood protection.
  - **Rio Salado Environmental Restoration EIS, Phoenix and Tempe, AZ.** Conducted the land use and recreation, and aesthetics analyses for this environmental restoration project in the Salt River and Indian Bend Wash located in the Cities of Phoenix and Tempe. Incidental to the primary objective of the Proposed Action (environmental restoration) is the creation of passive recreational opportunities associated with the restored habitat areas, such as trails for walking and biking, and areas for observing wildlife and learning about the natural history of the river.
  - **Airspace Restrictions EA, Ft. Irwin, CA.** Conducted the land use, recreation, aesthetics, and socioeconomics analyses of impacts for the conversion of unrestricted airspace to restricted airspace above Ft. Irwin in the Mojave Desert.
  - **National Guard Armory Building EA, Los Angeles, CA.** Conducted the land use, aesthetics, and socioeconomics analyses and prepared the cumulative impacts and policy consistency sections.

  - **Supplemental EA for the Seven Oaks Dam Woolly Star Land Exchange, San Bernardino County, CA.** Prepared the land use and recreation analyses and policy consistency section.
  - **Lower Santa Ana River Operations and Maintenance EA, Orange County, CA.** Responsible for conducting the land use, recreation, aesthetics, socioeconomics, and cultural resources analyses.
  - **EA for Area Lighting, Fencing, and Roadways at the International Border, San Diego, CA.** Conducted the land use, aesthetics, and socioeconomics analyses and prepared the policy consistency section.
  - **Border Patrol Checkpoint Station EA, San Clemente, CA.** Analyzed the aesthetic impacts of the installation of a concrete center divider and a Pre-inspected Automated Lane adjacent to and parallel to Interstate 5.
  - **Upper Newport Bay Environmental Restoration Project, Newport Beach, CA.** Prepared physical setting, socioeconomics, land and water uses, and cultural resources sections for the Baseline Conditions Report and the Environmental Planning Report.
  - **Whitewater/Thousand Palms Flood Control Project, Thousand Palms, CA.** Prepared the land use and recreation, aesthetics, and socioeconomics affected environment sections for the project's Baseline Conditions Report that was incorporated into the project EIS.
  - **San Antonio Creek Bridges Project, Vandenberg Air Force Base, CA.** Prepared the physical setting, land use, socioeconomics, utilities, and aesthetics sections for analyses of bridge alternative impacts for missile transport on Vandenberg Air Force Base.
  - **Ft. Irwin Expansion Mitigation Plan, Mojave Desert, CA.** Responsible for developing Ft. Irwin's Public Access Policy based on mitigation measures from the Army's Land Acquisition EIS for the National Training Center. Policy includes provisions for access by research and scientific uses.

- **Los Angeles Unified School District (LAUSD), Los Angeles County, CA.** Ms. Vahidi is Program Manager for Aspen's Environmental Master Services Agreement with the LAUSD (nation's second largest school district) to prepare CEQA documents (EIRs, IS/MNDs, Categorical Exemptions) in review of the LAUSD's four-phased new school construction program intended to meet existing and projected overcrowded conditions (200,000 seat shortfall) within the LAUSD (i.e., City of Los Angeles and all or parts of 28 surrounding jurisdictions cover 700 square miles of land). As the Program Manager, she is responsible for client interface and providing CEQA expertise to the LAUSD on day-to-day basis, QA/QC activities for all Aspen documents submitted, budget tracking and allocation, staff assignments, and the general day-to-day management of this contract. Thus far, Aspen has been awarded 48 CEQA document assignments for new school projects, school expansions and additions. In addition to her duties as the contract manager, Ms. Vahidi has managed the preparation of several CEQA documents under this contract, including:
  - **East Valley Middle School No. 2 EIR.** This middle school was proposed to be located at the previous Van Nuys Drive-In site. The EIR focused on impacts associated with air quality, hazards and hazardous materials, noise, land use and planning, and traffic and transportation. Major issues of concern included traffic and noise generated by school operation activities. The EIR included LAUSD design standards and measures employed to minimize environmental impacts.
  - **Canoga Park New Elementary School IS/MND.** This elementary school would be developed on a parcel of land owned by the non-profit organization, New Economics For Women (NEW). This "Turn-Key" project consisted of a Charter Elementary School to be developed by NEW and sold to the LAUSD for operation. It was later decided that NEW would lease the school back and run it as a charter school. Issues of concern included, pedestrian safety, traffic, air quality, noise, and land use.
  - **Mt. Washington Elementary School Multi-Purpose Room Addition Project IS/MND.** This project proposed the development of a multi-purpose room facility, including a library, auditorium, and theater, to the existing Mt. Washington Elementary School campus located in Los Angeles. The surrounding residential community had concerns regarding the proposed project's impacts on aesthetics, traffic, air quality, and noise. Of particular concern, were impacts generated due to the after-hours use of the multi-purpose room facility by civic and community groups.

   - **New School Construction Program EIR.** Serves as a Study Area Manager (Valley Districts), and Issue Area Coordinator (IAC) (i.e., technical lead and reviewer) for social science issues, including land use, socioeconomics, public services, population and housing, and utilities and service systems. As the IAC, she has formulated the scope of work and methodology for analysis of issues and mitigation options. In addition to her managerial duties, Ms. Vahidi is preparing the Land Use section of the EIR, and directing the preparation of the Project's Scoping Report.
   - **Belmont Senior High School 20-Classroom Modular Building Addition Project.** Under Aspen's on-going master services agreement with the LAUSD, served as the project manager for CEQA documentation and permitting efforts related to the addition of modular classrooms to the existing Belmont Senior High School campus. Issues of concern included, potential impacts to sensitive receptors adjacent to the school from construction-related air quality, noise, and traffic, and operation-related noise generated by the new classrooms. As the LAUSD's CEQA consultant, Ms. Vahidi directed the preparation of technical documentation in support of a Class 32 In-Fill CEQA Categorical Exemption. This technical documentation included analyses of potential project-related air quality, noise, and traffic impacts, which were then submitted to LAUSD as one packet. Subsequent to preparation of this packet, LAUSD filed a CEQA Notice of Exemption for the classroom addition project.
   - **Narbonne High School Stadium Lighting Project MND Addendum.** Served as the project manager for this project proposed to add a new stadium, lighting, and associated sport facilities needed to address existing needs at Narbonne High School. Issues of concern include lighting impacts to the surrounding neighborhood, and available parking stock.

- **SCE Calnev Power Line and Substation Project IS/MND.** Aspen was contracted to thoroughly review and analyze Southern California Edison Company's Application for a Permit to Construct and Proponent's Environmental Assessment (PEA) for the Calnev Power Line and Substation Project in the City of Colton. Ms. Vahidi served as the Deputy Project Manager for preparation of the IS/MND. Tasks include: a site visit, and evaluation of the project's compliance with the Commission's General Order 131D, Rule 17.1, and associated information submittal requirements; and preparation of a letter report identifying data deficiencies of the Application and PEA. Upon formal CPUC acceptance of the Application and PEA, Aspen prepared a CEQA Initial Study Checklist by identifying baseline data, project characteristics, and determining impact significance for each issue area. Each issue area's impact determination was supported by a paragraph or more of analysis describing the rationale for the impact identified, or for the lack of a significant impact. Upon completion of the Initial Study, the Mandatory Findings of Significance were prepared and Aspen determine that a Mitigated Negative Declaration should be prepared per CEQA Guidelines.
- **SCE Six Flags Substation and Power Line Project IS/MND.** Ms. Vahidi served as Deputy Project Manager for preparation of the IS/MND. Reviewed and provided comments on the permit application by SCE to construct a substation and power line to provide electrical service to Six Flags Amusement Park in Valencia, CA. Subsequent to the application completeness review, she prepared the project's Initial Study Checklist and Mitigated Negative Declaration for the California Public Utilities Commission (CPUC). Identified possible deficiencies and provided recommendations.
- **Industrywide Survey for the South Coast Air Quality Management District.** Ms. Vahidi coordinated Aspen's work for an Air Toxics Survey of harmful emissions by auto body and paint shops, performed in compliance with AB2588. She was responsible for development of an industrywide emission inventory for these facilities; she also performed information management, facility verifications, survey mail-outs, emissions calculations, analysis of calculated results, and preparation of the final report.
- **Technical Support to NEPA Lawsuit, Angeles National Forest, CA.** Ms. Vahidi prepared a detailed project chronology and a list of all applicable federal, State, and local laws and regulations in support of the USDA Office of General Counsel and National Forest's response to the City of Los Angeles' 1996 lawsuit on the adequacy of the Pacific Pipeline EIS.
- **Yellowstone Pipeline EIS, Lolo National Forest, Montana.** Environmental Justice and Public Services Issue Area Specialist. Responsible for conducting the analysis of project impacts on minority and

low-income populations to comply with Presidential Executive Order 12898 on Environmental Justice using Census data to determine population density, minority population percentages and unemployment rates to determine the potential for disproportionate project impacts on affected communities. Also responsible for conducting analysis of project impacts such as population inmigration and pipeline accidents on public services in western Montana. During the EIS scoping process, she served as the project public participation coordinator and was responsible for preparation of the project newsletter, setup of the first round of scoping meetings, and determination of project information centers.

- **Santa Fe Pacific Pipeline Project EIR.** Ms. Vahidi was responsible for development and screening of alternatives for a 13-mile petroleum products pipeline from Carson to Norwalk, CA. Prepared analyses of project impacts on socioeconomics, public services, utilities, and aesthetics.
- **Pacific Pipeline Project Mitigation Monitoring, Compliance, and Reporting Program (MMCRP).** Ms. Vahidi served as the expert technical reviewer for the socioeconomics and environmental justice issues. As the MMCRP Agency Liaison, was responsible for developing protocol for efficient interagency communication procedures in coordination of mitigation activities with the CPUC, USFS, Responsible Agencies, and the project proponent. Also responsible for the development and management of the MMCRP Community Outreach and Public Access Program.
- **Pacific Pipeline Project EIR.** For the California Public Utilities Commission's (CPUC) EIR on the originally proposed route of this proposed pipeline (from Santa Barbara County to Los Angeles), Ms. Vahidi developed and coordinated a public participation program to comply with CEQA's mandate for information disclosure and public involvement in decision-making. The Final EIR was certified in September 1993.
- **Pacific Pipeline Project EIS and Subsequent EIR.** Ms. Vahidi prepared the socioeconomics and public services analysis, the Environmental Justice analysis in compliance with Presidential Executive Order 12898, as well as portions of the Land Use and Public Recreation analyses, including a comprehensive comparative analysis of project alternatives on this EIS/Subsequent EIR for the U.S. Forest Service (Angeles National Forest) and the CPUC. Ms. Vahidi managed the subsequent GIS mapping of socioeconomic data relative to pipeline corridor alternatives and other industrial facilities. She also prepared the cumulative projects list (covering a five county area for the Proposed Project and its alternatives) used for the cumulative scenario analyses of the various issue areas in the EIS/SEIR. As the Public Participation Program Coordinator for the project, she developed, implemented, and managed the public involvement efforts for the NEPA and CEQA environmental review processes. This included: setup and logistics for 20 separate scoping meetings, informational workshops, and public hearings along the project route; preparation of all meeting handouts; preparation of project newsletters and public notices; placement of project documents on Internet; and maintenance of the a project telephone information hotline. She also reviewed over 2,000 public comments (written and verbal) received on the Draft EIS/SEIR, for subsequent distribution to the project team.
- **Alturas Transmission Line Project EIR/EIS.** Ms. Vahidi conducted the analysis of potential impacts on minority populations and low-income populations in compliance with Presidential Executive Order 12898 on Environmental Justice using Census data to determine population density, minority population percentages and unemployment rates, and the potential impacts of the transmission line on affected communities. She also prepared the cumulative projects list and map used for analyses of cumulative impacts. She managed development of meeting handouts; scheduling and logistics for four scoping meetings; developed and maintained project mailing list; reviewed public scoping comments and prepared the Scoping Report; coordinated four sets of informational workshops and public hearings for the Draft EIR/EIS; supervised the distribution of comments on the Draft EIR/EIS to the project team; and coordinated the distribution of the Draft and Final EIR/EIS to affected public agencies, organizations, and citizens.

EIP Associates **1998 to 2001**

- **Program EIR for the Divestiture of PG&E's Hydroelectric Generation Assets.** For the CPUC's EIR evaluating the Pacific Gas & Electric Company's (PG&E) proposal to divest their hydroelectric facilities in California, served as the land use technical analyst for two watershed areas, and the Task Manager for the Socioeconomics and Transportation sections of the EIR covering five watershed areas. PG&E owns and operates the largest private hydroelectric power system in the nation. Situated in the Sierra Nevada, Southern Cascade, and Coastal mountain ranges of California, this system is strung along 16 different river basins and annually generates approximately five percent of the power consumed each year in California. The proposed sale of assets also includes approximately 140,000 acres of land proposed for sale with the hydroelectric system. The EIR analyzes the range of operational changes that could occur under new ownership, including complex integrated models that analyze power generation and water management. The land use section of the EIR examines the implications of the change in ownership of lands and the potential for impacts due to development or potential changes in use. Contributed significantly to the extensive GIS analysis, which was conducted to determine the development suitability and potential intensity of development that might occur on the lands if sold. These results served as one of the primary bases for analysis of impacts associated with the sale of the hydroelectric assets.
- **Section 108 Loan Guarantee EA/FONSI for the Waterfront Development Project.** Served as the Manager and Principal Preparer for this EA/FONSI for the City of Huntington Beach Economic Development Department. Prepared NEPA documentation evaluating the impacts resulting from the use of HUD Section 108 Loan guarantee funds for the Waterfront Resort Expansion Project in accordance with The HUD NEPA Guidelines and Format 1 (Environmental Assessments at the Community Level). Tasks included: (1) Evaluation of activities that would be categorically excluded from NEPA based on an assessment of the NEPA Implementing Guidelines for HUD Projects; (2) Evaluation of proposed actions compliance with all applicable federal statutes, regulations, and policies; and (3) Preparation of an Environmental Assessment/Mitigated Finding of No Significant Impact (EA/FONSI) for proposed actions that are not categorically excluded. Proposed actions to be evaluated consisted mainly of infrastructure improvement projects, rehabilitation and/or development of affordable housing, provision of relocation assistance, facilitation of development and/or redevelopment plans, property acquisition, provision of open space, etc.
- **MTA Mid Cities/Westside Transit Corridor Study EIS/EIR.** Served as the EIS/EIR Deputy Project Manager (DPM) for this 3-phase (including prepared the Major Investment Study (MIS), the Environmental Impact Statement (EIS), and an evaluation of the urban design implications of transit interventions on selected routes) study intended to address current and long range traffic congestion in the central and westside areas of the Los Angeles, Basin. Three east/west corridors and a range of transit alternatives ranging including Rapid Bus, light rail, and heavy rail are being evaluated. In addition to her duties as DPM for this comprehensive joint EIS/EIR, Ms. Vahidi prepared the Environmental Justice Analysis (per Executive Order 12898), the Section 4(f) Parklands discussion, and the land use and socioeconomics sections of the EIS/EIR.
- **Wes Thompson Ranch Development Project EIR.** Served as the EIR Project Manager for this hillside residential development in the City of Santa Clarita. Issues of concern included seismic and air quality impacts associated with the excavation of 2 million cubic yards of soil, the project's non-compliance with the City's hillside ordinance for innovative design, and traffic generated by project-related population growth in the area. Four different site configuration alternatives were developed as part of the EIR analysis. Other issues of concern included sensitive biological resources, the potential for hydrological impacts due to disturbance of the hillside, and cultural resources.
- **City of Santa Monica Environmental Assessments.** As one of the City's qualified CEQA consultants managed several environmental assessment documents for housing, commercial, institutional, and mixed-use developments in compliance with CEQA, including:

- **Berkeley Manor Condominium EIR and Technical Reports**. This one-issue EIR originally was a CEQA Categorical Exemption per direction of the City. During preparation of the Categorical Exemption documentation, it was determined that project-generated traffic would have potentially significant impacts. As a result, a traffic technical report was prepared as the background document for and EIR. In addition, shade and shadow impacts were evaluated in a technical report to ensure that shading impacts from the proposed structure on surrounding uses would not be significant. A simple Excel model was developed for calculation of shade and shadow angles.
- **Seaview Court Condominiums IS/MND.** This comprehensive Initial Study/Mitigated Negative Declaration included six technical reports including traffic, cultural resources, parking survey, shade and shadow analysis, and a geotechnical assessment to evaluate the level of severity of this development in the waterfront area of Santa Monica. Major issues of concern were; parking and project-generated traffic on adjacent narrow residential streets; visual obstruction and shading impacts of the proposed structure; liquefaction and seismic impacts to adjacent properties as result of the project's excavation for a subterranean parking garage; and the potential impacts of the project to impact the integrity of a historic district and the historic Seaview Walkway to the beachfront.
- **Four-Story Hotel IS/MND.** A comprehensive Initial Study/Mitigated Negative Declaration was prepared for this four-story hotel adjacent to St. John's Hospital in Santa Monica. Major issues of concern included project-generated traffic on surrounding multi-family residential uses and emergency access to the hospital.
- **Santa Monica College Parking Structure B Replacement EIR.** This focused EIR addressed issues related to traffic and neighborhood land use impacts associated with the addition of a 3-story parking structure in the center of the SMC campus. Major issues of concern included the potential for project-generated traffic to cause congestion at the school's main entrance on Pico Boulevard, and the potential for overflow traffic to impact the Sunset Community of single-family homes adjacent to the school.
- **North Main Street Mixed-Use Development Project EIR.** This EIR included evaluation of impacts resulting from the development of a mixed-use development in Santa Monica's "Commercial Corridor" on Main Street, with ground-floor residences and boutique commercial uses. Major issues of concern included traffic and parking impacts to Main Street and surrounding residential land uses, shade and shadow impacts, and neighborhood impacts.

