ABENGOA MOJAVE SOLAR

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Supplemental Staff Assessment - Part A

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

EXECUTIVE SUMMARY

Testimony of Craig Hoffman

Energy Commission staff published a Staff Assessment (SA) for the Abengoa Mojave Solar (AMS) project on March 15, 2010. This document included staff's analysis, conclusions, and recommendations for the project. Staff publically noticed the Staff Assessment for a 30-day comment period that lasted from Tuesday March 16, 2010 to Thursday, April 15, 2010.

During this comment period, public workshops were held on Tuesday, April 6, 2010 in Sacramento at the Energy Commission and on Wednesday, April 7, 2010 at the Barstow City Hall to discuss staff's findings, proposed mitigation, and proposed compliance-monitoring requirements. Based on the workshops and written comments, staff has refined its analysis, corrected any errors, and finalized conditions of certification.

This Supplemental Staff Assessment (SSA) has been prepared based upon discussions at the SA workshops and written comments provided by the applicant, agencies and public. This SSA is a limited document representing revisions and additions to various technical sections that were commented upon. This document does not include each technical section. For a complete project description and all the technical sections please see the original SA document with the complete engineering, environmental, public health and safety analysis of the AMS project. The SSA only includes sections that were revised or had public comments.

The AMS SSA is being published in two parts. SSA Part A contains the Energy Commission staff's final environmental and engineering evaluation of the project in the following technical sections: Hazardous Materials, Noise and Vibration, Public Health, Traffic and Transportation, Visual Resources, Waste Management and Worker Safety and will serve as staff's testimony during evidentiary hearings. SSA Part B will be published on May 21, 2010 and will contain the Energy Commission staff's final environmental and engineering evaluation of the project in the following technical sections: Air Quality, Biological Resources, Cultural Resources, Land Use, Soils and Water Resources and Transmission System Engineering.

Staff's testimony that will be provided at the Energy Commission's Evidentiary Hearings on the AMS project will encompass the SA and revisions to sections included in the SSA Part A and the SSA Part B.

For purposes of the table of contents, the sections have the same numbering as in the previous SA. Sections that are not included in this SSA have strikethrough.

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. On October 21, 2009, the Energy Commission found the project data adequate, thereby deeming the AFC complete for filing purposes and starting the certification process.

On December 8, 2009, staff conducted a publicly noticed Data Response and Issue Resolution workshop at the Energy Commission in Sacramento and discussed the applicant's data responses on 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 December 9, 2009, the Energy Commission Committee assigned to oversee the proceeding conducted a publicly noticed Site Visit, Informational Hearing and Environmental Scoping Meeting 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 January 15, 2010, staff conducted a second publicly noticed Data Response and Issue Resolution workshop at the Energy Commission 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.

On March 15, 2010 the Energy Commission published the AMS Staff Assessment (SA). The SA examines engineering, environmental and 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). This document was publically noticed for comments from March 16, 2010 to April 15, 2010.

The Energy Commission held public workshops on the SA on April 6th in the City of Sacramento and April 7th in the City of Barstow. At these workshops, discussions on the project were held, and written comments were provided by the applicant, agencies and the public. This SSA has been prepared to respond to those comments and information and analysis not provided in the SA.

INFORMATION NOT IN THE STAFF ASSESSMENT

Staff acknowledged within the SA that there was additional technical analysis that would need to be included within the SSA. The following information and analysis was not provided within the SA and is included in the SSA Part A and Part B:

Air Quality - a Final Determination of Compliance from the Mojave Desert Air District has been incorporated into staff's analysis.

Biological Resources – a Section 7 consultation has been initiated between the applicant and US Fish and Wildlife Service. The applicant has provide to the Energy Commission, US Fish and Wildlife Service, and California Department of Fish and Game: a Biological Assessment, 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 has updated the analysis based upon new the information.

Soil and Water Resources – the following materials were provided for staff to complete their analysis in the SSA:

- Submittal of the following information was provided 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 provided an environmental analysis for the Lockhart Substation Interconnection & Communication facilities for

downstream congestion management improvements in order for staff to complete a CEQA analysis on proposed improvements. this information will be included as Transmission System Engineering – Appendix A.

Waste Management – the applicant completed a site characterization and sampling report which was reviewed by staff to verify that no new Waste Management mitigation measures were necessary.

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

Staff believes that with the Commission's adoption of staff's proposed mitigation measures and the proposed conditions of certification, the AMS project would comply with all applicable laws, ordinances, regulations, and standards (LORS).

PROJECT'S ENVIRONMENTAL IMPACTS

Within the SA, technical staff was not able to make definitive conclusions about project impacts in; Air Quality, Biological Resources, Soils and Water Resources, Transmission System Engineering and Waste Management. 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. This analysis does not include Air Quality, Biological Resources, Cultural Resources, Land Use, Soils and Water Resources and Transmission System Engineering which will be provided in SSA Part B. 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 SSA.

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 following table.

Executive Summary Table 1
Summary of Impacts to Each Technical Area

Technical Area	Complies with LORS	Impacts Mitigated
Air Quality	Provided in SSA Part B	
Biological Resources	Provided in SSA Part B	
Cultural Resources	Provided in SSA Part B	
Hazardous Materials	Yes	Yes
Land Use	Provided in SSA Part B	
Noise and Vibration	Yes	Yes
Public Health	Yes	Yes
Soil and Water Resources	Provided in SSA Part B	
Traffic and Transportation	Yes	Yes
Transmission System Engineering	Provided in SSA Part B	
Visual Resources	Yes	Yes
Waste Management	Yes	Yes
Worker Safety and Fire Protection	Yes	Yes

STAFF ASSESSMENT COMMENTS

The following persons and agencies commented on the Staff Assessment. Responses to comments are provided in the technical sections.

County of San Bernardino / C Hyke (TN 56176), Comments on agriculture mitigation consistency with San Bernardino County.

County of San Bernardino / C Hyke (TN 56264), Comments on biological mitigation, impacts to county services and agricultural mitigation.

Defenders of Wildlife / J Aardahl (TN 56245), Commented on water conservation opportunities and impacts on surrounding protected biological resources.

Department of Conservation / D. Otis (TN 56177), Comments on agriculture mitigation.

Department of Conservation / M. Meraz (TN 56512), Comments on agriculture mitigation and LESA model.

Ellison, Schneider and Harris / C. Ellison (TN 56350). Applicant's Comments on Staff Assessment.

Glenn Maclean (TN 56215), Commented on the historical and cultural value of the Lockhart General Store.

Joe Ramirez (TN 56231), Commented on existing road and traffic conditions, change in view and quality of life, illumination of the night sky, the evaporation ponds as a draw for insects and emergency services.

Southern California Edison / H. Arshadi (TN 56289), Commented on the project description and need for environmental review on interconnection facilities.

Transition Habitat Conservancy / J. Bays (TN 56241), Commented on the agricultural mitigation requirement.

ENVIRONMENTAL ASSESSMENT

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^{TM}(or equivalent), 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 (or equivalent such as Dowtherm A)

Therminol VP1 (or equivalent) would be used as the heat transfer fluid (HTF) in the solar panels to collect solar heat and transfer it to the steam turbines to generate power. 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 is aware that Dowtherm A is a mixture of the same chemicals at the same percentages as Therminol VP-1 and thus the applicant will be free to use either brand of HTF.)

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 appropriately designed isolation methods 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 final 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 collector loop in the event of a leak of fluid. These valves shall be actuated automatically, manually, remotely, or locally as determined during detailed engineering design. The detailed 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; **or**

   B. Power plant personnel on site 24 hours per day, 7 days per week,

      and

      the CCTV able to view 100% of the power block perimeters

      or breach detectors **or** 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 piping 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.