- **Specific Plans and Redevelopment Projects.** As the senior technical lead for land use, prepared the project description, alternatives screening and development, cumulative scenario, and land use analysis for:
  - **Cabrillo Plaza Specific Plan EIR in Santa Barbara.** This project consisted of a mixed-use commercial development on Santa Barbara's waterfront on Cabrillo Boulevard. On-site uses included an aquarium, specialty retail, restaurants, and office space.
  - **Culver City Redevelopment Plan and Merger EIR.** This programmatic EIR evaluated the impacts of the City's redevelopment of its redevelopment zones. A major land use survey and calculation of acreage of redevelopment lands was conducted as part of the EIR.
  - **Dana Point Headlands Specific Plan EIR.** This EIR evaluated the development of coastal bluff in the City with hotel, single- and multi-family residential, and commercial uses. Major issues of concern included ground disturbance as a result of excavation, impacts to terrestrial and wildlife biology, recreation impacts to beachgoers, and project-generated population inducement.
  - **Blocks 104/105 Redevelopment Project EIR in Huntington Beach (Project Manager).** This EIR evaluated the development of a supermarket, retail shops, and office space in the City's Waterfront Redevelopment Zone. Issues of concern evaluated included traffic, land use, and impacts to on-site historic structures.

HONORS AND AWARDS

- 2006 American Planning Association, Los Angeles Section Environmental Award for the Los Angeles Unified School District New School Construction Program, Program EIR
- 2004 Association of Environmental Professionals Statewide Best EIR Award for the Jefferson-Martin 230 kV Transmission Project EIR.
- 2001 Outstanding Performance Award from the State of California Energy Commission.

- 1992-93 recipient of the USC Merit ("Ides of March") Scholarship from the Southern California Association of Public Administrators (SCAPA).
- University of California, Irvine, School of Social Sciences. Graduated with Highest Honors in Political Science.

PROFESSIONAL ASSOCIATIONS

- American Planning Association (APA), Los Angeles Section Executive Board Member
- Association of Environmental Professionals (AEP)

DECLARATION OF
Testimony of Susanne Huerta

I**, Susanne Huerta,** declare as follows:

1. I am presently employed by Aspen Environmental Group, a contractor to the California Energy Commission, Siting, Transmission and Environmental Protection Division, as a **Environmental Planner/Land Use Technical Specialist**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Land Use** for the **Abengoa Mojave Solar Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 26, 2010 Signed: Original signed by S. Huerta

At: Agoura Hills, California

SUSANNE R. HUERTA

Environmental Planner

ACADEMIC BACKGROUND

Master of Urban Planning, New York University, 2007
B.A., Geography, University of California, Los Angeles, 2004

PROFESSIONAL EXPERIENCE

Ms. Huerta is an Environmental Planner with five years of experience in environmental consulting, city planning, economic development and GIS analysis. She is currently conducting the technical analysis for agricultural and land use analyses for numerous solar and wind energy generating facilities. While attending graduate school, Ms. Huerta interned for a city planning consultant firm in New Jersey. Her city planning background includes experience in the preparation of master plans, the evaluation of site plans and subdivisions, and conducting land use surveys. At Aspen Environmental Group, Ms. Huerta conducts research and prepares environmental analyses in accordance with CEQA, NEPA, and various other environmental laws and regulations. Ms. Huerta's project-specific efforts are provided below.

Aspen Environmental Group — 2007 to present

- **Topaz Solar Farm Project Environmental Impact Report (EIR), San Luis Obispo County, CA, Project Assistant/Technical Specialist (2009-Present).**Ms. Huerta is currently preparing the Project Description and the technical analysis for the agriculture section for this 550 MW solar photovoltaic power plant on the Carrizo Plain of eastern San Luis Obispo County. The project includes solar arrays that would cover approximately 4,200 acres, as well as an electric substation and switching station.
- **California Valley Solar Ranch Project EIR, San Luis Obispo County, CA, Technical Specialist (2009-Present).** Ms. Huerta is currently preparing the technical analysis for the agricultural resources for this 250 MW solar photovoltaic power plant on the Carrizo Plain of eastern San Luis Obispo County. The project includes solar arrays that would cover nearly 2,000 acres, as well as an electric substation, a 2.5-mile transmission line, and expansion of a surface aggregate mine.
- **Pacific Wind Project EIR, Kern County, CA, Technical Specialist (2009-Present).** Ms. Huerta is currently preparing the technical analysis for land use and public services. The project is proposed to be located on approximately 8,300 acres of land with up to 250 wind turbines to produce up to 250 MW of wind energy.
- **Alcoa Dike Project Supplemental Environmental Assessment EA/EIR, US Army Corps of Engineers, Technical Specialist (2009-Present).** Ms. Huerta is a preparing the land use and visual analysis for the Supplemental EA/EIR Addendum under the NEPA/CEQA for the United States Army Corps of Engineers. A Supplemental EA/EIR Addendum is being performed to address design changes to the approved Alcoa Dike located in the Prado Basin, Riverside County.
- **Auxiliary Dike Project Supplemental Environmental Assessment (EA)/EIR, US Army Corps of Engineers, Technical Specialist (2009).** Ms. Huerta prepared the land use and visual analysis for the Supplemental EA/EIR Addendum under the NEPA/CEQA for the United States Army Corps of Engineers. A Supplemental EA/EIR Addendum is being performed to address design changes to the approved Auxiliary Dike located in the Prado Basin, Riverside County.

- **Baldwin Hills Community Standards District (CSD), City of Culver City, Technical Specialist (2009).** Technical Specialist for the review of a County of Los Angeles environmental document and preparation of an oil and gas drilling ordinance for the City of Culver City in Los Angeles County. Ms. Huerta reviewed the technical comments on the Baldwin Hills Community Standards District EIR prepared by the County of Los Angeles for the Inglewood Oil Field. The technical review included the evaluation of the County's proposed CSD (drilling ordinance), which the County revised based on public comments. The City used the review comments as part of their formal comments submitted on the County's EIR and CSD.
- **California River Parkways Trailhead Project Initial Study/Mitigated Negative Declaration (IS/MND), Ventura County Watershed Protection District, Technical Specialist, (2009).** The project would provide a new point of entry to the Ventura County-maintained Ojai Valley Trail and the Ventura River Trail, building on an existing trails network, and would include a new parking lot and crosswalk. Ms. Huerta performed the analyses for land use, agricultural and mineral resources, public services, and recreation resources.
- **TANC Transmission Project, Transmission Agency of Northern California, Staff Professional (2009).** Public scoping for 600 miles of proposed 230-kV and 500-kV transmission lines and associated infrastructure extending from eastern Lassen County south through the Sacramento Valley, and branching west to the Bay Area and east to Tuolumne County: Ms. Huerta assisted in the acquisition and processing of 6,600 scoping comments and information requests; responded via phone, email, and postal mail to public and agency inquiries throughout the twice extended, five-month scoping period; quantitatively evaluated scoping data; and authored sections of the scoping report.
- **Alta-Oak Creek Mojave Project EIR, Kern County, CA, Technical Specialist (2008-2009).** Ms. Huerta is prepared the technical analysis for land use, public services, population, and housing resources. The project is proposed to be located on approximately 11,000 acres of land with up to 350 wind turbines to produce up to 800 MW of wind energy. This would be the first project of the Alta Wind Energy Center which is designed to produce 1,500 MW of wind power in the Tehachapi Wind Resource Area of Kern County**.**
- **Santa Maria River Levee Repair Project, US Army Corps of Engineers, Technical Specialist (2008).** An Environmental Assessment (EA) is being performed for the corrective action to repair the design deficiency of the Santa Maria River Levee in order to avoid the potentially catastrophic consequences of a levee breach that would affect the population of the city of Santa Maria. Ms. Huerta has prepared technical analysis of potential land use and socioeconomic impacts for the EA under NEPA.
- **River Supply Conduit (RSC) Upper Reach Project EIR, Los Angeles and Burbank, CA, Technical Reviewer (2008).** Under Aspen's environmental services contract with the City of Los Angeles Department of Water and Power (LADWP), Ms. Huerta assisted in preparation of the potential impacts to recreational resources for this EIR. The RSC is a major transmission pipeline in the LADWP water distribution system. The existing RSC pipeline's purpose is to transport large amounts of water from the Los Angeles Reservoir Complex and local ground water wells to reservoirs and distribution facilities located in the central areas within of the City of Los Angeles. The LADWP proposed a new larger RSC pipeline to replace and realign the Upper and Lower Reaches of the existing RSC pipeline.
- **Tehachapi Renewable Transmission Project (TRTP) EIR/EIS, Kern, Los Angeles, and San Bernardino Counties, CA, Technical Specialist (2007-Present).** In preparation of a joint EIR/EIS for the CPUC and USDA Forest Service (Angeles National Forest), Ms. Huerta conducted research and analysis for impacts related to public services and utilities, and prepared the Cumulative Impact Scenario. In addition, she prepared the EIR/EIS Summary; and assisted in preparation of the Project

Description, Alternative Screening Report, Scoping Report, and the public comment period of the Draft EIR/EIS.

California Energy Commission (CEC)

In response to California's power shortage, Aspen has assisted the CEC in evaluating the environmental and engineering aspects of new power plant applications throughout the State under three separate contracts. Ms. Huerta has served as a Staff Professional for Land Use Staff Assessments since 2008. Her specific projects are listed below.

- Peak Workload Support for the Energy Facility Siting Program and the Energy Planning Program (Contract #700-05-002; 4/11/06 through 3/30/09)
  - **Carrizo Energy Solar Farm, San Luis Obispo County, CA.** Staff Professional for the Land Use Staff Assessment for Carrizo Energy, LLC's Application for Certification (AFC) to build the Carrizo Energy Solar Farm (CESF), which will consist of approximately 195 Compact Linear Fresnel Reflector (CLFR) solar concentrating lines, and associated steam drums, steam turbine generators (STGs), air-cooled condensers (ACCs), and infrastructure, producing up to a nominal 177 megawatts (MW) net. The CESF is located in an unincorporated area of eastern San Luis Obispo County, west of Simmler and northwest of California Valley, California. The CESF includes the solar farm site, a minimal offsite transmission system connection, and construction laydown area. The CESF site will encompass approximately 640 acres of fenced area in an area zoned for agricultural uses as specified in the San Luis Obispo County General Land Use Plan. Issues of concern include the impacts of the power plant on adjacent land uses and compliance with applicable local LORS.
  - **Willow Pass Generating Station, Pittsburg, CA.** Staff Professional for the Land Use Staff Assessment for a new, approximately 550-megawatt (MW) dry-cooled, natural gas-fired electric power facility proposed by Mirant. Development of Willow Pass would entail the construction of two generating units and ancillary systems including, adjacent electric and gas transmission lines, and water and wastewater pipelines.
  - **Stirling Energy Systems Solar One, San Bernardino County, CA.** Staff Professional for the Land Use Staff Assessment/BLM EIS for a nominal 850-megawatt (MW) Stirling engine project, with construction planned to begin late 2010. The primary equipment for the generating facility would include the approximately 30,000, 25-kilowatt solar dish Stirling systems (referred to as SunCatchers), their associated equipment and systems, and their support infrastructure. Major issues of concern include the conversion of approximately 8,230 acres of open space to industrial uses, compliance with BLM's CDCA Plan, etc.
  - **Stirling Energy Systems Solar Two, Imperial County, CA.** Staff Professional for the Land Use Staff Assessment/BLM EIS for a nominal 750-megawatt (MW) Stirling engine project, with construction planned to begin either late 2009 or early 2010. The primary equipment for the generating facility would include the approximately 30,000, 25-kilowatt solar dish Stirling systems (referred to as SunCatchers), their associated equipment and systems, and their support infrastructure. Major issues of concern include conversion of 6,500 acres of public recreation land used for OHV use and camping, and compliance with the BLM's CDCA plan.
  - **City of Palmdale Hybrid Power Plant Project, Palmdale, CA.** Staff Professional for the Land Use Staff Assessment for the Palmdale Hybrid Power Project (PHPP) proposed by the City of Palmdale. The PHPP consists of a hybrid of natural gas-fired combined-cycle generating equipment integrated with solar thermal generating equipment to be developed on an approximately 377-acre site in the northern portions of the City of Palmdale (City).
  - **Abengoa Mojave Solar One Project, San Bernardino County, CA.** Staff Professional for the Land Use Staff Assessment of a nominal 250 megawatt (MW) solar electric generating facility to be located near Harper Dry Lake in an unincorporated area of San Bernardino County. Issues of concern include the impacts associated with the conversión of 1,765 acres of open space lands.

PREVIOUS EXPERIENCE

Burgis Associates, Inc. — May 2006 to May 2007

Ms. Huerta worked as a consultant for city planning departments and private developers throughout northern New Jersey. Her primary projects were to draft a master plan reexamination report and an open space and recreation element of a master plan. Within these projects she evaluated existing socioeconomic conditions and land uses, and conducted an inventory of recreational facilities and open space. She also used ArcGIS to illustrate zoning recommendations and update land use and zoning maps. Other routine projects included the evaluation of site plan, subdivision and variance applications for compliance with local, State and federal regulations.

Brooklyn Economic Development Corporation — September to December 2005

Ms. Huerta conducted research and field surveys for community revitalization projects. She also participated in collaborative meetings with other community organizations.

ADDITIONAL TRAINING AND COURSES

- Successful CEQA Compliance (February 2009)
- CEQA Basics Workshop Series (November 2008)
- Advanced courses in ArcGIS
- Graduate courses in Environmental Impact Assessment and Environmental Policy

PROFESSIONAL AFFILIATIONS

- American Planning Association

DECLARATION OF
SHAHAB KHOSHMASHRAB

I**, SHAHAB KHOSHMASHRAB**, declare as follows:

1. I am presently employed by the California Energy Commission in the **ENGINEERING OFFICE** of the Facilities Siting Division as a **MECHANICAL ENGINEER**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I participated in the preparation of the staff testimony on **Facility Design** for the **Abengoa Mojave Solar Project** based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: March 1, 2010 Signed: Original signed by S. Khoshmashrab

At: Sacramento, California

Shahab Khoshmashrab
Mechanical Engineer

Experience Summary

Nine years experience in the Mechanical, Civil, Structural, and Manufacturing Engineering fields involving engineering and manufacturing of various mechanical components and building structures. This experience includes QA/QC, construction/licensing of electric generating power plants, analysis of noise pollution, and engineering and policy analysis of thermal power plant regulatory issues.

Education

- California State University, Sacramento-- Bachelor of Science, Mechanical Engineering
- Registered Professional Engineer (Mechanical), California

Professional Experience

2001-2004--Mechanical Engineer, Systems Assessment and Facilities Siting– California Energy Commission

Performed analysis of generating capacity, reliability, efficiency, noise and vibration, and the mechanical, civil/structural and geotechnical engineering aspects of power plant siting cases.

1998-2001--Structural Engineer – Rankin & Rankin

Engineered concrete foundations, structural steel and sheet metal of various building structures including energy related structures such as fuel islands. Performed energy analysis/calculations of such structures and produced structural engineering detail drawings.

1995-1998--Manufacturing Engineer – Carpenter Advanced Technologies

Managed manufacturing projects of various mechanical components used in high tech medical and engineering equipment. Directed fabrication and inspection of first articles. Wrote and implemented QA/QC procedures and occupational safety procedures. Conducted developmental research of the most advanced manufacturing machines and processes including writing of formal reports. Developed project cost analysis. Developed/improved manufacturing processes.

DECLARATION OF
Scott Debauche

I**, Scott Debauche,** declare as follows:

1. I am presently employed by Aspen Environmental Group, a contractor to the California Energy Commission, Siting, Transmission and Environmental Protection Division, as a **Socioeconomic and Transportation/Traffic Technical Specialist**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Socioeconomics** for the **Abengoa Mojave Solar Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 26, 2010   Signed: Original signed by S. Debauche

At: Agoura Hills, California

SCOTT DEBAUCHE
Environmental Planner

ACADEMIC BACKGROUND
B.S., Urban & Regional Planning, University of Minnesota, 1994

PROFESSIONAL EXPERIENCE

Mr. Debauche is an environmental planner with 14 years of experience preparing a variety of federal and State of California environmental, planning, and analytical documents for large-scale infrastructure and development projects. Mr. Debauche brings the experience of specializing in the integration and completion of NEPA and CEQA documentation joint documentation. Mr. Debauche specializes in evaluating Transportation/Traffic, Noise, Socioeconomics and Environmental Justice, Air Quality, Alternatives analysis, and public and community involvement programs.

Aspen Environmental Group — 2001 to present

- **TANC Transmission Project (TTP) EIR/EIS, several Northern California Counties.** Mr. Debauche is currently serving as the Technical Specialist in charge of preparation of the EIR/EIS Transportation/Traffic and Socioeconomics CEQA/NEPA analysis. The Transmission Agency of Northern California (TANC) and Western Area Power Administration (Western), an agency of the U.S. Department of Energy (DOE), are the CEQA lead agency and NEPA lead agency, respectively. The TTP generally would consist of new and upgraded 500 kilovolt (kV) and 230 kV transmission lines, substations, and related facilities generally extending from northeastern California near Ravendale in Lassen County to the California Central Valley through Sacramento and Contra Costa Counties and westward into the San Francisco Bay Area.
- **Alta Wind Project EIR, Kern County, CA.** Mr. Debauche is the Technical Specialist for Transportation/Traffic, Noise, and Air Quality for this EIR. The applicant, Alta Windpower Development, LLC, proposes to develop the Alta-Oak Creek Mojave Project (proposed project or project) for the commercial production of up to 800 Megawatts (MW) of electricity from wind turbines. The proposed project would result in construction of up to 350 wind turbine generators, their ancillary facilities and supporting infrastructure located on three distinct land areas comprising a total of approximately 10,750 acres located approximately 3 miles west of State Route (SR) 14 (Antelope Valley Freeway) and 3 miles south of SR-58 in the Willow Springs area of eastern Kern County.
- **Littlerock Reservoir Sediment Removal Project EIS/EIR, Palmdale, CA.** Mr. Debauche is the Technical Specialist for Transportation/Traffic, Noise, and Socioeconomics for this joint EIS/EIR evaluating the impacts of sediment removal alternatives for the Littlerock Reservoir and Dam on USFS Angeles National Forest (NEPA Lead Agency) lands in Los Angeles County. The project involves impacts to the arroyo toad, extensive coordination with USFWS for a Section 7 consultation, incorporation of new Forest Service Plan updates and requirements into the analysis, preparation of the Forest Service required BE/BA, and analysis of compliance with federal conformity requirements. Aspen is currently working on the Administrative Draft EIR/EIS and assisting the PWD with portions of their Proposition 50 grant application to the DWR.

- **Baldwin Hills Oil Field Community Standards District EIR Review and Ordinance Preparation, Culver City, CA.** Mr. Debauche served as the Technical Specialist for the City of Culver City reviewing the Los Angeles County Baldwin Hills Oils Field Community Standards District EIR Noise analysis evaluating the impacts of expanding the existing Baldwin Hills oil field. Once completed, Mr. Debauche then prepared the Noise section of the newly enacted City of Culver City Community Standards District overlay zone restricting noise generation by the Baldwin Hills Oil Field on the residents of Culver City.
- **Long Beach LNG Import Project, Long Beach, CA.** Under contract to the City of Long Beach, Aspen was tasked to review the Draft EIS/EIR for the proposed construction and operation of this onshore Liquified Natural Gas facility to be located at the Port of Long Beach. Mr. Debauche reviewed the document for technical adequacy and assisted the City in preparing written comments for the following sections of the EIS/EIR: Transportation/Traffic and Noise.
- **Sunset Substation and Transmission and Distribution Project CEQA Documentation, Banning, CA.** Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for this EIR. The City of Banning proposes to construct the Sunset Substation and supporting 33-kilovolt (kV) transmission line that would interconnect with the City's existing distribution system. The purpose of this new substation and transmission is to relieve the existing overloads that are occurring within the City's electric system and to accommodate projected growth in the City.

California Public Utilities Commission (CPUC). Under Aspen's environmental services contract with the CPUC, Mr. Debauche has prepared environmental analysis sections of environmental reports analyzing large-scale infrastructure projects. His project experience with the CPUC includes the following:

- **Tehachapi Renewable Transmission Project (TRTP) EIR/EIS, Kern, Los Angeles, and San Bernardino Counties, CA.** For this EIR/EIS prepared by USFS, Angeles National Forest and CPUC, Mr. Debauche is currently serving as the Technical Specialist for Noise and Alternatives evaluation for SCE's proposal to construct, use, and maintain a series of new and upgraded high-voltage electric transmission lines and substations to deliver electricity generated from new wind energy projects in eastern Kern County. Approximately 46 miles of the project would be located in a 200- to 400-foot right-of-way on National Forest System land (managed by the Angeles National Forest) and approximately three miles would require expanded right-of-way within the Angeles National Forest. The proposed transmission system upgrades of TRTP are separated into eight distinct segments: Segments 4 through 11. Segments 1 (Antelope-Pardee) and Segments 2 and 3 (Antelope Transmission Project) were evaluated in separate CEQA and NEPA documents as described below.
- **Devers–Palo Verde 500 kV Transmission Line Project EIS/EIR, southern California/western Arizona.** For this EIR/EIS prepared by U.S. Bureau of Land Management and CPUC, Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for SCE's proposed 250-mile transmission line project from the Palo Verde Nuclear power plant in Arizona to the northern Palm Springs area in California. Major issues of concern include EMF and visual impacts on property values, impacts on the area's vast recreational resources and tribal lands, and the development and evaluation of several route alternatives, including the Devers-Valley No. 2 Route Alternative, which eventually was approved by the CPUC.
- **Antelope-Pardee 500 kV Transmission Line Project EIS/EIR, Los Angeles County, CA.** For this EIR/EIS prepared by USFS, Angeles National Forest and CPUC, Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for SCE's proposed 25-mile transmission line project from the Antelope Substation in the City of Lancaster, through the ANF, and terminating at SCE's Pardee Substation in Santa Clarita. Major issues of concern included impacts to biological, recreational, and cultural resources within Forest lands, EMF and visual impacts on property values, impacts on residences in the urbanized southern regions of the route, and the development and evaluation of several route alternatives.
- **MARS EIR/EIS, Monterey, CA.** Mr. Debauche served as the technical specialist in charge of preparing the Environmental Justice analysis for this EIR/EIS, which would evaluate the effects associated with the

installation and operation of the proposed Monterey Accelerated Research System (MARS) Cabled Observatory Project (Project) proposed by Monterey Bay Aquarium Research Institute (MBARI)[NEPA Lead Agency]. The goal of the Project was to install and operate, in State and Federal waters, an advanced cabled observatory in Monterey Bay that would provide a continuous monitoring presence in the Monterey Bay National Marine Sanctuary (MBNMS) as well as serve as the test bed for a state-of-the-art regional ocean observatory, currently one component of the National Science Foundation (NSF) Ocean Observatories Initiative (OOI). The Project would provide real-time communication and continuous power to suites of scientific instruments enabling monitoring of biologically sensitive benthic sites and allowing scientific experiments to be performed. The environmental justice analysis evaluated the potential for any disproportionate project impacts to both land-based populations and fisheries workers. The CEQA Lead Agency was CSLC.

- **El Casco System Project EIR, Riverside, CA.** Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for this EIR prepared for the CPUC to evaluate SCE's application for a Permit to Construct (PTC) the El Casco System Project. The Proposed Project would be located in a rapidly growing area of northern Riverside County, which includes the Cities of Beaumont, Banning, and Calimesa. A 115 kV subtransmission line begins at Banning Substation and extends westward toward the proposed El Casco Substation site within the existing Banning to Maraschino 115 kV subtransmission line and Maraschino–El Casco 115 kV subtransmission line ROWs. Major issues of concern include impacts to existing and residential land uses, which have led to the development of a partial underground alternative and a route alternative different than the project route proposed by SCE (the Applicant). The 1,200-page Draft EIR was released for a 45-day public review and comment on December 12, 2007, and evaluates project alternatives at the same level of detail as the Proposed Project analysis.
- **Antelope Transmission Project, Segments 2 & 3 EIR, Los Angeles and Kern Counties, CA.** For this EIR being prepared by the CPUC, Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation. The proposed Project includes both Segment 2 and Segment 3 of the Antelope Transmission Project, and involves construction of new transmission line infrastructure from the Tehachapi Wind Resource Area in southern Kern County, California, to SCE's existing Vincent Substation in Los Angeles County, California. The Tehachapi Wind Resource Area is one of the State's greatest potential sources for the generation of wind energy. A variety of wind energy projects are currently in development for this region. Major issues of concern include EMF and visual impacts on property values, impacts on residences and agricultural resources, and the development and evaluation of several substation and route alternatives.
- **Diablo Canyon Power Plant (DCPP) Steam Generator Replacement Project EIR, San Luis Obispo County, CA.** Mr. Debauche served as the Technical Specialist for Socioeconomics and Alternatives evaluation of this EIR. The EIR addressed impacts associated with the replacement of the eight original steam generators (OSGs) at DCPP Units 1 and 2 due to degradation from stress and corrosion cracking, and other maintenance difficulties. The Proposed Project would be located at the DCPP facility, which occupies 760 acres within PG&E's 12,000-acre owner-controlled land on the California coast in central San Luis Obispo County.
- **SDG&E Miguel Mission Substation Draft EIR.** The major part of the Proposed Project would include the installation of a new, bundled 230 kV circuit between Miguel and Mission Substations, which would be located entirely within SDG&E's existing 35-mile ROW. Mr. Debauche prepared social science analysis for the Initial Study, as well as the Draft EIR Project Description and several key environmental sections.
- **PG&E's Proposed Divestiture of Hydroelectric Assets Project EIR.** Mr. Debauche prepared several key sections of the Draft EIR, including Socioeconomics and Hazardous Materials analysis.
- **Viejo System Project IS/MND, Orange County, CA.** Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for the project's CEQA documentation, including and Initial Study, prepared on behalf of the CPUC to evaluate Southern California Edison's (SCE) Application for a Permit to Construct the Viejo System Project, which was in SCE's forecasted demand of electricity and goal of providing reliable electric service in southern Orange County. The Viejo System Project would serve Lake Forest, Mission Viejo, and the surrounding areas. Components of the project included, construction of the new 220/66/12 kilovolt (kV) Viejo Substation, installation of a new 66 kV subtransmission line within an existing SCE right-of-way, replacement of 19

double-circuit tubular steel poles with 13 H-frames structures, and minor modification to other transmission lines. Major issues of concern include visual impacts of transmission towers, EMF effects, and project impacts on property values.

- **Looking Glass Networks Fiber Optic Cable Project IS/MND, northern and southern California.** As part of Aspen's ongoing contract with the CPUC for review of Telecommunications projects, this document encompasses and evaluation of project impacts and network upgrades in the San Francisco Bay Area and the Los Angeles Basin Area. Prepared the socioeconomic analysis for this comprehensive CEQA document reviewing the potential impacts of hundreds of miles of newly proposed fiber optic lines throughout northern and southern California, including Los Angeles and Orange Counties.

California Energy Commission (CEC), Technical Assistance in Application for Certification Review. In response to California's power shortage, Aspen is assisting the California Energy Commission in evaluating the environmental and engineering aspects of new power plant applications throughout the State. As part of this effort, Mr. Debauche works as a technical specialist for Transportation/Traffic, Socioeconomics and Environmental Justice, and Alternatives analyses for the following power plant projects:

- **Carlsbad Energy Center Project, Carlsbad, CA.** Technical Specialist for both the Transportation/Traffic and Alternatives Staff Assessment for Carlsbad Energy Center, LLC's Application for Certification (AFC) to build the Carlsbad Energy Center Project (CECP), which will consist of a 558 MW gross combined-cycle generating facility configured using two units with one natural-gas-fired combustion turbine and one steam turbine per or unit. Issues of concern include major incompatibilities with local LORS, and cumulative impacts from widening of I-5.

- **GWF Tracy Combined Cycle Power Plant, San Joaquin County, CA.** Technical Specialist for the Transportation/Traffic Staff Assessment for GWF's proposal to modify the existing TPP, a nominal 169-megawatt (MW) simple-cycle power plant, by converting the facility into a combined-cycle power plant with a nominal 145 MW, net, of additional generating capacity.

- **GWF Henrietta Peaker Project, Kings County, CA.** Technical Specialist for the Transportation/Traffic Staff Assessment for GWF's proposal to modify the existing Henrietta Power Plant. New once-through steam generators (OTSGs) will be installed to allow the plant to be operated in its current simple-cycle configuration with no steam generation but with the selective catalytic reduction (SCR) and oxidation catalyst in operation, or to operate as a combined-cycle power plant generating an additional 25 MW of power with new proposed emission limits.

- **CPV Vaca Station Power Plant, Solano County, CA.** Technical Specialist for the Transportation/Traffic Staff Assessment for CPV Vacaville, LLC (CPVV) filed an Application for Certification (08-AFC-11) seeking authority to construct and operate the CPV Vaca Station (CPVV) project, a natural gas-fired, combined-cycle electrical generating facility rated at a nominal generating capacity of 660 megawatts (MW). The CPVV is proposed for a 24-acre site located at the intersection of Lewis and Fry roads in a rural area within the city limits of Vacaville, Solano County.

- **Kings River Conservation District Community Peaker Power Plant, Fresno County, CA.** Technical Specialist for the Transportation/Traffic Staff Assessment for the Kings Rivers Conservation District, who filed a Small Power Plant Exemption for the King River Conservation District Peaking Power Plant. The proposed 97-megawatt natural gas-fired plant will be located south of the City of Fresno and near the community of Malaga in Fresno County.

- **Lodi Energy Center, Lodi, CA.** Technical Specialist for the Socioeconomics Staff Assessment for a combined-cycle nominal 225-megawatt (MW) power generating facility.

- **Ivanpah Solar Electric Generating System Project, San Bernardino County, CA.** Technical Specialist for the Socioeconomics Staff Assessment/BLM EIS for a 400-megawatt solar thermal electric power generating system. The project's technology would include heliostat mirror fields focusing solar energy on power tower receivers producing steam for running turbine generators. Related facilities would include administrative buildings, transmission lines, a substation, gas lines, water lines, steam lines, and well water pumps. The proposed project would be developed entirely in the Mojave Desert region of San Bernardino County, California.

- **Canyon Power Plant, Anaheim, CA.** Technical Specialist for the Socioeconomics Staff Assessments for a nominal 200 megawatt (MW) simple-cycle plant, using four natural gas-fired combustion turbines and associated infrastructure proposed by Southern California Public Power Authority (SCPPA). This project is a peaking power plant project located within the City of Anaheim, California.
- **Valero Cogeneration Project, Benicia, CA.** Technical Specialist for the Socioeconomics Staff Assessments for a proposed cogeneration facility at the Valero Refinery in Benicia. Issues addressed included impacts on public services and other project-related population impacts such as school impact fees.
- **Rio Linda/Elverta Power Project, Sacramento, CA.** Technical Specialist for the Socioeconomics Staff Assessments for a 560-megawatt natural gas power plant in the northern Sacramento County. Issues of importance included environmental justice and impacts on property values.
- **Magnolia Power Project, Burbank, CA.** Technical Specialist for the Socioeconomics Staff Assessments for this nominal 250-megawatt natural gas combined-cycle fired electrical generating facility to be located at the site of the existing City of Burbank power plant. Environmental justice issues and potential impacts on local economy and employment were evaluated.
- **Avenal Energy Project, Kings County, CA.** Technical Specialist for the Socioeconomics Staff Assessments for a 600-megawatt combined cycle electrical generating facility, and associated linear facilities.
- **Inland Empire Energy Center, Riverside County, CA.** Technical Specialist for the Socioeconomics Staff Assessments for a 670-megawatt natural gas-fired, combined-cycle electric generating facility and associated linear facilities including, a new 18-inch, 4.7-mile pipeline for the disposal of non-reclaimable wastewater, and a new 20-inch natural gas pipeline. The project would be located on approximately 46-acres near Romoland, within Riverside County.
- **Coastal Plant Study.** Technical Specialist for the Socioeconomics Staff Assessments for a possible modernization, re-tooling, or expansion of California's 25 coastal power plants including the Encina Power Plant and the San Onofre Nuclear Power Plant.

Los Angeles Department of Water and Power (LADWP). Responsible for conducting the analyses of the technical and social science issue areas for a variety of EISs and EAs as part of two environmental services contracts. Delivery orders have included:

- **River Supply Conduit (RSC) Upper Reach Project EIR, Los Angeles and Burbank, CA.** Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for the CEQA document for this project. The RSC is a major transmission pipeline in the LADWP water distribution system. The existing RSC pipeline's purpose is to transport large amounts of water from the Los Angeles Reservoir Complex and local ground water wells to reservoirs and distribution facilities located in the central areas within of the City of Los Angeles. The LADWP proposed a new larger RSC pipeline to replace and realign the Upper and Lower Reaches of the existing RSC pipeline, which would involve the construction of approximately 69,600 linear feet (about 13.2 miles) of 42-, 48-, 60-, 66-, 72-, 84-, and 96-inch diameter welded steel underground pipeline.
- **Mulholland Pumping Station and Lower Hollywood Reservoir Outlet Chlorination Station Project IS/MND, Los Angeles, CA.** Under Aspen's on-going environmental services contract with the City of Los Angeles Department of Water and Power (LADWP), Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for preparation of CEQA documentation for this project. LADWP proposed to replace the existing historic pumping/chlorination station building as well as the existing lavatory and unoccupied Water Quality Laboratory buildings with a new single structure pumping/chlorination station within the LADWP's Hollywood Reservoir Complex located in the Hollywood Hills section of the City Los Angeles. These improvements were required due to the age and deterioration of the facility and the potential risk of seismic damage to existing structures. An Initial Study was prepared in support of a City of Los Angeles General Exemption.
- **Taylor Yard Water Recycling Project (TYWRP) IS/MND, Los Angeles and Glendale, CA.** Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for preparation of CEQA documentation for this project. LADWP proposed to construct the TYWRP in order to provide recycled water produced by the Los Angeles–Glendale Water Reclamation Plant (LAGWRP) to the Taylor Yard. An important part of the City of Los Angeles' expanding emphasis on water conservation is the concept that water is a resource that can be used more

than once. Because all uses of water do not require the same quality of supply, the City has been developing programs to use recycled water for suitable landscaping and industrial uses. The project is located in the southernmost part of the City of Glendale and northeastern part of the City of Los Angeles. The IS/MND was adopted in the Summer of 2007.