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. Furthermore, 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. The following comments from the applicant have been received (ESH 2010m). Below are the staff's responses to those comments.

1. Revision to Condition of Certification **NOISE-4**: The applicant has requested to clarify that the noise limitations contained in this condition of certification are placed on noise created by the plant operation alone. The purpose of the proposed language is to clarify that the limits are not "project plus ambient" but rather the difference between "project plus ambient" and "ambient", resulting in the noise created by the project alone.

   Staff's Response: Even though this condition as written originally is intended to require limitation on the project alone noise levels (see Condition of Certification **NOISE-4**, 1st paragraph, 3rd line), staff has added the applicant's request. This revision does not alter any of the originally written requirements and is for further clarifications only.

2. Revision to Condition of Certification **NOISE-6**: The applicant would like flexibility to conduct concrete work in the warmer temperature months earlier than 7 a.m. to ensure the quality of materials placed meet standards and best practices, and ability for heavy equipment activities for earthmoving months to begin at 5 a.m. to perform routine maintenance on equipment.

   Staff's Response: Staff agrees with the applicant's request and has revised Condition of Certification **NOISE-6** to allow this. Extending construction hours beyond normal daytime hours during hot summer days and performing early morning routine maintenance on construction equipment for a temporary period is typical of any power plant project located in an area where working conditions are difficult due to hot summer temperatures. This revision would not likely result in significant noise impacts due to the temporary nature of the construction activities. However, to ensure this, staff proposes Condition of Certification **NOISE-2**, which would establish a public notification and noise complaint process requiring the applicant to resolve any complaints caused by construction noise.

3. Revision to Condition of Certification **NOISE-7**: The applicant has requested revisions to Condition of Certification **NOISE-7** (**STEAM BLOW RESTRICTIONS**) to provide some flexibility in implementing any necessary mitigation measures at the project's closest noise receptor and has also questioned the reasoning behind staff's requirement of limiting the high pressure steam blows to during the daytime hours as opposed to the low pressure steam blow.

   Staff's Response: In addition to higher noise levels from high pressure steam blows than low pressure steam blows the reason staff typically requires the high pressure steam blow to be conducted during the day is that this activity can occur several times a day for 2-3 weeks, and if nighttime steam blows are allowed, it can be disturbing when people are trying to sleep. The low pressure steam must be a continuous 36-hour activity without interruption, which is usually scheduled so that it would last through only one night; limiting it to daytime hours would not be practical or necessary.

Staff has not included any requirements beyond what is crafted in this condition of certification for most previous and current Energy Commission's power plant projects. Numerous power plants have been able to meet the limit of 89 dBA at 100 feet for high pressure steam blows, but to accommodate the applicant staff has revised this requirement to 60 dBA to be measured near LT-1 and ST-2, the closest noise-sensitive receptors. Note that the 89 dBA level at 100 feet, when projected based on distance only (not including attenuation due to air absorption and topography) at LT-1 (approximately 2,700 feet from the nearest power block), would result in 60 dBA. Staff believes this requirement is appropriate and equivalent to the normal requirement of 89 dBA at 100 feet.

Because the Holmes residence at ST-1 is also relatively close to LT-1, staff has added a requirement in this condition of certification to monitor the steam blow noise at ST-2 and temporarily relocate the residents at ST-2 as well, if necessary as explained in the condition of certification. This condition of certification as originally written did not need this requirement because the applicant's request of having the option to relocate the receptors, as opposed to mitigating the noise at the source, had not been proposed. If steam blow noise proves to be too loud (as defined in the condition) at LT-1, it is likely that it would be also too loud at ST-1.

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).

All noise limitations contained in this condition of certification are independent of ambient levels. The limitations are placed on noise created by the project plant operation alone.

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 Noisy equipment operation and noisy construction work relating to any project features shall be restricted to the times delineated below, unless the CPM has provided permission allowing extension of these hours for limited work approved by the CPM:

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.

STEAM BLOW RESTRICTIONS

NOISE-7 If a traditional, high-pressure steam blow process is used, the project owner shall monitor steam blow noise at the closest receptors, LT-1 and ST-1, to ensure the noise of steam blows does not exceed 60 dBA at these locations. If this noise level is unattainable, the project owner shall either relocate the residents for the duration of steam blows to a location further away from these activities, or equip steam blow piping with a temporary silencer that quiets the noise of steam blows to no greater than 60 dBA measured at LT-1 and ST-2. The steam blows shall be conducted between 7:00 a.m. and 7:00 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”.

ESH 2010m - Ellison, Schneider and Harris / C. Ellison (TN 56350). Applicant’s Comments on Staff Assessment. Submitted to CEC on 4/21/2010.

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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 2 to 3 dB 4 to 9 dB 10 dB or more	3 dB 2 dB 1 dB 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:

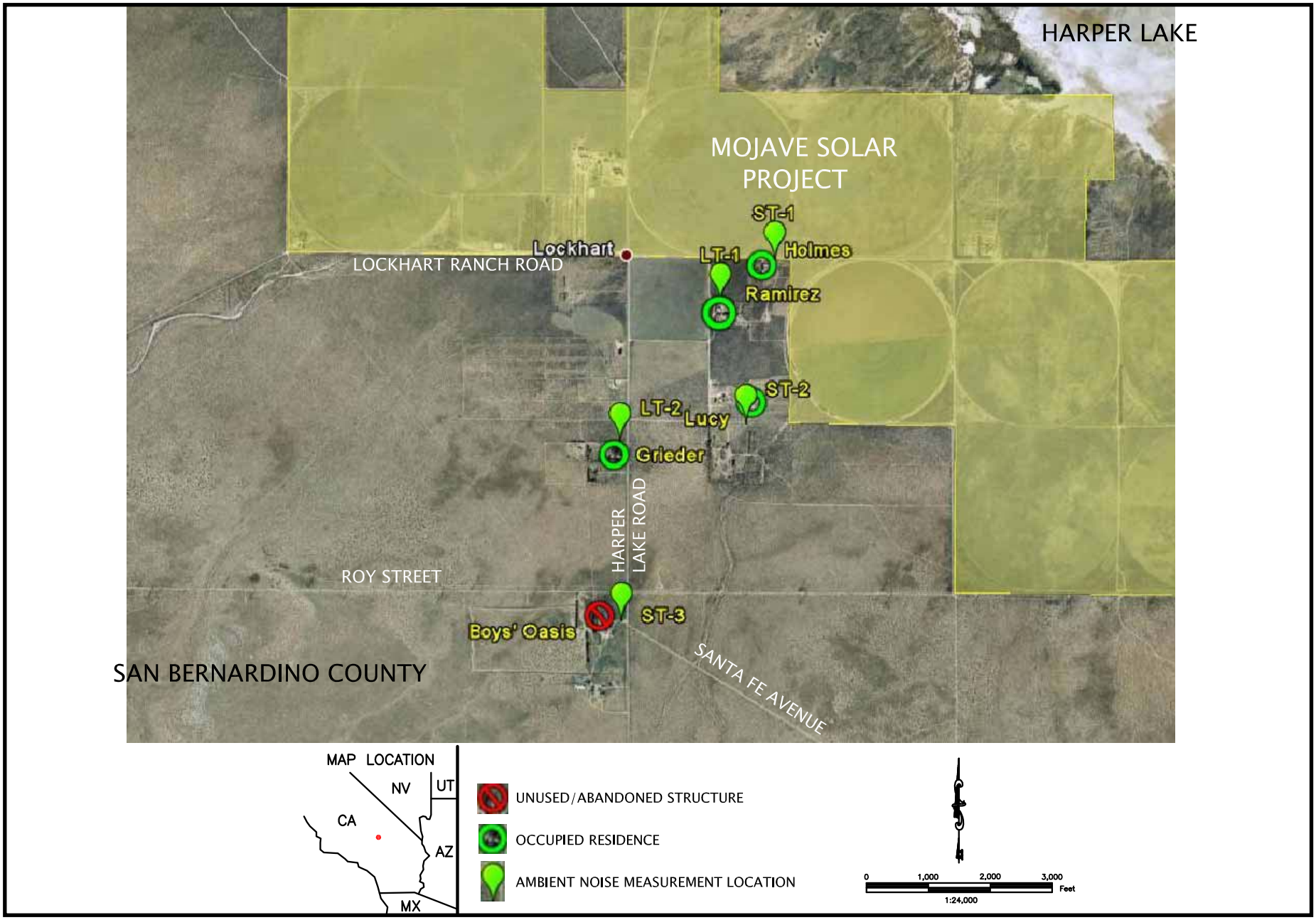
Noise Table A4
OSHA Worker Noise Exposure Standards

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, MAY 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 Supplemental Staff Assessment (SSA) 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 4 and 5**. For risk calculations using the HARP model, the “Derived (Adjusted) Method” was used for cancer risk and the “Derived (OEHHA) Method” was used for chronic noncancer hazard.

Cancer risk and chronic and acute hazard index values obtained by staff are compared to results reported by the applicant in the January 2010 response to data requests in **Public Health Table 6**. Risk and hazard were determined at the point of maximum impact, PMI, under the 70 year residential scenario, located 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 7. 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 4
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 5
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 6
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 7
Results of Staff's Analysis: Contribution to Total Cancer Risk by Individual Substances from All Sources at the Point of Maximum Impact (PMI).

Substance	Auxiliary Boiler (2 units)	Diesel Firewater Pump (2 units)	Diesel Generator (2 units)	Cooling Tower (12 cells	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 in the area of public health.

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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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 informational 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 afternoon (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 parabolic mirrors 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 parabolic mirrors 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 parabolic mirrors to reflect concentrated sunlight towards the adjacent roadways. This is most likely to occur when the mirrors 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 mirrors 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.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

PROJECT APPLICANT

Comment (related to **TRANS-1**): It is difficult to establish the exact dispersal of labor and associate traffic distribution. This option (*more than one park-and-ride lot*) offers flexibility for the Applicant to address the intent of the Condition with construction planning information

> Response: **TRANS-1** has been amended to allow for more than one park-and-ride lot and for flexibility in the location(s) based upon the geographic distribution of construction employees.

Comment (related to **TRANS-3**): Pursuant to discussions at the April 6, 2010 SA Public Meeting, the staff's intent is for the sub-surface conditions of the road to be evaluated visually, not through testing.

Response: **TRANS-3** has been revised to clarify that only visual evaluation is necessary.

Comment (related to **TRANS-4**): During the SA Public Meeting on April 6, 2010, the Energy Commission staff agreed to confirm whether the Applicant's project alone was prompting the need for the extended left-turn pocket on SR-58 at Harper Lake Road (to accommodate traffic from the west). Given that the impacts of construction are temporary, this measure seems excessive and controllable by monitoring and rerouting of traffic as needed and based upon conditions experienced during construction.

Considering a majority of the deliveries will come from the Barstow area, the need to extend the turn pocket for traffic from the west was not obvious. If the need for the lengthened left-turn pocket is because of cumulative effects of another project, language should be added to require the projects share costs for the road improvement proportionally.

Response: The lengthening of the eastbound left-turn pocket on SR-58 at Harper Lake Road is needed based upon the traffic volumes provided in the applicant's technical studies and verified by Energy Commission staff. The vast majority of the traffic expected to make this turn is from construction employees and not material deliveries. With the queue of vehicles expected to greatly exceed the storage of the existing turn-pocket, this represents a substantial safety hazard in creating the potential for a high-speed, rear-end collision.

The need to lengthen the left-turn pocket is solely a function of the proposed project. However, other proposed projects along Harper Lake Road may result in the need to further lengthen the lane. **TRANS-4** has been amended to indicate that a fair share approach is appropriate if the extent of the widening as required by Caltrans is dictated by traffic contributions from other projects.

Comment (related to **TRANS-5**): The referenced BNSF intersection already has train approach warning lights and barricades to alert and block traffic for the purpose of safety at the railroad crossing. To add flag men would be unnecessary. Additionally, deliveries are not affected by the BNSF crossing since for the same reason, it is lighted and with automatic barricades.

Response: **TRANS-5** has been amended to delete the reference to flag men, but it retains the provision for prohibiting hazardous materials deliveries during non-daylight periods. While staff still believes it would be beneficial to have flag men and encourages the applicant to pursue this, staff cannot definitively show the nexus between increased vehicle trips and a safety conflict with the railroad crossing (given that it has lights and gate arms).

Retaining the provision to prohibit non-daylight deliveries of hazardous materials is important because of the added community hazard (beyond the driver) that would result from any truck/rail collision. Additionally, the ability to adequately respond and clean-up from any incident is much greater during daylight hours.

JOE RAMIREZ

Comment: It was proposed that the contractors driving to the site are to both slow down and minimize passing on Harper Lake Road.

> Response: Vendors, employees, and other potential drivers of this roadway are subject to state motor vehicle laws regarding speeding and safe passing. The Energy Commission is not in a position to place a condition on the project that would deviate from, or duplicate, state laws in this area. However, staff would encourage the applicant to impose some restraints on driver behavior for its vendors and employees via their contractual arrangements.

Comment: I am concerned of the pot holes that will occur due to the heavy traffic and the repair as a result. Harper Lake Road can at times be dangerous, especially at night. If it were not for the Governor's visit this last week, there would have been many more pot holes to drive around. This road is not designed to handle the weight of traffic load being proposed with this project. Between both the heavy loads and numerous deliveries, there will be potentially dangerous conditions. I feel there should be strong language included in the approved construction documents to repair these unavoidable conditions in a timely manner.

> Response: **TRANS-3** requires the applicant to repair Harper Lake Road and a portion of SR-58 to their pre-project condition. Environmental law limits the ability of an agency to require an applicant to fix an existing problem. However, the applicant can voluntarily repair existing problems, which may be in their interest.

Comment: This (park and ride) is an excellent idea, it could help reduce the traffic and wear on our road. For clarification, will contractors affiliated with the solar plant be a part of this park and ride while the deliveries of materials and equipment are done on many separate trucks?

> Response: The park-and-ride lot(s) would be for a majority of the construction workers (see **TRANS-1**). They would park at these facilities and be bused into the site. Deliveries of some materials would go directly to the site, while others would be brought to a staging/assembly area near the site.

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 secure or construct one or more park-and-ride facilities with a combined capacity of 500 spaces..

Verification: At least 90 days prior to start of site mobilization, the project owner shall propose new park-and-ride lot(s) to the County of San Bernardino for review and comment and the Compliance Project Manager (CPM) for review and approval. The proposal shall include a rationale for the location of the lot(s) based upon the expected geographic distribution of employees and availability of suitable sites. 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(s) are 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 visual 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 visual 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.

If Caltrans requests the pocket be made longer than 300 feet to accommodate traffic from other development projects in the area, then the applicant should only be responsible for a fair share proportion of the overall cost.