- **DC Electrode Project IS/MND, Los Angeles, CA.** Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for preparation of CEQA documentation for this project. LADWP proposed to construct a new electrode distribution line from West Los Angeles to the Pacific Ocean stopping point in Malibu, CA up the Pacific Coast Highway.
- **District Cooling Plant Project, Los Angeles IS/MND, CA.** Mr. Debauche served as the Technical Specialist for Transportation/Traffic, Noise, Socioeconomics, and Alternatives evaluation for preparation of CEQA documentation for this project. LADWP proposed to construct a District Cooling Plant and Distribution System (proposed project) in order to provide a centralized system for producing chilled water for use by area users, which are generally large commercial, governmental, industrial and institutional buildings who generate their own chilled water utilizing individual chiller plants for space cooling and air-conditioning.

U.S. Army Corps of Engineers, Los Angeles District. Responsible for conducting the analyses of the social science issue areas for a variety of EISs and EAs as part of two environmental services contracts. Delivery orders have included:

- **Northeast Phoenix Drainage Area Alternatives Analysis Report, Phoenix and Scottsdale, AZ.** Worked with preparation of an alternatives analysis report that evaluated the potential environmental impacts associated with channel and detention basin alternatives to control flooding problems resulting from fast rate of development in the northeast Phoenix area.
- **Murrieta Creek Flood Control and Environmental Restoration Project**. Mr. Debauche served as a technical writer of an Environmental Assessment and Mitigation Monitoring plan for Phase 1 of a flood control and restoration project in Riverside County.

California Department of Water Resources. Responsible for conducting the environmental analyses for CEQA compliance as part of two environmental services contracts. Delivery orders have included:

- **Piru Creek Stabilization and Restoration Project.** The California Department of Water Resources (CDWR) proposes to repair erosion damage at a series of three locations downstream of Pyramid Dam and seismically retrofit the Pyramid Dam access bridge that crosses Piru Creek. Mr Debauche served as technical writer of the Initial Study for this project.

Los Angeles Unified School District (LAUSD), Los Angeles County, CA. Deputy Program manager and Technical writer for several CEQA documents (EIRs and IS/MNDs) being prepared as part of Aspen’s ongoing services contract with the LAUSD to help approve school projects that would meet existing overcrowded conditions in the greater Los Angeles area. Projects have included:

- **New School Construction Program EIR.** Serves as a technical writer for social science issues, including socioeconomics, and population and housing for this Program EIR being prepared for the LAUSD. The LAUSD 2020 Program would provide student seats throughout the LAUSD via a combination of the addition of portable classrooms to existing campuses, modernization and reconfiguration of existing campuses, and the construction of new schools. Mr. Debauche prepared the Noise, Socioeconomic, and Alternative Evaluation of this EIR.
- **East Valley Middle School No. 2 EIR.** Served as a key technical writer for this middle school project proposed to be located at the previous Van Nuys Drive-In site. The EIR focused on impacts associated with air quality, hazards and hazardous materials, noise, land use and planning, and traffic and transportation. Major issues of concern included traffic and noise generated by school operation activities. The EIR included LAUSD design standards and measures employed to minimize environmental impacts.
- **Mt. Washington Elementary School Multi-Purpose Room Addition Project IS/MND.** Served as Deputy Program Manager for this project proposed the development of a multi-purpose room facility, including a library, auditorium, and theater, to the existing Mt. Washington Elementary School campus located in Los Angeles. The surrounding residential community had concerns regarding the proposed

project's impacts on aesthetics, traffic, air quality, and noise. Of particular concern, was impacts generated due to the after-hours use of the multi-purpose room facility by civic and community groups.

- **Canoga Park New Elementary School IS/MND.** Served as technical writer for this elementary school project proposed to be developed on a parcel of land owned by the non-profit organization, New Economics For Women (NEW). This "turn-key" project consisted of a Charter Elementary School to be developed by NEW and sold to the LAUSD for operation. It was later decided that NEW would lease the school back and run it as a charter school. Issues of concern included, pedestrian safety, traffic, air quality, noise, and land use.
- **Hughes Magnet Span School IS/MND.** Served as a technical writer for socioeconomics, hydrology, public services and utilities, and recreational impacts for the proposed re-opening of the existing Hughes Middle School as a Magnet Span School serving up to 1,620 District 6th though 12th grade students. The re-opening of the Hughes Middle School would require the relocation of the existing uses of the campus. The existing Enadia Way Elementary School and Platt Ranch Elementary School would be re-opened for the relocation of these uses.
- **Wonderland Elementary School Portable Classroom Additions IS/MND.** Served as the technical writer of an IS/MND for a proposed addition to the Wonderland Avenue Elementary School, located in the City of Los Angeles. Ms. Walker is responsible for overall coordination and scheduling of the project's environmental review, communications with the LAUSD, senior technical review of all documents produced, presentation during the project's public scoping meetings and hearings, and assurance of public noticing. Served as technical writer of the IS/MND.
- **Pio Pico Elementary School Playground Expansion IS/MND**. Completed a Notice of Preparation, Initial Study, and Administrative Draft EIR for the expansion of a playground at the existing Pio Pico School in the LAUSD. The playground was proposed on five residential properties. One of the residences is a potentially significant historical resource because of its association with an African-American woman journalist, Fay M. Jackson. This project was cancelled by the LAUSD after completion of the administrative draft report. Served as technical writer of the IS/MND.
- **Fairfax Senior High School Portable Classroom Addition IS/MND**. Served as technical writer of the IS/MND for the addition of portable classrooms at the school. Major issue areas covered were noise, hydrology, and geotechnical analysis.
- **Polytechnic Senior High School Portable Classroom Addition IS/MND**. Served as technical writer of the IS/MND for the addition of portable classrooms at the school. Major issue areas covered were noise, hydrology, and geotechnical analysis.
- **Washington Senior High School Portable Classroom Addition IS/MND**. Served as technical writer of the IS/MND for the addition of portable classrooms at the school. Major issue areas covered were noise, hydrology, and geotechnical analysis.

EIP Associates 1998 to 2001

MTA Mid Cities/Westside Transit Corridor Study EIS/EIR. Was a key writer of the EIS/EIR for this 3-phase (including prepared the Major Investment Study (MIS), the Environmental Impact Statement (EIS), and an evaluation of the urban design implications of transit interventions on selected routes) study intended to address current and long range traffic congestion in the central and westside areas of the Los Angeles Basin. Three east/west corridors and a range of transit alternatives ranging including Rapid Bus, light rail, and heavy rail are being evaluated. In addition to preparing several issue area chapters of this comprehensive joint EIS/EIR, Mr. Debauche assisted with the Environmental Justice Analysis (per Executive Order 12898), the Section 4(f) Parklands discussion, and the land use and socioeconomics sections of the EIS/EIR.

Wes Thompson Ranch Development Project EIR. Served as project writer for this hillside residential development in the City of Santa Clarita. Issues of concern included seismic and air quality impacts associated with the excavation of 2 million cubic yards of soil, the project's non-compliance with the City's hillside ordinance for innovative design, and traffic generated by project-related population growth in the area. Four different site configuration alternatives were developed as part of the EIR analysis. Other issues of concern included sensitive biological resources, the potential for hydrological impacts due to disturbance of the hillside, and cultural resources. As the technical writer for socioeconomics, noise, hazardous materials, air quality, and public services, Mr. Debauche conducted analysis and prepared these environmental sections as well as the project description, alternatives screening and development, traffic assistance, and cumulative scenario for:

City of Santa Monica Environmental Assessments. Was key writer of several environmental assessment documents for housing, commercial, institutional, and mixed-use developments in compliance with CEQA. As the technical writer for socioeconomics, noise, hazardous materials, air quality, and public services, Mr. Debauche conducted analysis and prepared these environmental sections as well as the project description, alternatives screening and development, traffic assistance, and cumulative scenario for:

- **Seaview Court Condominiums IS/MND.** This comprehensive Initial Study/Mitigated Negative Declaration included six technical reports including traffic, cultural resources, parking survey, shade and shadow analysis, and a geotechnical assessment to evaluate the level of severity of this development in the waterfront area of Santa Monica. Major issues of concern were; parking and project-generated traffic on adjacent narrow residential streets; visual obstruction and shading impacts of the proposed structure; liquefaction and seismic impacts to adjacent properties as result of the projsect's excavation for a subterranean parking garage; and the potential impacts of the project to impact the integrity of a historic district and the historic Seaview Walkway to the beachfront.
- **Four-Story Hotel IS/MND.** A comprehensive Initial Study/Mitigated Negative Declaration was prepared for this four-story hotel adjacent to St. John's Hospital in Santa Monica. Major issues of concern included project-generated traffic on surrounding multi-family residential uses and emergency access to the hospital.
- **Santa Monica College Parking Structure B Replacement EIR.** This focused EIR addressed issues related to traffic and neighborhood land use impacts associated with the addition of a 3-story parking structure in the center of the SMC campus. Major issues of concern included the potential for project-generated traffic to cause congestion at the school's main entrance on Pico Boulevard, and the potential for overflow traffic to impact the Sunset Community of single-family homes adjacent to the school.
- **North Main St. Mixed-Use Development Project EIR**. This EIR included evaluation of impacts resulting from the development of a mixed-use development in Santa Monica's "Commercial Corridor" on Main Street, with ground-floor residences and boutique commercial uses. Major issues of concern included traffic and parking impacts to Main Street and surrounding residential land uses, shade and shadow impacts, and neighborhood impacts.

Specific Plans and Redevelopment Projects. As the technical writer for socioeconomics, noise, hazardous materials, air quality, and public services, Mr. Debauche conducted analysis and prepared these environmental sections as well as the project description, alternatives screening and development, traffic assistance, and cumulative scenario for:

- **Cabrillo Plaza Specific Plan EIR in Santa Barbara.** This project consisted a mixed-use commercial development on Santa Barbara's waterfront on Cabrillo Boulevard. On-site uses included an aquarium, specialty retail, restaurants, and office space.
- **Culver City Redevelopment Plan and Merger EIR.** This programmatic EIR evaluated the impacts of the City's redevelopment of its redevelopment zones. A major land use survey and calculation of acreage of redevelopment lands was conducted as part of the EIR.
- **Dana Point Headlands Specific Plan EIR.** This EIR evaluated the development of coastal bluff in the City with hotel, single- and multi-family residential, and commercial uses. Major issues of concern included ground disturbance as a result of excavation, impacts to terrestrial and wildlife biology, recreation impacts to beachgoers, and project-generate population inducement.
- **Triangle Gateway Redevelopment Project EIR in Beverly Hills, CA.** This EIR evaluated the development of a supermarket, retail shops, and office space in the triangle gateway portion of

downtown Beverly Hills. Issues of concern evaluated by Mr. Debauche included traffic, land use, and impacts to on-site historic structures.

- **UCLA Campus Housing Expansion.** This EIR evaluated the development and expansion of campus housing within the UCLA campus. Issues of concern evaluated by Mr. Debauche included hazardous materials and population/housing.

CH2M Hill - Minneapolis, MN 1995 to 1998

- **Minneapolis/St. Paul International Airport Expansion EIS:** Mr. Debauche was a key writer of the EIS for this $4 million technical and environmental study, including the preparation of an Environmental Impact Statement (EIS), and an evaluation of the urban design implications of a proposed $800 million expansion of the existing MSP International airport, including transit and terminal modifications and the inclusion of a new perpendicular runaway. The studies included alternatives to the project and the long-term effects on the cities of Minneapolis and St. Paul. In addition to preparing several issue area chapters of this comprehensive EIS, Mr. Debauche assisted with the Environmental Justice Analysis (per Executive Order 12898), the Section 4(f) Parklands discussion, and the socioeconomics sections of the EIS. In addition, Mr. Debauche assisted with preparation of a technical report on airport noise effects on nearby housing and mitigation programs for the impacts of the proposed runway.
- **Minneapolis/St. Paul Wastewater Treatment Facility Expansion EIS:** Was a key writer of the EIS for expansion of the existing wastewater treatment facility serving the twin cities area. The studies included alternatives to the project and the long-term effects on the cities of Minneapolis and St. Paul. Mr. Debauche prepared several issue area chapters of this comprehensive EIS, including the Environmental Justice Analysis (per Executive Order 12898), and the socioeconomics sections of the EIS.

PROFESSIONAL ASSOCIATIONS

- American Planning Association (APA), Chapter Member

DECLARATION OF
Christopher B Dennis, P.G.

I, **Christopher B. Dennis**, declare as follows:

1. I am presently employed by the California Energy Commission for the in the Environmental Office of the Siting, Transmission and Environmental Protection Division, as an Engineering Geologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepared the staff testimony on **Soil and Water Resources** for the Abengoa Mojave Solar project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed thereto.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: February 26, 2010 Signed: Original signed by C. Dennis

At: Sacramento, California

CHRISTOPHER B. DENNIS, P.G., J.D.

EXPERIENCE SUMMARY

Mr. Dennis is a licensed Professional Geologist with the State of California. His professional experience includes over 17 years of innovative technical and management experience. He has worked with a wide variety of CEQA and environmental management issues including soil, water, and waste compliance, investigation, and remediation. He has recently worked with siting and compliance of natural gas-fired and solar power plants. He has been a portfolio manager for several major oil companies and the East Bay Municipal Utility District's trench spoils program. He actively managed Unocal CERT, ExxonMobil, and ChevronTexaco pipeline, service station, bulk fueling, and terminal sites. He is knowledgeable of California's regulatory structure and laws, and is proficient in CEQA analysis, risk assessment, site assessment, remediation, environmental due diligence, and database/GIS development and management.

EDUCATION/REGISTRATION/CERTIFICATIONS

Pepperdine Law School, Certificate in Dispute Resolution, 1997
Whittier College of Law, J.D., 1996
California State University, Fullerton, B.S. Geology, 1989
Licensed Professional Geologist, State of California #7184
OSHA-SARA 40-Hour Hazardous Waste Activity Training 29 CFR 1910.120

PROFESSIONAL HISTORY

2007 to Current California Energy Commission, Engineering Geologist
2004 to 2007 Science Applications International Corporation, Senior Geologist
2004 to 2004 Bay Consulting Services, LLC, Principal
2001 to 2004 Cambria Environmental Technology, Inc., Senior Geologist
2000 to 2001 Alisto Engineering, Inc, Senior Geologist
1998 to 2000 TRC, Inc., Senior Geologist
1993 to 1995 GeoResearch, Inc., Project Manager
1990 to 1993 AeroVironment, Inc., Staff Geologist
1989 to 1990 Applied Geosciences, Inc., Technician

2007 to Current California Energy Commission, Sacramento, CA

Siting, Transmission, and Environmental Protection Division. Focusing on siting and compliance for simple-cycle, combined cycle, solar, and hybrid power plants. Developed a broad knowledge of CEQA impact analysis and mitigation involving water resources, water quality, soil resources, and waste management. Developed preliminary and final staff assessments involving issues of basin water management, overdraft, water quality, water conservation, water transfers, flood potential, and wind and water soil erosion. Deeply involved in issues surrounding the recently proposed large-scale solar power projects including project grading designs, flood management, water use, biological resource impacts, interagency cooperation, and laws, ordinances, regulations, and standards compliance. Also participating in the Quarterly Fuels and Energy Reporting (QFER) program and Environmental Policy Report. Oversaw the development of a QFER database for the collection and management of water use and wastewater discharge by all power plants 20 MW and greater in California.

2004 to 2007 Science Applications International Corporation, Sacramento, CA

Chevron, Northern California (various sites). Managed several former pipeline right-of-way and pump stations sites within the Central California region. Developed and implemented new written field quality assurance/quality control procedures for the entire portfolio of sites. Developed and implemented an analytical laboratory evaluation plan. Managed the groundwater monitoring and sampling program for the portfolio. Initiated low-flow sampling and the use of pre-packed filter screens in boreholes to reduce turbidity in groundwater samples and attain low risk-assessment level detection limits. Initiated a crude oil remediation study for the portfolio that is proving to be a pivotal tool for closure of the pipeline sites. Submitted the first soil vapor survey workplan to the RWQCB for the portfolio and was given approval of that workplan without comment. Worked with a GIS team to incorporate all pertinent site data into a web-based GIS and geo-reference the GIS as appropriate. This portfolio required a significant amount of for-end planning and coordination. Developed and managed all sites budgets and billing.

2004 to 2004 Bay Consulting Services, LLC, Rocklin, CA

Chevron, Northern California (various sites). Completed several closure requests with Tier I/II risk analysis. Started and operated this experimental company for two months.