TRANS-5 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.

Verification: A record of hazardous materials deliveries shall be provided to the CPM as required in **HAZ-3**.

REFERENCES

California Code. Vehicle Code. 2008.

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.

Code of Federal Regulations. *Title 14 Aeronautics and Space, Federal Aviation Administration.* 2008.

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County of San Bernardino. Circulation and Infrastructure Element of the General Plan. 2007.

EDAW / AECOM. Mojave Solar Employment Commute Behavior Study 2008. 2009.

San Bernardino Associated Governments. Traffic Congestion Management Plan. 2005.

San Bernardino County. Non-Motorized Transportation Plan 2001 Update. June 2001.

Southern California Association of Governments. 2008 Regional Transportation Plan. 2008.

Transportation Research Board. 2000. Highway Capacity Manual.

Wilson & Company, Inc. Application for Certification Mojave Solar Project. July 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.

Key Observation Points (KOPs)

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 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 (physical size) and very noticeable to a wide area but would occur very infrequently.

The 20th 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 Wate**r** 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.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received comments from Joe Ramirez regarding visual resources.

Joe Ramirez
April 7, 2010

Comment: View - There is a difference of the term "View" that I would like to state. The View that we enjoy every day is the vista of the existing fields, the dry lake, the mountains, *and* the horizon beyond. There is a beauty with the passing of seasons that we see and enjoy every year, thus concealing us from our treasured View. Without a doubt there will be a change in our View once the construction begins and even when it is completed. There were discussions and photographs of the Views of the fencing and the solar panels that will be seen from nearby roads. As I stated in the meeting, seeing as how we are located at a higher elevation, we would be much more inclined to see the project from a different perspective. Our View will then be of the solar project rather than the dry lake and mountains. The new solar panels, as I understand it, will be oriented both north and south. Although the sun's rays will be focused on the tube in the center of the panel, I do know that there will be some visual excessive light residue that will occur. With the existing solar plant we have no problem, seeing as how it is located several miles away, but with the proposed panels we are pessimistic on the final visual lighting effects. Though we do understand that the new owner would like to be a good neighbor and propose some options to minimize sight of any unwanted hardscape. We are quite receptive to Fred Redell's proposal to landscaping as one means to provide a visual barrier. I would like to see some drawing or a written section showing the proposed panels and how our line of sight looking north will be affected. Fred stated that he would provide this drawing for our viewing.

> Response: As observed in the analysis of KOP 4 of the Staff Assessment, 'staff recognizes that the few residents experiencing this view would be strongly affected. In an effort to provide relief from permanent view of the project . . . staff recommends Condition of Certification VIS-2 (Offsite landscape Screening).' It is staff's opinion that such screening, if properly designed and sufficient in extent, has the capability of reducing these impacts substantially. Mr. Ramirez also expresses concern about possible glare effects. As stated in the Staff Assessment, staff shares those concerns and has called for both Condition of Certification VIS-2 and VIS-4 to address these. In the opinion of staff's glare expert, Condition VIS-4 would eliminate potential hazardous glare exposure, and would also minimize the worst instances of non-hazardous nuisance glare. Staff's glare expert has noted that, based on field observations of other trough projects,

the worst instances of nuisance glare are expected to occur as reflections from the bottom of the trough parabola at certain hours of the morning and afternoon. Condition VIS-4 is intended to screen off-site views of that portion of the trough parabola during those periods. Condition VIS-2 is intended to minimize the effects of any residual nuisance glare, which would be intermittent and transient, through landscape screening of the affected residences. Finally, Mr. Ramirez cites applicant's proposal to provide a line of sight analysis to illustrate the exposure of his residence to views of the project. Staff would strongly encourage the applicant to provide such an analysis for Mr. Ramirez' review and comment.

Comment: Illumination - The lighting of the facilities at night can be quite the eye sore, and very distracting of our existing night scene. Fred Redell had mentioned that minimal lighting would be used and pointed towards the ground, thus minimizing lighting in a horizontal direction towards us. Still after our meeting I looked towards the existing solar project and the orange glow from the main plant can be seen for many miles. I ask that someone look into this and review all options to reduce this element from the sight of the local residences.

Response: Staff completed a thorough review of the lighting and illumination proposed by the project in the AFC. Typical lighting systems would provide operations and maintenance personnel with illumination in both normal and emergency conditions. The system will consist primarily of lighting for activities or emergency egress required during an outage of the plant's AC electrical system. 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 and off-site glare in the site vicinity.

The staff assessment includes Condition of Certification VIS-3 that addresses light pollution and night sky issues to ensure shielding of all project lighting, including construction lighting, and to prevent upward-directed illumination. The goal of this condition is to eliminate light pollution and screen offsite receptors from unwanted lighting while still maintaining the minimum lighting needed for safety and security purposes.

The project owner would be required to submit the following plans and specifications for review and comment by staff prior to construction:

1. Final lighting plans (showing fixture locations, type, mounting heights, controls, etc.)

2. Fixture and controls schedule (detailed information)

3. Fixture cut sheets and specifications (section 16500 or equal)

4. Controls cut sheets and specifications (section 11054 or equal)

5. An integrated photometric plan showing vertical and horizontal foot-candles at all property lines for a height of 20'

The implementation of VIS-3 will reduce night time illumination to a less than significant

IMPACT 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) lighting does not illuminate the nighttime sky;

c) illumination of the project and its immediate vicinity is minimized as to times of use and extent, and;

d) lighting on the exhaust stacks shall be the minimum needed to satisfy safety and security concerns.

Permanent night lighting shall comply with all applicable standards, practices, and regulations including, and specifically, the following Illuminating Engineering Society documents:

- RP-33-99 Lighting for Exterior Environments
- DG-13-99 Outdoor Lighting
- TM-10-00 Addressing Obtrusive Light (Urban Sky Glow and Light Trespass) in Conjunction with Roadway Lighting
- TM-15-07 Luminaire Classification System for Outdoor Luminaires

Verification: At least 90 days prior to ordering any exterior lighting, the project owner shall contact the CPM to show compliance with all of the above requirements. This shall include, but not be limited to, final lighting plans, fixture and control schedules, fixture and control cut sheets and specifications, a photometric plan showing vertical and horizontal footcandles at all property lines to a height of 20 feet, and the proposed time clock schedule.

Prior to construction and prior to commercial operation, the project owner shall notify the CPM that the installation of 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 after receiving the notification the project owner shall implement the modifications and notify the CPM when the modifications are competed and ready for inspection.

Within 48 hours of receiving a lighting complaint, the project owner shall provide he CPM with a complaint resolution form as specified in the Compliance General Conditions, including a proposal to resolve the complaint, and a schedule for implementation of the proposed resolution. The project owner shall notify the CPM within 48 hours after completing the resolution of the complaint. 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.

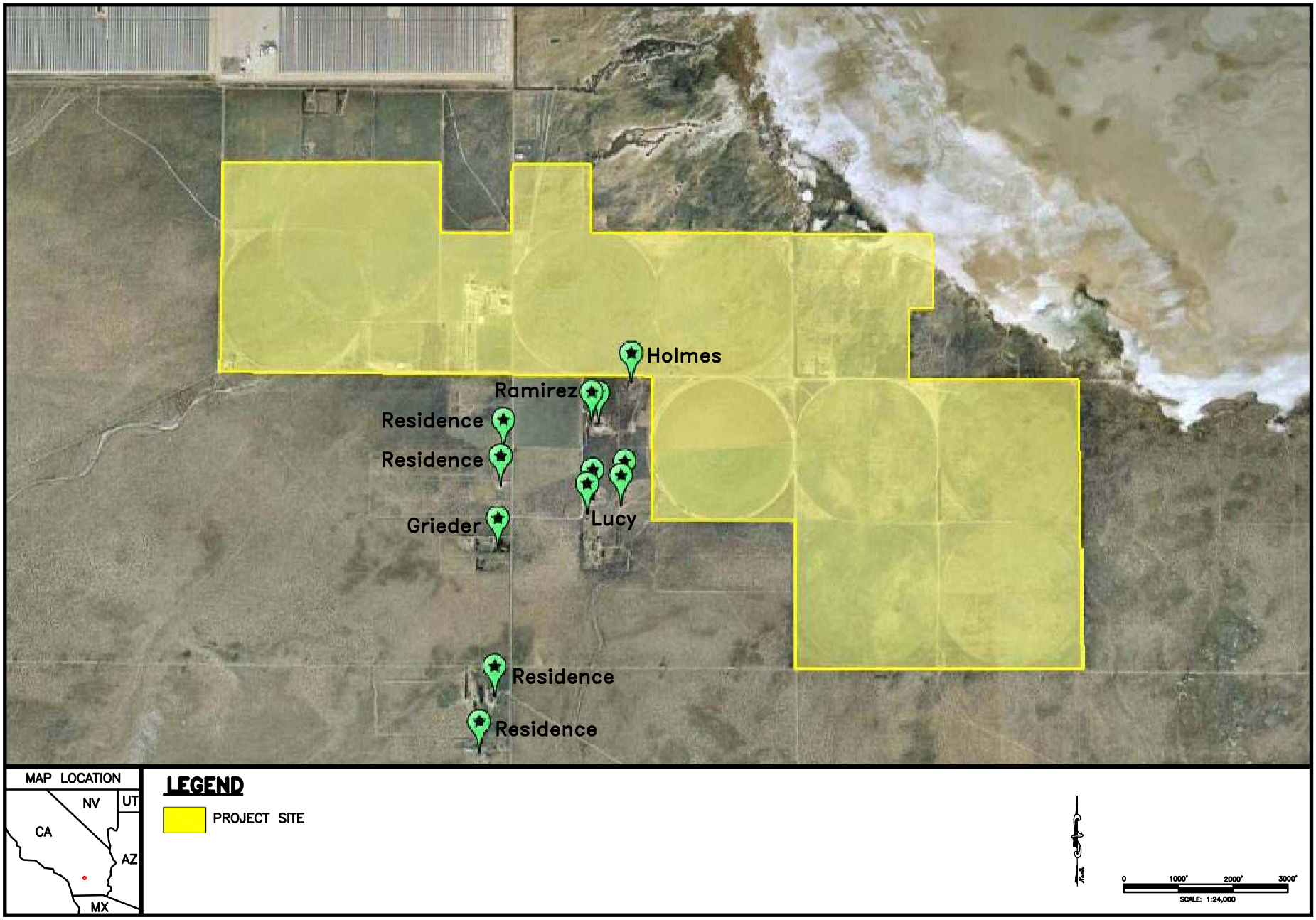
ESH 2009d – Ellison, Schneider and Harris / C. Ellison (TN 54268). Written Responses to Data Request Set 1B (nos. 1-86), dated 11/25/09. Submitted to CEC on 11/25/2009.