2001 to 2004 Cambria Environmental Technology, San Ramon and Rocklin, CA

Chevron, Northern California (various sites). Responsible for a large portfolio (40 - 60+ active sites) of ChevronTexaco service station, bulk fueling, and terminal sites in Northern California, some of which were located in the sensitive Lake Tahoe area. Started Cambria's Rocklin office and grew that office to a staff of over 12 in less than a year through initiative and hard work. Helped develop and received State Underground Storage Tank (UST) Fund pre-approved for ~100 low-risk ChevronTexaco sites as part of a management transfer initiative. Through good regulatory communication, solid analysis, and hard work, closed over 30 sites in two years (half of one portfolio). Site closures were risk-based using both natural attenuation and active remediation approaches. Worked with Caltrans on a freeway (CA I-80) expansion project that required excavation and dewatering beneath a former Chevron site. Through a series of constructive meetings, built into the Caltrans request for bid, specifications for handling petroleum impacted excavated soils and water. The expansion project has proceeded as expected and planned. Liaison for the client and regulators. Developed and managed all sites budgets and billing.

East Bay Municipal Utility District, Northern California (various sites). Brought to Cambria a three-year, $275K/yr maximum EBMUD contract. The contract focused on pre-trenching activity soil sampling/analysis for potential contaminant identification and on trench spoils sampling/analyses for soil disposal. Developed a small group of professionals to manage this portfolio. As part of this project, managed several EPA SW-846 statistical soil analysis projects at District landfill sites with volumes up to ~180,000 cubic yards of landfilled soil. Created and surveyed statistical grids on the landfills and characterized the soil for removal to Class III or Class II landfills. Conducted site investigations and quarterly groundwater monitoring projects. Liaison for the client and regulators. Developed and managed all sites budgets and billing.

2000 - 2001 Alisto Engineering, Lafayette, CA

Caltrans, Northern California (various sites). Conducted statistical analyses of the soil from the shoulders of several Caltrans highways in Southern California. Performed the statistical analyses to determine lead hazard levels for use soil management planning in proposed construction corridors. The statistical analyses were performed on sample populations ranging from approximately 80 to 300. Liaison for the client and regulators. Developed and managed all sites budgets and billing.

Industrial Facilities, Northern California (various sites). Conducted site investigations at several industrial sites in Northern California. Developed storm water pollution prevention plans (SWPPPs) for development projects in downtown San Jose and a Caltrans project along CA I-680. Liaison for the client and regulators. Developed and managed all sites budgets and billing.

1998 - 2000 TRC, Concord, CA

ExxonMobil, Northern California (various sites). Responsible for a mid-size portfolio (15 - 20+ active sites) of ExxonMobil service station and bulk fueling sites in Northern California. Through good regulatory communication, solid analysis, and hard work, closed over 30 sites. Site closures were risk-based using both natural attenuation and active remediation approaches. For one bulk plant on the sensitive Napa River, secured a public recession of a RWQCB cleanup and abatement order and site closure for Mobil after two years of negotiations, technical presentations, and meetings. Conducted high vacuum, dual-phase extraction at several ExxonMobil sites. Liaison for the client and regulators. Developed and managed all sites budgets and billing.

Quick Stop Markets, Northern California (various sites). Developed and managed a small portfolio of Quick Stop Market sites in Northern California. Saved the client thousands of dollars in lease fees by closing a site through solid regulatory negotiation and communication, and aggressive site assessment and remediation. The site was located a few blocks upgradient from Lake Merritt in Oakland. Conducted high vacuum, dual-phase extraction at several Quick Stop sites. Liaison for the client and regulators. Developed and managed all sites budgets and billing.

Miscellaneous Sites, Northern California. Team member of the Level 3 Communications environmental impact report (EIR) submittals, preparing geologic hazard evaluations. Conducted site investigations at several industrial sites in Northern California. Liaison for the client and regulators. Developed and managed all sites budgets and billing.

1993 - 1995 Project Manager, GeoResearch, Long Beach, CA

Unocal CERT, Southern California (various sites). Project manager of a portfolio of active Unocal CERT sites. Frequently utilized mobile laboratories to assist in the placement of soil borings, vapor extraction, and groundwater wells. Conducted risk assessments, site assessments, tanks pulls, station demolitions, aquifer and vapor extraction tests, and remediation system designs and installations.

1990 - 1993 Staff Geologist, AeroVironment, Monrovia, CA

Project manager and project geologist for industrial sites and government projects. Team leader for documenting homestead well locations and archaeological and biological concerns at over 400 former homestead sites at Edwards AFB using GPS technology. Conducted groundwater sampling according to AFCEE protocols, and soil-vapor and geophysical surveys at Vandenberg AFB. Member of the design team of a mobile soil-vapor laboratory. Lead designer of an insitu soil-vapor sample collection system. Managed two teams for monitoring landfill vapor emissions and subsurface migration at active county operated landfills, and wrote the standard operating procedures, conducted field training, and prepared quarterly AQMD reports.

DECLARATION OF
Mike Conway

I, Mike Conway, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as an Engineering Geologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Soil and Water Resources** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:___March 2, 2010_ Signed:_Original signed by M. Conway

At: Sacramento, California

Resume For: Mike Conway

Education: Bachelor of Science in Geology, University of California, Davis, August 2003.
Master of Science in Geology, California State University, Sacramento, expected 2011

Certifications: Certified Professional in Erosion and Sediment Control (CPESC)
Certified Erosion, Sediment and Storm Water Inspector (CESSWI)
Leadership in Energy and Environmental Design Accredited Professional (LEED AP)

Experience:

Engineering Geologist: California Energy Commission, Sacramento, CA ***2009***

- Conduct analyses of soil and water resource reports submitted to Commission
- Assess impacts to soil and water resources from construction and operation of energy producing facilities
- Perform onsite evaluations of soil and water resources pre and post-project
- Implement a CEQA-like review of proposed energy projects to evaluate environmental impacts

Environmental Scientist: Central Valley Water Board, Rancho Cordova, CA ***2009***

- Wrote municipal storm water permits for Phase I communities in the Central Valley
- Reviewed storm water annual reports for Phase I and II municipalities
- Conducted audits of industrial sites for compliance with storm water permits
- Conducted audits of municipalities for compliance with municipal permits
- Help communities better understand how to effectively implement storm water programs
- Represented Water Board in large technical workshops and other public forums

Environmental Consultant: Wood Rodgers, Inc., Sacramento, CA ***2006-2009***

- Consulted clients on how to comply with Federal, State and local storm water quality and environmental regulations
- Helped public and private sector clients gain State Water Resources Control Board (SWRCB) permit coverage under Large and Small MS4 General Permits, NPDES Permits, CWA Section 401 Permits
- Consulted clients on Army Corps of Engineers, 404 Permitting
- Developed a storm water quality manual for Yolo County
- Prepared Caltrans environmental documentation and design for all project phases
- Prepared Storm Water Management Plans (SWMP) and Storm Water Pollution Prevention Plans (SWPPP)
- Drafted water pollution control exhibits using both AutoCAD and MicroStation
- Prepared Caltrans Storm Water Data Reports including cost estimates
- Designed landscaping plans for Caltrans' Modesto Ramp Rehabilitation Project
- Prepared Spill Prevention Control and Countermeasure (SPCC) plans
- Created Hazardous Materials Business Plan for City of Fort Bragg, California
- Prepared proposals for outgoing environmental quality project bids
- Performed field visits to evaluate Best Management Practice (BMP) effectiveness in reducing erosion and sedimentation
- Facilitated multiple storm water quality training workshops for groups up to 20 plus

Storm Water Quality Consultant: Envirosafety Services, Elk Grove, CA ***2004-2006***

- Wrote site specific SWPPPs to include guidance specific to city, county, and geographical constraints
- Designed BMP exhibits using AutoCAD
- Conducted inspections at construction sites throughout the Central Valley for (SWPPP) compliance
- Resolved storm water compliance issues in cooperation with site superintendents, county and city inspectors
- Researched current storm water protection regulations to best protect clients

Post-Graduate Researcher: Dept. of Land, Air, and Water Resources, U.C. Davis, CA ***2003***

- Studied the effects of irrigation practices on wetland ecology and water quality
- Independently organized monthly analyses and data processing of selenium contaminated invertebrate, algae, and water samples from the Tulare Lake Drainage District
- Managed concentrated acids, carcinogenic solutions, and final fluorescence measurements
- Compiled research data and presented findings to a team of eight colleagues

Lab Technician: Raney Geotechnical Laboratory, West Sacramento, CA ***2001***

- Conducted moisture density, unconfined compression tests, Atterburg Limit, curve, plasticity tests, and basic calculations for soil samples
- Administered load tests on concrete cylinders and mortar samples
- Performed percolation tests and Dynamic Cone Penetrator (DCP) tests in the field and gathered water samples for environmental analysis

DECLARATION OF
John L. Fio

I, John L. Fio, declare as follows:

1. I am presently a consultant to the California Energy Commission for the Siting Office of the Energy Facilities Siting Division as a Hydrogeologic Consultant through Aspen Environmental Group**.**

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Soil and Water Resources** for the Abengoa Mojave Solar project based on my independent analysis of the Application for Certification and the supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: February 22, 2010 Signed: Original signed by J. Fio

At: Davis, California

JOHN L. FIO

QUALIFICATIONS

John L. Fio has over 25 years of problem-solving experience. Mr. Fio analyzes groundwater systems, quantifies chemical transport in the subsurface, and evaluates groundwater surface-water interactions. He is a recognized expert on hydrologic and water quality issues in the San Francisco Bay Area and the San Joaquin Valley, California.

John Fio:

- Develops and employs numerical models for site, water district, and basin-wide investigations.
- Calculates extraction effects on groundwater levels, stream flow, and lake levels.
- Establishes water quality monitoring programs.
- Designs water management plans.
- Evaluates groundwater quality effects of wastewater and recycled water disposal to land.
- Develops and implements Geographic Information System (GIS) databases.
- Determines water sources using chemical and age-dating techniques.

PROFESSIONAL EXPERIENCE

January, 1998 – present

Principal Hydrologist, HydroFocus, Inc. *Davis, CA*

- Technical Groundwater Expert, Bureau of Water and Power, City of Beijing, China. Providing review, oversight, and direction for data collection, data interpretation, and groundwater-flow and constituent transport modeling of recycled water groundwater storage project.
- Water supply master plan, California Water Service Company, South San Francisco, California. Assessed water supply and quality benefits of alternative water supply projects in the Westside Groundwater Basin.
- Data and modeling analysis of regional drainage conditions – San Joaquin Valley, California.
- Groundwater-flow, solute-transport, and water-quality impacts from wastewater disposal to land: sanitary districts and municipalities located in San Joaquin and Contra Costa Counties, California.
- Groundwater quality, sea water intrusion and groundwater flow in San Francisco and San Mateo Counties, California.   Field data collection, groundwater-flow and geochemical modeling to define seawater intrusion and quantify processes affecting groundwater quality.
- Groundwater extraction to control and remediate solvent plume – San Mateo County. Use of groundwater-flow model and field data collection and analysis to quantify contaminant movement and remediation.

- Quantitative hydrogeochemical assessment of contaminant transport near Menlo Park, California. Development of groundwater-flow and solute-transport models to quantify hydrocarbon transport beneath industrial facility near San Francisco Bay.
- Groundwater recharge and subsurface storage, Merced County, California. Developed and implemented regional groundwater-flow model to assess groundwater recharge and pumping projects.
- Depletion of subsurface flow to the North Platte River, Wyoming and Nebraska. Data analysis and modeling of stream aquifer interactions in support of interstate water rights conflict.
- Hydrologic and geochemical impacts of groundwater pumping and surface water injection– Sacramento County.

1995 to 1997

Senior Project Hydrologist, Hydrologic Consultants, Inc. *Sacramento, CA*

Project experience in the evaluation of groundwater flow, water quality, and solute transport. Consulting assignments included the following:

- Developed relationships to describe geologic controls and load-flow relationships for Santa Ynez River drainage system. The Santa Ynez River is a significant source of water recharging the Lompoc Groundwater Basin, and the relationships were part of a network of interacting reservoir operations, surface-water, and groundwater-flow and transport models.
- Evaluation of groundwater-flow paths beneath South San Francisco Bay. The groundwater-flow system was quantified using a groundwater-flow model to assess system response to pumping centers located east and west of the Bay.
- Coordination with the California Regional Water Quality Control Board on the remediation of a VOC plume in Mountain View, California.
- Assess the response of groundwater levels, streamflow, and spring discharge to groundwater pumpage in the Mammoth Basin, California.
- Quantifying stream flow depletions owing to increased consumption and groundwater pumping.

1990 to 1995

Research Grade Hydraulic Engineer, U.S. Geological Survey Sacramento, CA

- Conducted regional and geohydrologic and groundwater quality investigations in the western San Joaquin Valley, California.
- Directed the development of a regional Geographic Information System database for the South San Francisco and Peninsula Area, California.
- Supervised data collection and development of databases, data analyses, and report writing.
- Constructed groundwater flow models for parts of the western San Joaquin Valley and South San Francisco Bay areas, California.
- Interacted with private and public cooperators and funding agencies.

1987 to 1990

Civil Engineer, U.S. Geological Survey *Sacramento, CA*

- Conducted field-scale investigations of on-farm drainage systems.
- Developed groundwater-flow model of tile drainage system. Assessed flow paths and salt transport in shallow flow-system. Quantified regional groundwater-flow paths intercepted by on-farm drainage systems.
- Integrated particle-tracking models with groundwater-flow model results to assess advective transport of salts and selenium.

1985 to 1987

Hydrologist, U.S. Geological Survey *Sacramento, CA*

- Designed and conducted sorption experiments and incorporated results into a solute transport model.
- Assessed the distribution of salts and selenium in unsaturated and saturated soil profiles.
- Developed analytical method to estimate organic selenium concentrations in soil extracts.

1983 to 1984

Research Assistant, University of California *Davis, CA*

- Conducted an assessment of methods used to analyze for selenium in soil extracts, aqueous samples, and animal tissues.
- Implemented experiments to assess arsenic volatilization from soils.
- Conducted laboratory analyses to estimate the buffering capacity of soils in response to acidic deposition.

ACADEMIC BACKGROUND

Master of Science, 1987, Civil Engineering, University of California at Davis
Bachelor of Science, 1984, Soil and Water Science, University of California at Davis

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers
Association of Groundwater Scientists and Engineers
California Groundwater Resources Association

AWARDS AND HONORS

U.S. Geological Survey Performance Award: 1989, 1990, 1992, 1993, and 1994
Citation for Outstanding Performance, University of California, Davis (1981)
Edward Kraft Scholarship Prize, University of California, Davis (1981)

RELEVANT PUBLICATIONS

Hydrogeology of the San Francisco Bay Area

Metzger, L.F. and ***Fio, John L.***, 1997, Ground-water development and the effects on ground-water levels and water quality in the Town of Atherton, San Mateo County, California, U.S. Geological Survey Water-Resources Investigations Report 97-4033, 31p.

Fio, John L., and Leighton, D.A., 1995, Geohydrologic framework, Historical Development of the ground-water system, and general hydrologic and water-quality conditions in 1990, south San Francisco Bay and Peninsula area, California: U.S. Geologic Survey Open-File Report 94-357, 46 p.

Leighton, D.A., ***Fio, John L.***, and Metzger, L.F., 1995, Database of well and areal data, South San Francisco Bay and Peninsula area, California: U.S. Geological Survey Water-Resources Investigation Report 94-4151, 47 p.

Geochemistry and Salt Migration

Fio, John L., Fujii, R. and Deverel, S.J., 1991, Selenium mobility and distribution in irrigated and nonirrigated alluvial soils: Soil Science Society of America Journal, v. 55, p. 1313-1320.

Deverel, S.J., and ***Fio, John L.***, 1991, Ground-water Flow and solute movement to drain laterals, western San Joaquin Valley, California. 1: Geochemical Assessment, Water Resources Research, v. 27, no. 9, 2233-2246 p.

Fio, John L., and Fujii, R., 1990, Selenium speciation methods and application to soil saturation extracts from San Joaquin Valley, California: Soil Science Society of America Journal, v. 54, p. 363-369.

Fujii, R, and ***Fio, John L.***, 1988, Partitioning and speciation of soluble and adsorbed selenium in soils: Agronomy Abstracts, Amer. Soc. Agron. Annual meetings, Anaheim, California, p. 196-97.

Numerical Modeling – Groundwater flow and contaminant transport

Fio, John L., 1997, Geohydrologic effects on drainwater quality: Journal of Irrigation and Drainage Engineering, ASCE 123(3).

Fio, John L., and Leighton, D.A., 1994, Effects of ground-water chemistry and flow on quality of drainflow in the western San Joaquin Valley, California: U.S. Geological Survey Open-File Report 94-72, 28 p.

Fio, John L., 1994 Calculation of a water budget and delineation of contributing sources to drain flows in the western San Joaquin Valley, California: U.S. Geological Survey Open-File Report 94-45, 28 p.

Barlow, Paul M., Wagner, B.J., Belitz, K., and ***Fio, John L.***, 1993, Effects of Management alternatives on the shallow, saline ground water in the western San Joaquin Valley, California, Water Fact Sheet, Open-File Report 93-665.

Fio, John L., and Deverel, S.J., 1991, Ground-water flow and solute movement to drain laterals, western San Joaquin Valley, California. 2: Quantitative hydrologic assessment. Water Resources Research, v. 27, no. 9, 2247-2257 p.

Fio, John L., and Deverel, S.J., 1990, Interaction of shallow ground water and subsurface drains: implications for selenium transport and distribution in the western San Joaquin Valley, California. Abstract for technical session on ground-water flow systems and land use: relation to quality of shallow ground water, Association of Ground Water Scientists and Engineers, Anaheim, California, in Journal of Ground Water, v. 28, no. 5, p. 788-789.