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

MAY 2010



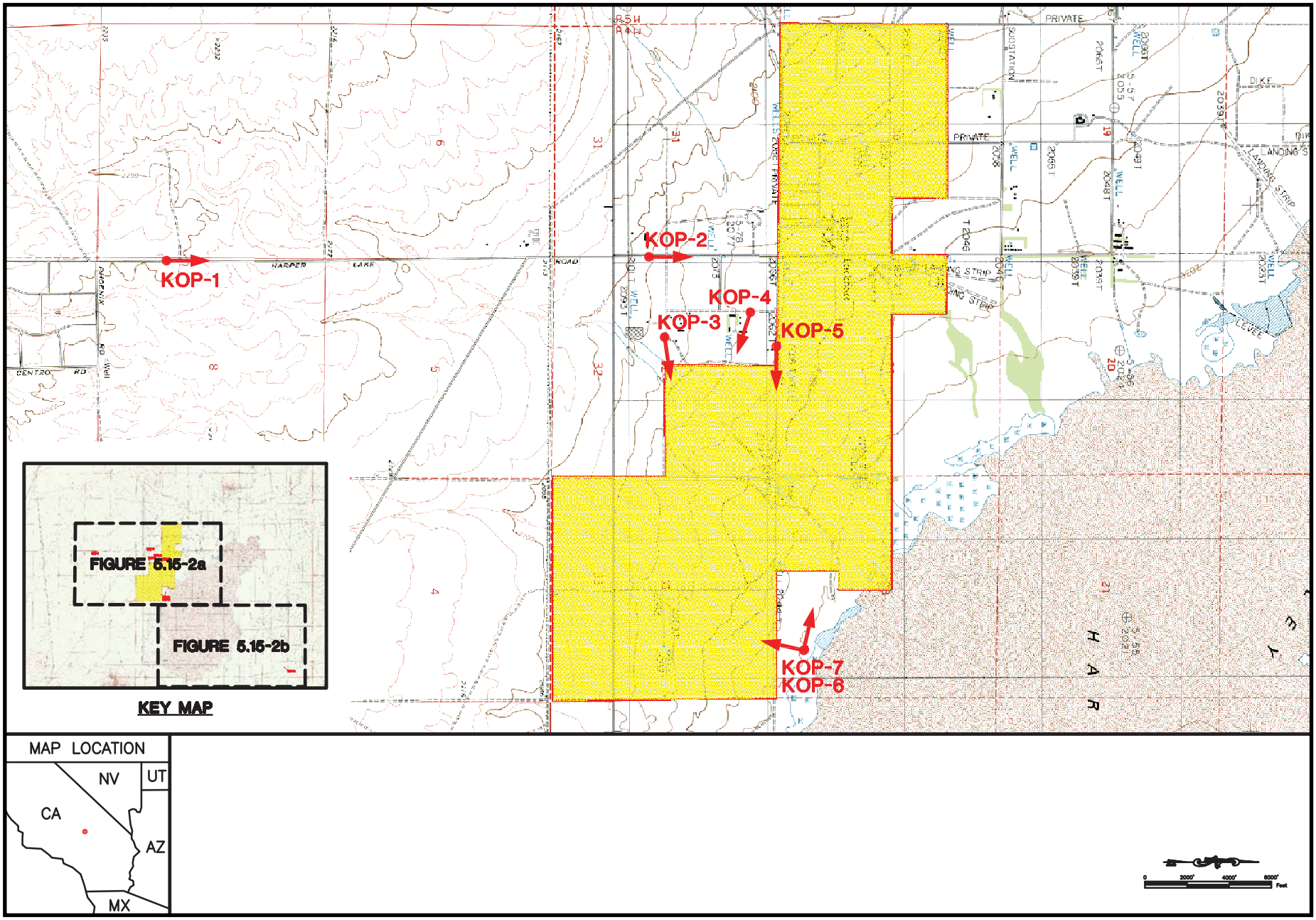
VISUAL RESOURCES

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

MAY 2010

VISUAL RESOURCES - FIGURE 2A

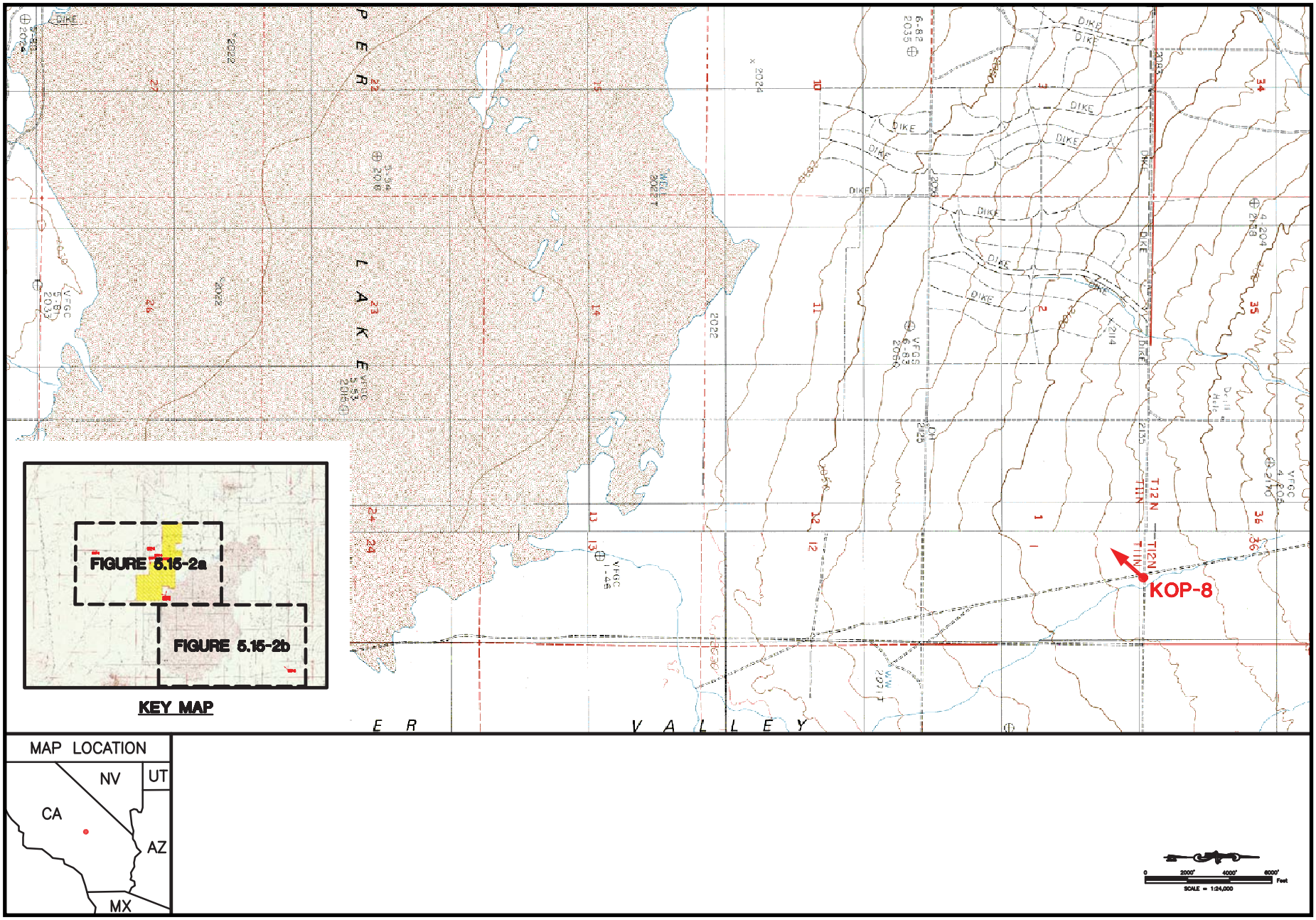
Abengoa Mojave Solar Project - Key Observation Points Map 1



VISUAL RESOURCES

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)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 3B

Abengoa Mojave Solar Project - KOP 1 - View from Harper Lake Road near Phoenix Road (Post-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 4A

Abengoa Mojave Solar Project - KOP 2 - View from Harper Lake Road South of Roy Road (Pre-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 4B

Abengoa Mojave Solar Project - KOP 2 - View from Harper Lake Road South of Roy Road (Post-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 5A

Abengoa Mojave Solar Project - KOP 3 - View from Roy Road East of Edie Road (Pre-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 5B

Abengoa Mojave Solar Project - KOP 3 - View from Roy Road East of Edie Road (Post-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 6A

Abengoa Mojave Solar Project - KOP 4 - View from Edie Road South of Lockhart Ranch Road (Pre-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 6B

Abengoa Mojave Solar Project - KOP 4 - View from Edie Road South of Lockhart Ranch Road (Post-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 7A

Abengoa Mojave Solar Project - KOP 5 - View from Lockhart Ranch Road East of Edie Road (Pre-Project)

MAY 2010

VISUAL RESOURCES

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

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, MAY 2010

SOURCE: AFC

VISUAL RESOURCES - FIGURE 8A

Abengoa Mojave Solar Project - KOP 6 - Views from Harper Lake Watchable Wildlife Area (Pre-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 8B

Abengoa Mojave Solar Project - KOP 6 - Views from Harper Lake Watchable Wildlife Area (Post-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 9A

Abengoa Mojave Solar Project - KOP 7 - Views from Harper Lake Watchable Wildlife Area (Pre-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 9B

Abengoa Mojave Solar Project - KOP 7 - Views from Harper Lake Watchable Wildlife Area (Post-Project)

MAY 2010

VISUAL RESOURCES

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

SOURCE: AFC

VISUAL RESOURCES - FIGURE 10A

Abengoa Mojave Solar Project - KOP 8 - View from Fossil Bed Road near Black Canyon Road (Pre-Project)

MAY 2010

VISUAL RESOURCES

SOURCE: AFC

VISUAL RESOURCES - FIGURE 10B

Abengoa Mojave Solar Project - KOP 8 - View from Fossil Bed Road near Black Canyon Road (Post-Project)

MAY 2010

VISUAL RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MAY 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, MAY 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, MAY 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.

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).

Applicable Law	Description
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.
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.

Applicable Law	Description
	(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.
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.

Applicable Law	Description
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.
Mojave Desert Air Quality Management District Rule 306	The purpose of the rule is to specify work practice requirements to limit asbestos emissions from building demolition and renovation activities, including the removal and associated disturbance of asbestos-containing materials.

SETTING

PROPOSED PROJECT

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 in 2010 and last approximately 24 months. Commercial operation would begin in the winter of 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.

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 reviews the project's Phase I ESA and works 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 reviews the applicant's proposed solid and

[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.

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 reviews the capacity available at off-site treatment and disposal sites and determines 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 buildings 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.

The applicant performed a sampling analysis of the project site In March of 2010 (see Waste Management Figure 1, AS 2010a). The applicant used 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 (test for Organochlorine Pesticides) and USEPA 8151A (test for Chlorinated Herbicides). Test method USEPA 8015 M, the test for Total Petroleum Hydrocarbons, 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.

The sampling analysis concluded that there are four items of environmental concern on the project site and would have to be remediated prior to the beginning of demolition and construction of AMS. The items that will be removed from the project site are asbestos containing material, lead-based paint, a non-operational underground aviation fuel tank, and hazardous material/wastes located in the abandoned General Store's basement (MJE 2010a).

Sections 101480 through 101490 of the California Health and Safety Code provide that a party responsible for remediation of a contaminated site may request regulatory oversight by a local agency that has assumed enforcement authority. The applicant has not requested the local agency provide regulatory oversight. Currently San Bernardino County will be responsible for permitting tank removal, and either the Lahontan Regional Water Quality Control Board (LRWQCB) or the Department of Toxic Substances Control (DTSC) will be responsible for remedial activity at the proposed site. The purpose of the oversight would be to supervise a site investigation and any remediation necessary to mitigate the site.

The San Bernardino County Fire Department (Certified Unified Program Agencies) is responsible for underground storage tank (UST) removal permits. The project owner is required to obtain a permit to remove the aviation fuel UST; however, if contamination is found, the project owner will participate in LRWQCB UST cleanup program once the cleanup is completed. If required, LRWQCB will provide a closure letter demonstrating satisfactory soil remediation completion.

Staff proposed Condition of Certification **WASTE-1** would require that removal of UST is conducted under the oversight of San Bernardino County Fire Department, with Energy Commission Compliance Project Manager (CPM) involvement. There are hazardous materials/wastes located in the General Store's basement. The applicant will either remove the hazardous material or have the waste transported by a certified hazardous waste hauler to a Class I landfill, or if remediation is required the applicant will work with the DTSC in the Voluntary Cleanup Program. Staff proposed Condition of Certification **WASTE-2** would require the construction contractor to obtain a unique hazardous waste generator identification number for the site prior to starting construction. Proposed Condition of Certification **WASTE-3** would require the applicant to participate in the /DTSC Voluntary Cleanup Program if remediation is required to cleanup spills of hazardous material on the project site.

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 proposed Condition of Certification **WASTE-4** 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, proposed Condition of Certification **WASTE-5** would require that the Professional Engineer or Professional Geologist inspect the site, determine what is required to characterize the nature and extent of contamination, and provide a report to the Energy Commission 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 would be required to develop and implement a Construction Waste Management Plan as described in the proposed Condition of Certification **WASTE-7**. 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, and 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, requiring that all local jurisdictions divert waste from landfill disposal by fifty percent. 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-7,** which would require the applicant to identify the hauler they will use and the facilities receiving the waste; and maintain documentation at the project site, accessible to regulatory agencies, showing the type and volume of waste disposed of 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

There are a number of older buildings located on the project site, and some of the buildings contain asbestos and lead paint. Certain building material wastes are banned from disposal in California Class II landfills. Treated wood, paint and coatings, plumbing and pipes, fluorescent lamps, batteries, thermostats and switches may contain asbestos, arsenic, lead, mercury or polychlorinated biphenyls (PCBs) Lights, batteries, thermostats, electrical switches and solvent-based and lead-based paint wastes are banned from California Class II landfills. Asbestos is included in various types of older building materials, including cement, roofing, flooring, insulation and fire-proofing materials.

During demolition of existing buildings, asbestos-containing materials will be handled in accordance with the Mojave Desert Air Quality Management District's (MDAQMD) Rule 306, which specifies work practice requirements to limit asbestos emissions from building demolition and renovation activities, including the removal and associated disturbance of asbestos-containing materials. The MDAQMD requires that project owners complete and submit an asbestos survey prior to renovations and demolition. Asbestos-containing materials must be removed prior to activities that may disturb them, including demolition. Proposed Condition of Certification **WASTE-8** would require that the project owner submit to the MDAQMD an Asbestos Demolition Notification Form for review and approval prior to removal and disposal of asbestos-containing materials.

Anticipated hazardous construction 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 of at a hazardous waste facility; solvents, used oils, paint, oily rags, and adhesives would be recycled or disposed of at a hazardous waste facility; and spent batteries would be disposed of 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-2**. 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, specific handling, disposal and other precautions may be necessary pursuant to hazardous waste management LORS. Proposed Conditions of Certification **WASTE-4** and **WASTE-5** 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 presents 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-9**. This would ensure that an accurate record is maintained of the project's waste storage, generation and disposal, and that compliance with waste management 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 percent biphenyl and 73.5 percent diphenyl oxide. The HTF is circulated through a solar steam generator where it transfers heat, which is used to generate high pressure steam that turns a steam turbine generator to produce electrical power (AS2009a, page 2-7). Approximately 2,292,000 gallons of Therminol VP-1 would be present within the solar collector system, including the piping and necessary expansion tanks.

Occasional spills of HTF from either equipment failure or human error can result in soil contamination. 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 disposed of 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]) staff, 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's 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 Land Treatment Unit (LTU) for treatment and are used as back fill material at the existing SEGS facilities. 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 at the proposed AMS facility 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 unit to treat soil contaminated with HTF caused by leaks or spills. The proposed bioremediation and land farm facilities, which will be established at each plant site, will each cover an area of approximately 1.5 acres (ESH 2009d, Data Response 83). Spills of HTF at the AMS facility 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 version of the manual "Test Methods for Evaluating Solid Waste" (SW-846). The waste material would

[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.

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) content. 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.

LRWQCB has determined that Test Method 8015 is no longer the only appropriate method for biphenyl and diphneyl ether analysis. They have determined that USEPA Method 1625B (revised July 1, 1995) (40CFR136) more accurately detects the two compounds (Brathode 2009). The AMS, LRWQCB approved, Corrective Action Plan approved either modified Method 8015 or 1625B be used to analyze soil impacted by HTF.

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. 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 Condition of Certification **WASTE-10** which would require the applicant to sample and test soils affected by discharges of HTF to determine whether HTF is present in hazardous concentrations. If the tests show HTF is present in hazardous concentrations, the affected soils must be disposed of in accordance with California Health and Safety Code (HSC) Section 25203.

If the concentrations of HTF in the affected soils indicate they can be stored and treated in the Land Treatment Unit, the applicant would be required to comply with Condition of Certification **SOIL&WATER-2**. Please see the **SOIL AND WATER RESOURCES** section of this document for further discussion of mitigation requirements. With implementation of the proposed Condition of Certification **WASTE-10 and SOIL&WATER-2**, 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 Condition of Certification **WASTE-11,** 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 sanitary wastewater would be disposed of in evaporation ponds and a septic leach field, respectively. Stormwater 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-2**, would be retained and used for hazardous waste generated during facility operation.

The hazardous wastes expected to be generated during routine project operation include used hydraulic fluids, oils, greases, oily filters and rags, 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-12**. The condition would require 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 solid 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 of at the five 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). 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. 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.

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 of the AMS facility would comply with waste management laws, ordinances, regulations, and standards if staff's recommended conditions of certification are adopted.

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 **12**. 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-2**).
   - 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-1, 2, 3, 4, 5**,**6**, **8**,**9** ,**10**,and **11**).
   - 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-10** and **12)**.

   Existing conditions at the AMS project site, including a UST, there are areas where prior site uses may have resulted in releases of hazardous substances or soil contamination. Therefore, staff is requiring the applicant to work with the San Bernardino County Fire Department, Regional Boards/ or DTSC for Tank removal, and possible remediation of the project site prior to construction.

2. 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 percent 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 Prior to removal of the underground storage tanks (USTs), the project owner shall obtain a permit from the San Bernardino County Fire Department. The CPM and the San Bernardino County Fire Department must acknowledge review of the plans for the project prior to permit issuance. After receiving approval from the CPM, the project owner shall obtain a permit for removal of all USTs.

Verification: No less than sixty (60) days prior to commencement of site mobilization, the project owner shall provide the plans to remove the underground storage tanks to the CPM for review and approval. The project owner shall inform the CPM via the monthly compliance report, of the data when all USTs were removed from the site.

WASTE-2 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-3 The project owner shall ensure that the Abengoa Mojave Solar One (AMS) Project site is properly characterized and remediated as necessary pursuant to LRWQCB or DTSC Voluntary Site Cleanup Programs. In no event shall project construction commence in areas requiring characterization and remediation until LRWQCB or DTSC, and CEC CPM have determined that all necessary remediation has been accomplished as necessary.