Fio, John L., and Deverel, S.J., 1989, Ground-water flow to subsurface drains in the western San Joaquin Valley, California: U.S. Geological Survey Second National Symposium on Water Quality, Orlando, Florida, November 12-17, 1989, abstracts and technical sessions, U.S. Geological Survey Open-File Report 89-409, p. 25.

Fio, John L., and Deverel, S.J., 1988, Ground-water flow to subsurface agricultural drains in the western San Joaquin Valley, California: Transactions of the American Geophysical Union, v. 69, no. 44.

Monitoring

Leighton, D.A. and ***Fio, John L.***, 1995, Evaluation of a monitoring program for assessing the effects of management practices on the quantity and quality of drainwater from the Panoche Water District, Western San Joaquin Valley, California, U.S. Geological Survey Open-File Report 95-731, 25 p.

Puckett, L.K., Alemi, M.M., Fan, A.M., ***Fio, John L.***, Hansen, D., Wallender, and W., Wernette, F., 1992, Long-term monitoring plan, San Joaquin Valley Drainage Implementation Program.

DECLARATION OF
Eugene B. (Gus) Yates

I, Gus Yates, declare as follows:

1. I am presently a consultant to the California Energy Commission for the Siting Office of the Energy Facilities Siting Division as a Hydrogeologic Consultant through Aspen Environmental Group**.**

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Soil and Water Resources** for the Abengoa Mojave Solar project based on my independent analysis of the Application for Certification and the supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: February 22, 2010 Signed: Original signed by E. Yates

At: Davis, California

EUGENE B. (GUS) YATES

QUALIFICATIONS

Gus Yates has been a professional hydrologist in California for over 25 years. His role in water resources management projects commonly bridges the technical and policy realms. He specializes in rapidly identifying the key water-related issues for a project and addressing them with appropriate quantitative tools that make the best use of available data. He ties his technical work back into management plans and regulatory compliance documents. He has extensive experience in analysis and management of groundwater basins and related surface water and habitat systems throughout central and northern California. Mr. Yates is registered with the State of California as a professional geologist and certified hydrogeologist.

PROFESSIONAL EXPERIENCE

April, 2009 – present

Senior Hydrologist, HydroFocus Inc. *Davis, CA*

Evaluates groundwater conditions at local and basinwide scales using modeling and statistical techniques; leads stakeholder processes to develop groundwater and watershed management plans that are grounded in technical understanding of the hydrologic system; applies operations models to optimize project design and quantify environmental impacts; applies training and experience in CEQA, NEPA, water-quality regulations, water rights, group facilitation, and litigation.

January, 1999 - March, 2009

Consulting Hydrologist in Private Practice *Berkeley, CA*

- Groundwater flow and transport model, San Benito County, CA – Developed a regional groundwater flow and salinity model with MODFLOW and MT3DMS.
- Groundwater flow model, Laguna Seca subarea, Monterey County, CA – Developed and jointly calibrated a soil-moisture-recharge model and groundwater flow model to evaluate safe yield in a small, structurally complex coastal basin.
- Southeast Chico drainage study – Applied MODFLOW and HEC-RAS models to determine the cause of periodic shallow flooding in a new suburb.
- Groundwater flow model, Yuba goldfields wet-pit gravel quarry, Yuba County, CA – Developed a local-scale MODFLOW model to estimate the impacts of a proposed gravel quarry that would penetrate a regional confining layer.
- Seaside Basin update on groundwater conditions, Seaside, CA – Updated and improved prior estimates of pumping, recharge, aquifer characteristics and yield to help resolve a water-rights dispute.
- Cambria Community Services District water-supply master plan – Quantified the frequency and duration of drought-related water shortages and evaluated feasibility of water supply alternatives.
- Fish habitat improvements, Yolo Bypass, CA -- Applied HEC-RAS stream hydraulics model with input from landowners and biologist to design creek modifications that would improve anadromous fish passage and create localized inundation for splittail spawning and rearing.

- Integrated water resources management plan, Yolo County, CA -- Provided technical expertise and local knowledge as coauthor of a countywide water management with state and local agencies.
- Groundwater management plan, Soquel Creek Water District, Santa Cruz County, CA -- Served as technical advisor and coauthor for GMP update to meet SB1938 requirements and focus monitoring and management actions on emerging key issues.

1991-1999

Environmental Scientist, Jones & Stokes Associates *Sacramento, CA*

- Willow Slough watershed management plan, Yolo County, CA – Facilitated stakeholder process; documented groundwater, flooding and habitat conditions; and developed BMPs for agriculture.
- Groundwater management plan, northern San Benito County, CA – Served as facilitator, technical advisor and author for a multi-party planning process to identify issues and realistic solutions in a heavily-used groundwater basin.
- Subsidence impacts of groundwater pumping, Mendota, CA – Developed regression equations based on extensive USGS data to predict subsidence from groundwater transfers.
- Nitrate contamination from septic systems, Los Osos, CA – Served as expert advisor for field investigation of nitrate contamination from septic systems in a sandy coastal aquifer.
- Operations model for conjunctive use of desal plant and groundwater, Cambria, CA – Developed a probabilistic, real-time operations model to guide the conjunctive use of a desalination plant with existing water-supply wells.
- Instream flow litigation, Putah Creek, Yolo and Solano Counties, CA – Expert witness in a trial challenging the adequacy of instream flows below Monticello Dam.

1982-1990

Hydrologist, U.S. Geological Survey *Sacramento, CA*

- Groundwater model of Salinas Valley groundwater basin, Monterey County, CA – Developed one of the earliest models of the Salinas Valley groundwater basin and applied optimization theory to conjuncitve use operations.
- Groundwater flow model, Los Osos, CA – Created a groundwater flow model to evaluate 3-D interactions of Los Osos Creek, the Pacific Ocean and groundwater flow in a layered coastal groundwater basin. Subsequently added solute transport module to estimate long-term nitrate impacts of a wastewater project.
- Groundwater flow and quality, Santa Rosa and San Simeon Creek basins, Cambria, CA – Managed a comprehensive investigation of groundwater conditions in two coastal stream valleys, and developed finite-element models to integrate data and explore management options.

ACADEMIC BACKGROUND

Master of Science, 1985, Water Science, University of California at Davis
Bachelor of Arts, 1979, Geology, Harvard University, Cambridge, MA

PROFESSIONAL AFFILIATIONS

American Institute of Hydrology – certified professional hydrogeologist
Groundwater Resources Association of California

DECLARATION OF
Steven J Brown, PE

I, Steven J Brown, declare as follows:

1. I have been retained as a consultant to the California Energy Commission for my professional specialty of transportation.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Traffic & Transportation Section** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/25/10 Signed: Original signed by S. Brown

At: Santa Monica, CA

STEVEN J. BROWN, PE

Senior Principal

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Mr. Brown is a Senior Principal with 22 years of experience in transportation planning and engineering. In addition to his 15 years of consulting experience, Mr. Brown was the Director of Transportation Planning for the City of Sacramento. He has managed projects in 8 states that include the following disciplines: transportation master plans, traffic calming, environmental impact assessments, parking and circulation studies, bicycle and pedestrian facility plans, new-urbanist planning, freeway interchanges, intersection/signal designs and corridor studies. Mr. Brown earned a Master's Degree in Transportation from the University of California, Berkeley, and a Master's in Business Administration from Golden Gate University in San Francisco. He is a registered traffic engineer in California.

EDUCATION

Bachelor of Science in Civil Engineering with Honors, University of California, Berkeley, 1985
Master of Science in Transportation, University of California at Berkeley, 1987
Masters in Business Administration, Golden Gate University, 1998

PROFESSIONAL AFFILIATIONS

Institute of Transportation Engineers (ITE):Member, Northern California Section President 2000-2001, Co-chair ITE District 6 Conference, 2004

PROFESSIONAL REGISTRATION

Licensed Traffic Engineer, State of California (TR1510)

AREAS OF EXPERTISE

Traffic Engineering •

PUBLICATIONS

US Traffic Calming Manual, co-authored with Reid Ewing, APA & ASCE, 2009
Skinny Streets, co-authored with Reid Ewing, ULI July 2007
Traffic Calming Revisited, co-authored with Reid Ewing and Aaron Hoyt, ITE Journal November 2005
Traffic Calming Revisited, TRB Conference, 2004
Community Based Street Design Standards, co-authored with Gwen Owens, ITE District 6 Conference, 1998
Measurable Traffic Calming Results, co-authored with Martin Hanneman & Ken Grehm, ITE District 6 Annual Conference, 1999
Calming the Community (Traffic Calming in Downtown Sacramento), co-authored with Steve Fitzsimons, ITE National and District 6 Conference, 1997
Traffic-Generation Characteristics of Distribution Centers, co-authored with Alan Telford, ITE District 6 Conference, 1990
The Single-Signal Interchange, co-authored with Gerald Walters, ITE National Conference, 1988

CEC PROJECTS

Moss Landing
Sterling Solar 2
Abengoa Mojave
Morro Bay

DECLARATION OF
Dr. Obed Odoemelam

I, Obed Odoemelam, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as a **Staff Toxicologist**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Transmission Line Safety and Nuisance** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 3/3/10 Signed: Original signed by O. Odoemelam

At: Sacramento, California

RESUME

DR. OBED ODOEMELAM

EDUCATION:

1979-1981 University of California, Davis, California. Ph.D., Ecotoxicology

1976-1978 University of Wisconsin, Eau Claire, Wisconsin. M.S., Biology.

1972-1976 University of Wisconsin, Eau Claire, Wisconsin. B.S., Biology

EXPERIENCE:

1989
The Present: California Energy Commission. Staff Toxicologist.

Responsible for the technical oversight of staffs from all Divisions in the Commission as well as outside consultants or University researchers who manage or conduct multi-disciplinary research in support of Commission programs. Research is in the following program areas: Energy conservation-related indoor pollution, power plant-related outdoor pollution, power plant-related waste management, alternative fuels-related health effects, waste water treatment, and the health effects of electromagnetic fields. Serve as scientific adviser to Commissioners and Commission staff on issues related to energy conservation. Serve on statewide advisory panels on issues related to multiple chemical sensitivity, ventilation standards, electromagnetic field regulation, health risk assessment, and outdoor pollution control technology. Testify as an expert witness at Commission hearings and before the California legislature on health issues related to energy development and conservation. Review research proposals and findings for policy implications, interact with federal and state agencies and industry on the establishment of exposure limits for environmental pollutants, and prepare reports for publication.

1985-1989 California Energy Commission.

Responsible for assessing the potential impacts of criteria and noncriteria pollutants and hazardous wastes associated with the construction, operation and decommissioning of specific power plant projects. Testified before the Commission in the power plant certification process, and interacted with federal and state agencies on the establishment of environmental limits for air and water pollutants.

1983-1985 California Department of Food and Agriculture.

Environmental Health Specialist.

Evaluated pesticide registration data regarding the health and environmental effects of agricultural chemicals. Prepared reports for public information in connection with the eradication of specific agricultural pests in California.

DECLARATION OF
William D. Kanemoto

I**,** William Kanemoto**,** declare as follows:

1. I am presently under contract with Aspen Environmental Group, a contractor to the California Energy Commission, Systems Assessment and Facilities Siting Division. I am serving as a Visual Resource Specialist to provide Peak Workload Support for the Energy Facility Siting Program and for the Energy Planning Program.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I participated in preparation of staff testimony on Visual Resources for the **Abengoa Mojave Solar Project** based on my independent analysis of the Application for Certification and supplements hereto, data from documents and sources deemed to be reliable, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions applicable to the vapor plume simulations and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 26, 2010 Signed: ____________

At: Oakland, California

William Kanemoto

Visual Resource/Aesthetics Analyst

Academic Background:

M. Landscape Architecture, University of Michigan, Ann Arbor, 1982
B.A. Liberal Arts (Honors), University of California, Santa Cruz, 1973

Professional Experience:

Principal
William Kanemoto & Associates, Oakland, California, 1993 - Present

William Kanemoto is Principal of William Kanemoto & Associates, an environmental consulting practice specializing in visual analysis and computer visualization in the context of environmental review. In this capacity he has served as principal investigator for visual analysis and simulation on a wide range of major infrastructure and development projects, including the High Desert Power Project AFC, Port of Oakland Expansion EIS, Route 4 East/Pittsburg BART EIS, FMC Substation and Transmission Line PEA, and numerous other infrastructure and transportation projects. Mr. Kanemoto received recognition from the California Association of Environmental Professionals for visual analysis, computer simulation, animation, and video production for the Stanford Sand Hill Road Projects EIR, prepared by EIP Associates and judged 'Best State-Wide EIR of 1997'.

Associate Director
Environmental Simulation Laboratory,
Institute of Urban and Regional Development,
Center for Environmental Design Research
University of California, Berkeley, 1994 - 2000

Instructed graduate students in the College of Environmental Design, U.C. Berkeley, served as consultant on various major planning projects in the San Francisco Bay Area, and conducted design collaborations with counterparts at Keio University and ARK CyberUniversity in Tokyo, Japan via the Internet.

Principal Investigator/Project Manager
Dames & Moore, San Francisco/Oakland, California, 1988-1992

Served as principal investigator of numerous visual analyses of major infrastructure projects throughout the U.S., in Europe, and in Asia. Gained extensive familiarity with the application of a wide range of professionally accepted visual assessment techniques in the context of CEQA, NEPA, and related regulatory requirements of the CPUC, CEC, FERC, DOT, U.S. Forest Service, BLM, and other agencies.

Project Manager
LSA Associates, Pt. Richmond, California, 1987-1988

Project manager and planner on environmental impact reports for various residential and commercial development projects in northern California.

Environmental Planner
Holton Associates, Berkeley, California, 1984-1987

Preparation of various resource and regulatory studies including EIRs, FERC Exhibit E, Section 404 alternative analyses, riparian restoration studies, and cumulative impact methodology studies for EPRI and Sierra County, CA.

DECLARATION OF
JAMES EARL JEWELL

I, James Earl Jewell, declare as follows:

1. I am currently under contract with the Aspen Environmental Group to provide environmental technical assistance to the California Energy Commission. Under Contract No. 700-05-002 I am serving as an Illuminating Engineer to provide Peak Workload Support for the Energy Facility Siting Program and for the Energy Planning Program.

2. A copy of my professional qualifications and experience is attached hereto and incorporated herein.

3. I assisted in the preparation of the final staff testimony on Visual Resources for the Abengoa Mojave Solar Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable sources and documents, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is accurate and valid with respect to the issues addressed therein.

5. I am familiar personally with the facts and conclusions applicable to matters of intrusive light and glare and relative brightnesses, and if called as a witness, could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 18 February, 2010 Signed: Original signed by J. Jewell

At: San Francisco, California

JAMES EARL JEWELL, LC, ATF, IES, CIES (Hon), SAH

EDUCATION:
- BA, College of the Pacific
- MFA, School of Drama, Yale University

EMPLOYMENT:
- 1957-67, Engineering Division, Holzmueller Corporation
- 1967-69, Theatre Consulting Service, Bolt, Beranek & Newman
- 1969-87, Lighting Services Administrator, Pacific Gas & Electric Company
- 1987- present, Consultant in Lighting
  - Since 1993 in association with Alan Lindsley, AIA, IES

PROFESSIONAL ACTIVITIES:

Illuminating Engineering Society
- President – 1984-85
- Vice President – 1983-84
- Director – 1979-86
- Office Lighting Committee – 1976 - present, Chairman, 1978-80
- Roadway Lighting Committee – 1974 – present, Chairman, 1990-92
- Regional Energy Committee Chairman – 1974-76, 1978-84
- Energy Advisory Committee – 1973-75
- Technical Missions – China – 1984, 1987, 1988

European Lighting Congress: Strasbourg, 1969; Florence, 1977; Granada, 1981; Lausanne, 1985; Budapest, 1989; Edinburgh, 1993; Berlin, 2001

Pacific Basin Lighting Congress: Chairman, Shanghai, 1989; Bangkok, 1993; Nagoya, 1997; Organizing Committee, Delhi, 2002; Cairns, 2005; Bangkok, 2009

Edison Electric Institute: Street Lighting Committee – 1971-87, Chairman 1979-81

International Commission on Illumination:
- Board of Administration – 1983-87, 1987-91
- Division Four (Lighting for Transport)
  - Technical Committee 4.34 -- 1980-95
  - Technical Committee 4.25 -- 1992-99

Professional Light Designers Convention: London, 2007; Berlin, 2009

Expert Witness – Admitted as an expert witness in the Superior Courts of Amador, Contra Costa, and San Francisco Counties.

AWARDS AND HONOURS:

IES Regional Technical Award – 1985
IES Distinguished Service Award – 1986
College of Fellows of the American Theatre --1988
Honourary Member, China IES – 1989
CIE Distinguished Service Award – 1991
IES Louis B. Marks Award – 1993

CERTIFICATION:

LC – Granted in 1990 by the National Council on the Qualification of Lighting Professionals

RELEVENT WORK EXPEREIENCE:

With PG&E appeared before CEC Committee and Staff on lighting issues with respect to the siting and licensing of Geysers steam power plants.

On behalf of PG&E and the IES appeared before the Simonson Committee to consult on the development of the lighting portions of Title 24.

On behalf of PG&E and the IES appeared before the CEC on numerous occasions to support the development of fluorescent lamp promotional programs and to assist in developing rigorous lighting ballast standards for California and on other lighting energy management issues.

While at PG&E supported and oversaw funding for projects on daylight following and electronic ballasts. Projects supported by both the DOE and CEC.

In practice as a lighting consultant worked with private clients and jurisdictions on matters concerned with light trespass and "intrusive" lighting.

JEJewell
19 February, 2010

DECLARATION OF
Thomas Packard

I, Thomas Packard, declare as follows:

1. I am presently under contract with William Kanemoto to provide environmental technical assistance to Aspen Environmental Group and the California Energy Commission. I am serving as a Visual Resource Specialist to provide Peak Workload Support for the Energy Facility Siting Program and for the Energy Planning Program.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Visual Resources** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from documents and sources deemed to be reliable, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: February 1, 2010 Signed: Original signed by T. Packard

At: Oakland, California

TOM PACKARD
& ASSOCIATES

Thomas Packard, ASLA
Tom Packard & Associates

Tom Packard is a freelance planning consultant who specializes exclusively in scenic resource planning, visual impact assessment, and visual impact mitigation. Educated in landscape architecture, Mr. Packard has over 23 years of experience preparing scenic resource management plans and conducting visual impact studies. He has worked in both the private and public sector on projects ranging from urban and parkland development to transportation, mining, and major utilities. Much of his work during the past five years has been in the Lake Tahoe Basin. Mr. Packard has designed and conducted comprehensive visual surveys of landscapes covering large areas as the basis for developing land use and resource management plans. He has designed and implemented public perception studies as a means of determining visual impacts of projects that have unique circumstances. He is experienced in the technical application of all major visual assessment methodologies, particularly the Scenery Management System employed by the USDA Forest Service, the Visual Management System used by the Bureau of Land Management, and the Tahoe Regional Planning Agency's Scenic Resource Threshold system. Mr. Packard lectures on the subject of visual resource management and impact assessment.

Selected Project Experience

- Principal Investigator and Project Manager for the **Landscape Inventory and Character Type Mapping of the Shoreline Area of Lake Tahoe.** This project was conducted for the Tahoe Regional Planning Agency as part of its 2007 update of the Regional Plan for the Lake Tahoe Basin. The inventory, which examines the Tahoe Basin landscape as seen from the surface of Lake Tahoe, provides detailed tabular and photographic documentation of the landscape's physical features and appearance characteristics. The inventory focuses on attributes of the natural landscape and the characteristics of human development. The data was used to define and map shoreline landscape character types and determining their ability to absorb human development without a loss in visual quality or exhibit undesirable changes in visual character. The information is suitable for formulating spatially explicit design guidelines that account for and respond to the specific landscape conditions in each area.

- Principal Investigator of scenic resources for the proposed **Stateline to Stateline Bike Trail Project**. The proposed project, presently in the planning stages, consists of a continuous, 30-mile long bike trail from North Stateline around the east side of Lake Tahoe to South Stateline. As part of a multi-disciplinary team, scenic resources are being studied to identify opportunities and constraints of potential routes for the bike trail. Potential impacts of the bike trail on scenic quality threshold indicators are being determined as part of the environmental review of the project.

- Principal Author and Project Manager of the **Eastshore Drive National Scenic Byway Corridor Management Plan** for 15 miles of State Route 28 along the east shore of Lake Tahoe within the State of Nevada. The Scenic Byway Corridor Management Plan addressed natural and cultural resource protection, interpretation of significant features, issues associated with limited parking, and provision of public access to beaches. The study area, from Incline Village south to Spooner Summit, receives heavy, year-round recreation use. Worked directly with the Scenic Byway Steering Committee throughout the project. Coordinated the involvement of the Tahoe Regional Planning Agency, Nevada DOT, US

Forest Service, Nevada Division of State Parks, county agencies and local jurisdictions, private citizens and public special interest groups.

- Principal Investigator for the **Marin County Local Coastal Program Inventory of Visual and Scenic Resources** as part of the County's recent update of their Local Coastal Plan. The inventory produced mapped, written, and photographic records of the coastal landscape as of February-March 2003. In addition, key viewpoints from which important scenic resources are seen and where outstanding vistas occur were identified and mapped. The County used this information to revise local coastal planning policies that guide future planning decisions.

- Principal investigator of potential visual impacts for the proposed **Beach Club on Lake Tahoe Project EIS**. The proposed project consists of a 20-acre, 142-unit condominium development in Douglas County, Nevada off of US Highway 50 reaching to the shore of Lake Tahoe. It includes a beachfront clubhouse with 159-foot pier. The project's scenic quality impacts were evaluated in accordance with the TRPA Code of Ordinances and Scenic Threshold Standards. The potential effect on TRPA scenic quality threshold indicators (SR-1 through SR-4) was determined by analyzing the visual presence of the proposed project as if built through the use of photo simulations. Compliance with the Code of Ordinances Chapter 30 - Design Standards was also evaluated. In the shoreland portion of the project, consistency with shoreland ordinances was determined by applying the Visual Magnitude – Contrast Rating System.

- Principal Investigator of the **Visual Resource Survey of Point Molaté** as part of the San Pablo Peninsula Open Space Study. The study involved cataloguing landscape features and characteristics of the study site and the major views that occur within and from the study area located at the north end of the San Francisco Bay. The visual characteristics of topography and landform, vegetation types and patterns, man-made features, shoreline configuration, views to off-site areas, views of on-site areas, and major features of visual interest were recorded. The information was used to analyze landscape character, assess scenic quality, and to identify visual resources opportunities and constrains for potential future public recreation use of the area.

- Member of TRPA Science Team, a panel of 11 different resource experts participating as Core Group members in the **Pathway 2007 Tahoe Regional Plan Update** by the Tahoe Regional Planning Agency and US Forest Service. Mr. Packard was selected as a panel member for his expertise in evaluating scenic resources, his knowledge of the TRPA scenic threshold system, and his understanding of US Forest Service Scenery Management practices. He helped develop proposed modifications to the Scenic Threshold system and scenic resource management strategies for future implementation.

- Principal Investigator of aesthetic resources for the **Cloverdale Ranch Study**, a project of the Peninsula Open Space Trust (POST). The project site is located on along the Pacific Coast on 5,638 acres between Ano Nuevo State Reserve and Butano State Park in San Mateo County, California. The study consisted of an inventory of the landscape and evaluation of scenic opportunities and constraints as part of the process to develop a unified vision and implementation strategy for the preservation, restoration, and enhancement of the ranch land for future public use and enjoyment.

Other Project Experience

- Investigator of visual impacts for the **Sonoma Country Inn EIR** which evaluated a proposed hillside restaurant, 50-room resort facility, and new winery near the Town of Kenwood in a highly scenic area of Sonoma County along Route 12, a designated State Scenic Highway.
- Principal investigator of visual impacts for the proposed **Village at Loch Lomond Marina Development**, a mixed use, waterfront project in San Rafael, California
- Prepared visual impact assessment as part of the City of Emeryville's **Saint Alban's Senior Housing Project EIR**, California, which studied the potential visual impacts of a proposed high-rise building on the Emeryville Peninsula on the east shore of San Francisco Bay.
- Principal investigator of visual/aesthetic and shadow impacts of the proposed **Rincon Sports and Entertainment Center** in downtown San Francisco, which considered view blockage and consistency of the visual character, mass, and scale of the proposed project with existing development in the surrounding area.
- Principal Investigator and Project Manager for the visual impact assessment of the **NAS Alameda Reuse Plan EIS/EIR**.
- Co-Investigator and Project Manager for the visual impact assessment of the **NS Treasure Island Reuse Plan EIS/EIR**.
- Prepared the visual analysis for the City of San Leandro's **Lake Chabot Terrace Project EIR**, California, which examined the potential visual effects of developing a 60-acre quarry site with approximately 137 single-family houses, identified building and layout design alternatives, and suggested ways to reduce or avoid adverse visual effects.
- Principal Investigator and Project Manager of the **Visibility Study of the East Palo Alto University Circle Redevelopment Project** that evaluated the degree of visual intrusion on Palo Alto neighborhoods that would result from two proposed 275-foot office towers and associated development in nearby East Palo Alto.
- Principal Investigator and Project Manager of the **Lafayette Athletic Club Visibility Study**.
- Prepared visual analysis for the **North Wavecrest Redevelopment Project Specific Plan and EIR** which examined the potential effects of subdividing and developing a vacant 490-acre coastal site immediately adjacent to State Highway 1 (Cabrillo Highway) and the Pacific Ocean in the City of Half Moon Bay, California.
- Principal Investigator of visual impacts for the **Palo Verde Ranch EIR** for a 340-unit subdivision project located on 485 acres of land along the south side of I-580 between Pleasanton and Hayward, California.
- Prepared visual analysis for the Town of Ross' **Monte Bello Subdivision EIR**, California, which examined the potential effects of subdividing a 37-acre vacant site immediately adjacent to a local park and Marin Municipal Water District watershed lands.
- Principal Investigator and Aesthetic Resource Analyst for the **West Pleasanton Expanded Planning Area Study**.
- Principal Investigator of potential visual impacts of various development scenarios for the **Bernal Property** in Pleasanton, California.
- Principal investigator of visual impacts for the proposed **Academy Heights Residential Development**, a high-end development project of seven lots in San Rafael, California.
- Principal Investigator of visual impacts for the **Paulsen-Whiting Bridge Replacement Project** in Watsonville, California.
- Principal Investigator of scenic impacts for the **Sierra Colina Village Project,** a proposed multi-unit residential development at Stateline, Nevada within the Lake Tahoe basin.
- Co-investigator for visual impact study of a proposed **Home Depot Development Project** adjacent to Highway 101 at the northern limits of the City of Santa Rosa.

- Co-investigator of visual studies for the **Lake Tahoe Shorezone Development Standards**, Lake Tahoe Basin which evaluated proposed Shorezone Development Standards for consistency with the Lake Tahoe Scenic Thresholds.
- Principal Investigator for the **Sign Ordinance and State Route 28 Beautification Plan Evaluation** in Lake Tahoe's North Stateline casino area at Crystal Bay, Nevada that assessed the effect of new commercial signs and proposed streetscape improvements relative to TRPA's scenic resource thresholds.
- Prepared visual analysis of the proposed **Hyatt Lake Tahoe Expansion Project** at Incline Village, Nevada.
- Project Manager of the **Roundhill to Stateline 120-kV Transmission Line EIR/EIS** and Principal Investigator for visual, land use, recreation and earth resources.
- Principal Investigator and Project Manager for the **Kingsbury Grade Scenic Mitigation Plan** for the lower portion of Kingsbury Grade (Nevada State Route 207) in Douglas County, Nevada.
- Principal Investigator and Project Manager for the **Mono Lake Basin Visual Resource Impact Analysis** in conjunction with the California State Water Resources Control Board's EIR for the Review of Mono Basin Water Rights of the City of Los Angeles.
- Principal investigator and project manager for the **Bodie Project Visual Resources Program,** Mono County, California that assessed the potential effects of proposed mineral exploration and possible future mine development on the visual resources of the region, particularly the "ghost town" of Bodie.
- Principal Investigator for the visual/aesthetic impact analysis of the **New Melones Lake Resource Management Plan (RMP)**, and **Environmental Report**, for the U.S. Bureau of Reclamation in California.
- Principal Investigator for the visual resource component of the **Cascade Reservoir Management Plan** for the U.S. Bureau of Reclamation.
- Principal Investigator and Project Manager for the **Statewide Scenic Highway Inventory and Eligibility Review** to identify state highways throughout California that are currently listed as eligible for State Scenic Highway designation but no longer meet the criteria for official designation.
- Principal Investigator and Project Manager for the visual analysis of the **Pittsburg/Antioch Transportation Corridor Study** that examined the visual impacts of three transportation alternatives between Concord and Antioch, California.
- Principal Investigator and Project Manager for the visual impact analysis of the **Rt. 101 Widening Project,** a major state highway improvement project through downtown Santa Rosa, California which involved adding new lanes to the highway and the removal of substantial amounts of mature trees and shrubs along a three mile stretch.
- Principal Investigator and Project Manager for the visual impact assessment of the **Rt. 84 Freeway Project** in Fremont, California, to U.S. Highway 101.
- Principal Investigator and Project Manager for the visual impact assessment of the **Rt. 87 Freeway Project** from downtown San Jose, California, to U.S. Highway 101.
- Principal Investigator and Project Manager for the **visual impact analysis of major state highway improvement projects** throughout seven Bay-area counties including Sonoma, Marin, Solano, San Francisco, Contra Costa, Alameda, and San Mateo.
- Principal Investigator and Project Manager for the visual analysis of **See-through Bridge Railing Designs** for state highways in California.
- Principal Investigator and Project Manager for the visual impact analysis of the **Rt. 101 Widening Project,** a major state highway improvement project through downtown Santa Rosa, California.
- Lecturer on the **Visual Impact Assessment of Highway Projects** at the California

Department of Transportation Landscape Architecture Academy, Environmental Planning Academy, and Environmental Planning Short Course.

- Principal Investigator for the visual impact analysis of a **Proposed Sign Ordinance Amendment, City of Fremont, California** that would authorize "large" freeway signs in any retail shopping center within the City which abuts a city limit line.
- Principal Investigator of visual impacts for the **Mountain Pass Mine EIR**.
- Principal Investigator for visual resources on the County of Yolo's **Off-Channel Mining Plan** and **Cache Creek Resources Management Plan EIRs for Lower Cache Creek**.
- Principal Investigator and Project Manager for the visual impact assessment of the **VCR Mining Project** in Imperial County, California.
- Principal Investigator and Project Manager for the visual impact assessment of the **Pine Tree Project**, a proposed open pit gold mine and ore processing facilities on 3,200 acres within the historic Mother Lode of Mariposa County, California.
- Principal Investigator and Project Manager for the **Penn Mine Site Long-Term Solution Project Environmental Impact Report; Calaveras County, California**.
- Co-investigator and Project Manager for the visual analysis of the proposed **Marsh Canyon Landfill** in Contra Costa County, California.
- Co-investigator for the visual analysis of the **Crockett Co-Generation Project**, a proposed facility at the existing C&H sugar plant in Crockett, California.
- Principal investigator for the visual analysis of **Idaho Power Company's Bliss, Lower Salmon Falls and Upper Salmon Falls Hydroelectric Projects** in conjunction with FERC re-licensing studies.
- Principal investigator for Aesthetic Resources as part of the FERC license application for **PacifiCorp's North Umpqua Hydroelectric Project**.
- Principal investigator of aesthetic impacts of PG&E's **Pitt No. 1 Hydroelectric Development** on the Pitt River in northeastern California situated in the Cascade region between Mt. Shasta and Mt. Lassen near the confluence of the Fall River and Pit River.
- Principal Investigator for the visual resource component of **PacifiCorp's Powerdale Hydroelectric Project FERC Relicensing Project** located on the Hood River, Oregon, 1 mile upstream of the Columbia River and partially within the Columbia River Gorge National Scenic Area.
- Principal Investigator for the visual resource component of **PacifiCorp's Yale Hydroelectric Project FERC Relicensing**, located on the Lewis River, Washington.
- Principal Investigator for visual resources for FERC relicensing of **Washington Water Power's Clark Fork Projects** in northwestern Montana and author of an Aesthetics Management Plan which identifies enhancement and mitigation measures and describes strategies to protect scenic resources over the life of the project license.
- Co-investigator of overall aesthetic impacts related to the proposed **El Portal Hydroelectric Development** on the Merced River at the western entrance to Yosemite National Park.
- Principal Investigator of visual impacts for the FERC re-licensing for PG&E's **Haas Kings Hydroelectric Project** in the highly scenic King's River region of California's central Sierra Nevada mountains.
- Co-investigator of impacts for the **SMUD/SPPCo Trans-Sierra 500kV Intertie Transmission Line** project.
- Principal Investigator and Project Manager for the visual impact assessment and environmental assessment of the **Carson City Transmission Line Relocation Project**.
- Principal Investigator for the visual impact assessment of the **CIP to Waiau 138 kV Transmission Line Project** which analyzed candidate routes through rural, suburban and urban settings, including shore zone management areas of Oahu.
- Principal Investigator and Project Manager for the visual impact assessment of the

Sagebrush Mojave-Vincent 230-kV Transmission Line Project.

- Principal Investigator and Project Manager for the **Tonkin Spring Transmission Line Environmental Assessment**.
- Principal Investigator and Project Manager for the **Cove 120-kV Transmission Line Environmental Assessment**.
- Principal Investigator for visual impacts for the **El Vado to Abiquiu Transmission Line**.
- Project Manager and Principal Investigator for the development of award-winning courtroom graphics for the **U.S. Department of Justice Reserved Water Rights Case**.
- Project Manager and Principal Investigator for the development of award-winning courtroom graphics for the **U.S. Department of Justice South Florida Everglades Litigation**.

Education

- B.L.A., University of Illinois, 1983
- M.L.A. Program, University of Illinois, Land Resource Planning track with concentration on visual assessment

Memberships

- American Society of Landscape Architects

Honors and Awards

- ASLA Honor Award, 1990, U.S. Department of Justice Reserved Water Rights Case
- ASLA Merit Award, 1995, U.S. Department of Justice South Florida Everglades Case
- Sigma Lambda Alpha, Honor Society for Academic Excellence in Landscape Architecture

DECLARATION OF
Ellen Townsend-Hough

I, **Ellen Townsend-Hough** declare as follows:

1. I am presently employed by the California Energy Commission in the Environmental Siting Office of the Energy Facilities Siting Division as an Associate Mechanical Engineer.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Waste Management** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 3/3/10 Signed: Original signed by E. Townsend-Hough

At: Sacramento, California

Ellen Townsend-Hough

SUMMARY

I am a chemical engineer with over 20 years of experience. My professional career has afforded me many unique growth and development opportunities. Working knowledge of the California Environmental Quality Act. Strength in analyzing and performing complex engineering analyses. Also worked as a policy advisor to a decision-maker for three years.

PROFESSIONAL EXPERIENCE

Writing

- Write letters, memos, negative declarations, environmental impact reports that require technical evaluation of mechanical engineering and environmental aspects of pollution control systems, environmental impacts, public health issues and worker safety.

Technical Analysis and Presentation

- Performs mechanical engineering analysis of designs for complex mechanical engineering analysis of designs for systems such as combustion chambers and steam boilers, turbine generators, heat transfer systems, air quality abatement systems, cooling water tower systems, pumps and control systems

- Review and process compliance submittals in accordance with the California Environmental Quality Act, the Warren Alquist Act, the Federal Clean Air Act and the California and Federal Occupational Health and Safety Acts to assure compliance of projects

- Provides licensing recommendations and function as an expert witness in regulatory hearings.

- Provide public health impact analysis to assess the potential for impacts associated with project related air toxic/non-criteria pollutant emissions.

- Evaluate the potential of public exposure to pollutant emissions during routine operation and during incidents due to accidents or control equipment failure

- Provide an engineering analysis examining the likelihood of compliance with the design criteria for power plants and also examine site specific potential significant adverse environmental impacts

Technical Skills

- Establish mitigation that reduces the potential for human exposure to levels which would not result in significant health impact or health risk in any segment of the exposed population.

- Assist with on-site audits and inspection to assure compliance with Commission decisions.

- Review and evaluate the pollution control technology applied to thermal power plants and other industrial energy conversion technologies.

- Work with the following software applications: WORD, Excel, and PowerPoint.

Policy Advisor

- Provided policy, administrative and technical advice to the Commissioner Robert Pernell. My work with the Commissioner focused on the policy and environmental issues related to the Commission's power plant licensing, research and development and export programs.

- Track and provide research on varied California Energy Commission (CEC) programs. Prepare analysis of economic, environmental and public health impacts of programs, proposals and other Commission business items.

- Represent Commissioner's position in policy arenas and power plant siting discussions.

- Write and review comments articulating commission positions before other regulatory bodies including Air Resources Board, California Public Utilities Commission, and the Coastal Commission.

- Wrote speeches for the Commissioner's presentations.

EMPLOYMENT HISTORY

2002-Present	Associate Mechanical Engineer	CEC Sacramento CA
1999-2002	Advisor to Commissioner	CEC Sacramento CA
1989-1999	Associate Mechanical Engineer	CEC Sacramento CA
1992-1993	Managing Partner	EnvironNet Sacramento CA
1988-1989	Sales Engineering Representative	Honeywell Inc Commerce CA
`1987-1988	Chemical Engineer	Groundwater Technology Torrance CA
1985-1986	Technical Marketing Engineer	Personal Computer Engineers Los Angeles CA
1985-1985	Energy Systems Engineer	Southern California Gas Company Anaheim CA
1980-1985	Design and Cogeneration Engineer	Southern California Edison Rosemead CA
1975-1980	Student Chemical Engineer	Gulf Oil Company Pittsburgh PA

EDUCATION

Bachelor of Science, Chemical Engineering
Drexel University, Philadelphia Pennsylvania

<u>Continuing Education</u>
Hazardous Material Management Certificate, University California Davis
Urban Redevelopment and Environmental Law, University of California Berkley
Analytical Skills, California Department of Personnel Administration (DPA) Training Center
Legislative Process/Bill Analysis, DPA Training Center
Federally Certified Environmental Justice Trainer

References furnished upon request.

DECLARATION OF
Erin Bright

I**, Erin Bright,** declare as follows:

1. I am presently employed by the California Energy Commission in the **Engineering Office** of the Siting Transmission and Environmental Protection Division as a **Mechanical Engineer**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Power Plant Efficiency, Power Plant Reliability,** and **Facility Design** for the **Abengoa Mojave Solar Project** (09-AFC-5) based on my independent analysis of the Application, supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: March 1, 2010 Signed: Original signed by E. Bright

At: Sacramento, California

Erin Bright
Mechanical Engineer

Experience Summary

One year of experience in the electric power generation field, including analysis of noise pollution, construction/licensing of electric generating power plants, and engineering and policy analysis of thermal power plant regulatory issues. One year of experience in the alternative energy field, including analysis of alternative fuel production and use.

Education

- University of California, Davis--Bachelor of Science, Mechanical Engineering and Materials Science
- University of California, Davis Extension Program--Renewable Energy Systems

Professional Experience

2007 to Present-- Mechanical Engineer, Energy Facilities Siting Division - California Energy Commission

Performed analysis of generating capacity, reliability, efficiency, noise, and the mechanical, civil/structural and geotechnical engineering aspects of power plant siting cases.

2006 to 2007--Energy Analyst, Fuels & Transportation Division - California Energy Commission

Performed analysis of use potential and environmental effects of emerging non-petroleum fuels, including compressed natural gas, biomass, hydrogen and electricity, in heavy and light duty transportation vehicles. Contributor to Energy Commission's alternative fuels plan.

DECLARATION OF
Michael S. Lindholm, P.G.

I, Michael S. Lindholm, declare as follows:

1. I am presently employed by Aspen Environmental Group, a contractor to the California Energy Commission, Systems Assessment and Facilities Siting Division, as a registered geologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **GEOLOGY AND PALEONTOLOGY** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 25, 2010

Signed: ______

At: Black Eagle Consulting, Inc.
Reno, Nevada

PROFESSIONAL GEOLOGIST
MICHAEL SCOTT LINDHOLM
No. 8152
exp 8-31-10
STATE OF CALIFORNIA

1-25-10

Michael S. Lindholm, P.G.
Project Geologist

Education

- B.S. – Geology –1984 – Stephen F. Austin State University
- M.S. – Geology – 1989 – Northern Arizona University

Registrations

- P.G. – California

Experience

2003 to Present: Black Eagle Consulting, Inc.; Project Geologist. Mr. Lindholm maintains over 18 years of geotechnical, mining and construction experience, and has supervised such projects throughout the western United States and South America. As Project Geologist, Mr. Lindholm coordinates and executes field exploration programs of future land development projects, and prepares the subsequent geotechnical reports used for bidding and construction. Additional tasks have included Quaternary fault investigations, liquefaction and slope stability analyses, septic system design, and forensic evaluation and remediation of distressed structures. Prior to his current position on the geotechnical staff, Mr. Lindholm worked in the Quality Control Department, where his duties included inspection, field sampling, and testing of soils, asphalt, and concrete. Over the past 2 years, Mr. Lindholm has assisted the California Energy Commission (CEC) in reviewing geology and paleontology sections of Applications for Certification (AFC) for various power plants throughout the State of California. The power plants included:

Walnut Creek Energy Park	Vernon Power Plant
Humboldt Bay Repowering Project	Bullard Energy Center Project
Victorville 2 Hybrid Power Project	San Gabriel Generating Station
Sentinel Peaker Project	Ivanpah Solar Electric Generating Station

2000 and 2002: AMEC Infrastructure. Mr. Lindholm was project inspector and tester during the construction of large-scale transportation and infrastructure projects. Additional experience includes inspection of traffic control, testing and inspection of concrete flatwork and structures, utility installation, and rockfall containment systems.

June 1989 to October 1999. Mr. Lindholm was an exploration and mine geologist for the minerals industry, during which time he worked to discover, explore and develop precious and base metal deposits in the western U.S. and overseas. He acquired extensive experience with geologic mapping, project drilling, geologic modeling, resource estimation, and database management.

Affiliations

- Geological Society of Nevada
- Treasurer – Association of Environmental & Engineering Geologists, Great Basin Chapter

Publications

Lindholm, M.S., 1991, "Evolution of the major structure that controls massive sulfide distribution at Jerome, Arizona," *in* Preoterozoic Geology and Ore Deposits of Arizona, Arizona Geological Society Digest 19, p. 261-270.

DECLARATION OF
Ajoy Guha

I, **Ajoy Guha**, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as an Associate Electrical Engineer.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Transmission System Engineering** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 3/3/2010 Signed: Original signed by A. Guha

At: Sacramento, California

RESUME

AJOY GUHA

Associate Electrical Engineer
California Energy Commission
1516 Ninth Street, MS 46
Sacramento, CA 95814

EDUCATION:

MSEE, POWER SYSTEMS ENGINEERING, PURDUE UNIVERSITY, INDIANA
BSEE, ELECTRICAL ENGINEERING, CALCUTTA UNIVERSITY, INDIA

CERTIFICATIONS:

REGISTERED PROFESSIONAL ENGINEER, CALIFORNIA, INDIANA & ILLIINOIS
MEMBER OF IEEE; MEMBER OF THE INSTITUTION OF ENGINEERS OF INDIA

SUMMARY OF PROFESSIONAL BACKGROUND:

Ajoy Guha, P. E. has 34 years of electric utility experience with an extensive background in evaluating and determining current and potential transmission system reliability problems and their cost effective solutions. He has a good understanding of the transmission issues and concerns. He is proficient in utilizing computer models of electrical systems in performing power flow, dynamic stability and short circuit studies, and provide system evaluations and solutions, and had performed generator interconnection studies, area transfer and interconnected transmission studies, and prepared five year transmission alternate plans and annual operating plans. He is also experienced in utilizing Integrated Resource Planning computer models for generation production costing and long term resource plans, and had worked as an Executive in electric utilities and experienced in construction, operation, maintenance and standardization of transmission and distribution lines.

WORK EXPERIENCE:

CALIFORNIA ENERGY COMMISSION, ENERGY FACLITIES SITING AND ENVIRONMENTAL DIVISION, SACRAMENTO, CA, 11/2000-Present.
Working as Associate Electrical Engineer in the Transmission System Engineering unit on licensing generation projects. Work involves evaluating generation interconnection studies and their impacts on transmission system, and providing staff assessments and testimony to the commission, and coordination with utilities and other agencies.

ALLIANT ENERGY, DELIVERY SYSTEM PLANNING, MADISON, WI, 4/2000-9/2000.
Worked as Transmission Services Engineer, performed Generator Interconnection studies and system planning studies.

IMPERIAL IRRIGATION DISTRICT, POWER DEPT., Imperial, California, 1985-1998.
Worked as Senior Planning Engineer in a supervisory position and in Transmission, Distribution and Integrated Resource planning areas. Performed interconnection studies for 500 MW geothermal plants and developed plan for a collector system, developed methodologies for transmission service charges , scheduling fees and losses. Worked as the Project Leader in the 1992 Electricity Report (ER 92) process of the California Energy Commission. Worked as the Project Leader for installation of an engineering computer system and softwares. Assumed the Project Lead in the standardization of construction and materials, and published construction standards.

CITY LIGHT & POWER, Frankfort, Indiana, 1980 – 1985.
Worked as Assistant Superintendent and managed engineering, construction and operation depts.

WESTERN ILLINOIS POWER CO-OP., Jacksonville, Illinois, 1978 – 1980.
Worked as Planning Engineer and was involved in transmission system planning.

THE CALCUTTA ELECTRIC SUPPLY CORPORATION LTD. (CESC), Calcutta, India, 1964 –1978.
Worked as District Engineer and was responsible for managing customer relations, purchasing and stores, system planning, construction, operation and maintenance departments of the most industrialized Transmission and Distribution division of the Utility. Worked as PROJECT MANAGER for construction of a 30 mile Double Circuit 132 kV gas-filled Underground Cable urban project. During 1961-63, worked as Factory Engineer for design, manufacturing and testing of transformers, motor starters and worked in a coal-fired generating plant.

DECLARATION OF
Mark Hesters

I, Mark Hesters, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as a Senior Electrical Engineer.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Transmission System Engineering** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 3/2/2010 Signed: Original signed by M. Hesters

At: Sacramento, California

Mark Hesters

916-654-5049
mark.hesters@energy.state.ca.us

Qualifications

- Analyzed the reliability impacts of electric power plants for nine years.
- As an expert witness, produced written and oral testimony in numerous California Energy Commission proceedings on power plant licensing.
- Expertise in power flow models (GE PSLF and PowerWorld), production cost models (GE MAPS), Microsoft word-processing, spreadsheet and database programs.
- Contributing author to many California Energy Commission reports.
- Represented the Energy Commission in the development of electric reliability and planning standards for California.

Experience

Senior Electrical Engineer

2005-Present California Energy Commission, Sacramento, CA

- Program manager of the transmission system engineering analysis for new generator Applications of Certification.
- Lead the development of transmission data collection regulations.
- Overhauled the transmission data adequacy regulations for the Energy Commission's power plant certification process.
- Participated in the analysis of regional transmission projects.
- Technical lead for Commission in regional planning groups.
- Energy Commission representative to the Western Electric Coordinating Council Operations Committee.

Associate Electrical Engineer

1998–2005 California Energy Commission, Sacramento, CA

- Lead transmission systems analyst for power plant licensing under 12-month, 6-month and 21-day licensing processes.
- Provided expert witness testimony on the potential transmission impacts of new power plants in California Energy Commission licensing hearings.
- Authored chapters for California Energy Commission staff reports on regional transmission issues.
- Studied the economics of transmission projects using electricity production simulation tools.
- Analyzed transmission systems using the GE PSLF and PowerWorld load flow models.
- Collected and evaluated transmission data for California and the Western United States

Electric Generation Systems Specialist

1990–1998 California Energy Commission, Sacramento, CA

- Lead generation planner for southern California utilities.
- Analyzed electric generation systems using complex simulation tools.
- Provided analysis on the impact of resource plans on air quality and electricity costs for California Energy Commission reports.
- Developed modeling characteristics for emerging technologies.
- Evaluated resource plans.

Education

1985–1989 University of California at Davis Davis, CA

- B.S., Environmental Policy Analysis and Planning

DECLARATION OF
Chris Davis

I, Chris Davis, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as a Compliance Project Manager.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **General Conditions Including Compliance Monitoring and Closure Plan** for the **Abengoa Mojave Solar** project (09-AFC-5) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: February 2, 2010 Signed: Original signed by C. Davis

At: Sacramento, California

Chris Davis

California Energy Commission
1516 Ninth St., MS-2000
Sacramento, California 95814
(916) 654-4842

Professional Experience

January 2008 to present

California Energy Commission
Planner III Compliance Project Manager – Oversee power plant construction. Process amendments to Energy Commission project certifications. Direct technical staff in tasks related to compliance issues regarding power plant project design, construction, operation, and associated environmental issues. Work with power plant operators, public agencies, community groups, engineering, legal and technical staff to identify and resolve issues.

2007-2008

California Energy Commission
Energy Specialist I – Education and outreach for the New Solar Homes Partnership (NSHP) and the Building Standards Office. Developed fact sheets on proposed changes to the 2008 building standards and a tutorial on how to use the PV Calculator to figure photovoltaic system power production and expected incentives. Wrote case study, articles and Web pages explaining various aspects of the NSHP program. Certified by CalCERTS (California Energy Rating and Testing Services) as a Home Energy Rating System (HERS) rater for photovoltaic systems. Organized, developed materials and staffed Energy Commission booth/tables for conferences put on by California Building Energy Consultants (CABEC) and others.

2005-2007

State Water Quality Control Board
Information Officer I - Liaison between the media and both the State Water Board and Central Valley Regional Water Board. Issues included waste (NPDES) permits, groundwater contamination and treatment, once-through cooling, emerging contaminants, contaminated beaches, stormwater containment, and areas of special biological significance. Organized, produced and served as master of ceremonies for presentations of grant awards to repair watersheds, practice sustainable forestry and construct water treatment facilities.

2005-2008

California Energy Commission
Information Officer I – Joined the Energy Commission media office during California's power crisis. Liaison between Energy Commission and media in the area of power plant licensing. Wrote

news releases about projects as they reached milestones in the approval and construction process, including a number of releases for Governor’s office about new facilities beginning operations. Initiated and developed Power Plant Fact Sheet in cooperation with Siting Office manager.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION
FOR THE *ABENGOA MOJAVE SOLAR POWER PLANT*

Docket No. 09-AFC-5
PROOF OF SERVICE
(Revised 3/4/2010)

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APPLICANT'S CONSULTANTS
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e-recipient@caiso.com

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Jennifer Jennings
Public Adviser's Office
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*indicates change

DECLARATION OF SERVICE

I, April Albright, declare that on March 15, 2010, I served and filed copies of the attached Abengoa Mojave Solar Staff Assessment. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[http://www.energy.ca.gov/sitingcases/abengoa/index.html].**

The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(C*heck all that Apply*)

For service to all other parties:

__✓__ sent link to electronic document to all email addresses on the Proof of Service list;

__✓__ CD copies personally delivered;

__✓__ CD copies delivered on this date, for mailing with the United States Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailed. **Hard copies are available upon request.**

AND

For filing with the Energy Commission:

__✓__ **sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (preferred method);**

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-5
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
Hdocket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Original signed by: ______________
April Albright