Verification: The project owner shall submit to the CPM copies of all pertinent correspondence, work plans, agreements, and authorizations between the AMS Project and LRWQCB or DTSC regarding Voluntary Site Cleanup Program requirements and activities at the AMS project site. The CPM shall review and comment on the proposed Cleanup Program requirements and activities. At least 60 days prior to the start of site mobilization, the project owner shall provide to the CPM written notice from San LRWQCB/DTSC that the AMS site has been investigated and remediated, as necessary, for compliance with the Voluntary Cleanup Program.

WASTE-4 If potentially contaminated soil is identified during site characterization, demolition, excavation, or grading at either the proposed site or linear facilities, as evidenced by discoloration, odor, detection by handheld instruments, or other signs, the professional engineer or professional geologist shall inspect the site, determine the need for sampling to confirm the nature and extent of contamination, and provide a written report to the project owner, LRWQCB/DTSC, and 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 construction activity at that location for the protection of workers or the public. If, in the opinion of the professional engineer or professional geologist, significant remediation may be required, the project owner shall contact the CPM and representatives of LRWQCB/DTSC 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 5 days of their receipt. The project owner shall notify the CPM within 24 hours of any orders issued to halt construction.

WASTE-5 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-6 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-7 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-8 Prior to demolition of existing structures, the project owner shall complete and submit a copy of a MDAQMD Asbestos Demolition Notification Form to the CPM and the MDAQMD for approval. After receiving approval, the project owner shall remove all Asbestos Containing Material (ACM) from the site prior to demolition.

Verification: No less than sixty (60) days prior to commencement of structure demolition, the project owner shall provide the Asbestos Demolition Notification Form to the CPM for review and approval. The project owner shall inform the CPM via the monthly compliance report, of the data when all ACM is removed from the site.

WASTE-9 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-10 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 treatment unit. 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-9** and reported to the CPM in accordance with Condition of Certification **WASTE-12**.

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-11 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-9**.

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-9**.

WASTE-12 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.

Verification: Copies of the unauthorized spill documentation shall be provided to the CPM within 30 days of the date the release was discovered.

REFERENCES

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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.

AS 2010a - Abengoa Solar Inc. / K. Sullivan (TN 55001). Surface Soil Sampling Plan. Submitted to CEC on 1/26/2010.

AS 2010e - Abengoa Solar Inc. (TN 56127). Site Material Sampling Plan. Submitted to CEC on 4/6/2010.

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CEC 2009n - CEC / C. Hoffman (TN 53770). Data Request Set 1B (nos. 1-86), dated 10/26/2009. Submitted to CEC on 10/26/2009.

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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.

ESH 2009a - Ellison, Schneider and Harris / C. Ellison (TN 54082). Notice of request for additional time for Data Request Set 1A, dated 11/11/09. Submitted to CEC on 11/11/2009.

ESH 2009b - Ellison, Schneider and Harris / C. Ellison (TN 54151). Notice of request for additional time for Data Request Set 1B, dated 11/16/09. Submitted to CEC on 11/16/2009.

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.

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 2009f - Ellison, Schneider and Harris / C. Ellison (TN 54582). Supplemental Written Responses to Data Request Set 1 (nos. 1-93), dated 12/23/09. Submitted to CEC on 12/23/2009.

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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 **-8**, 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

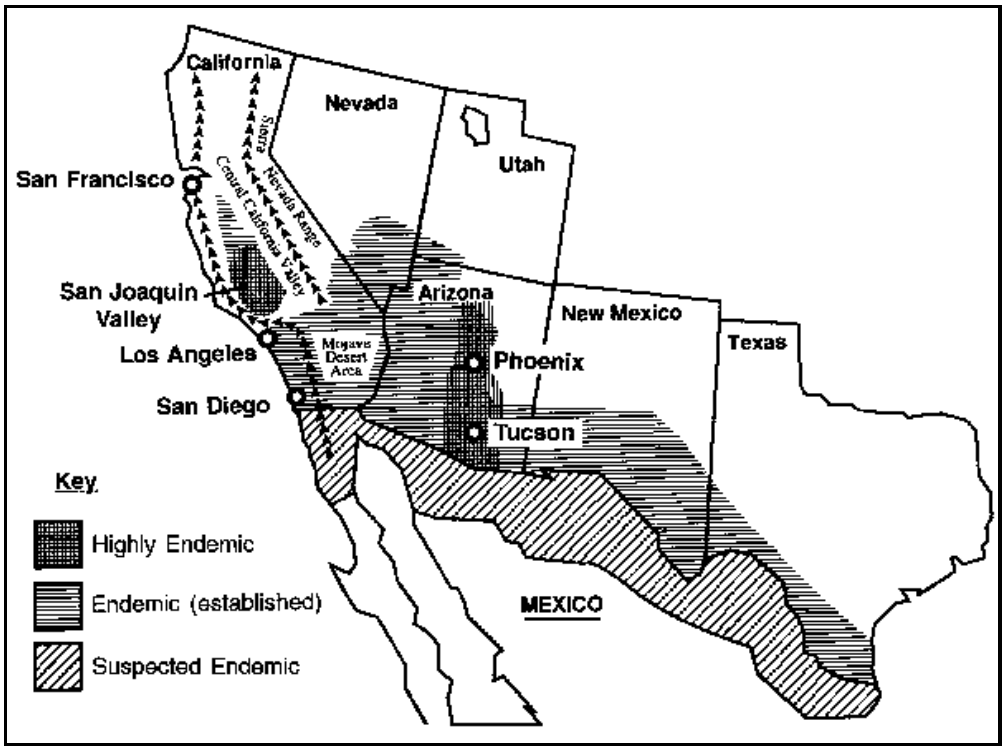
implemented at all power plants certified by the Energy Commission. During the audits conducted by staff, most site safety professionals welcomed the audit team and actively engaged it in questions about the team's findings and recommendations. These safety professionals recognized that safety requires 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.

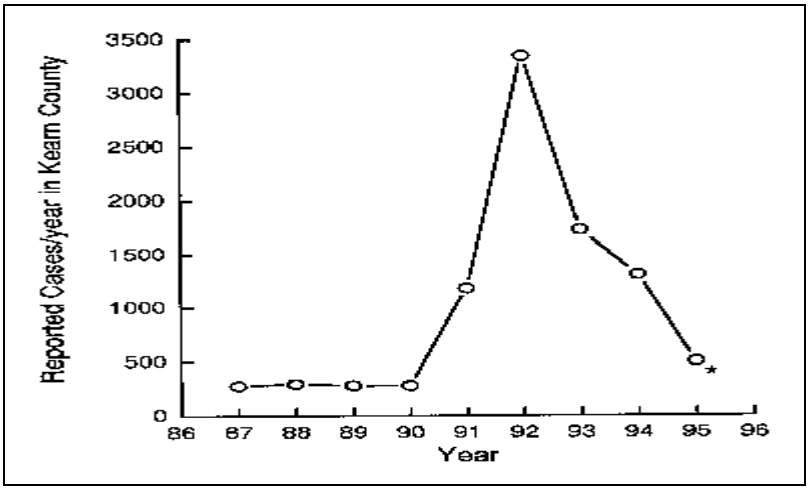
Worker Safety Figure 1
The Geographic Distribution of Coccidioidomycosis*



*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 3
Hospitalizations for Coccidioidomycosis, California, 1997–2002*

Category	Total hospitalizations	Total person-yrs (× 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).

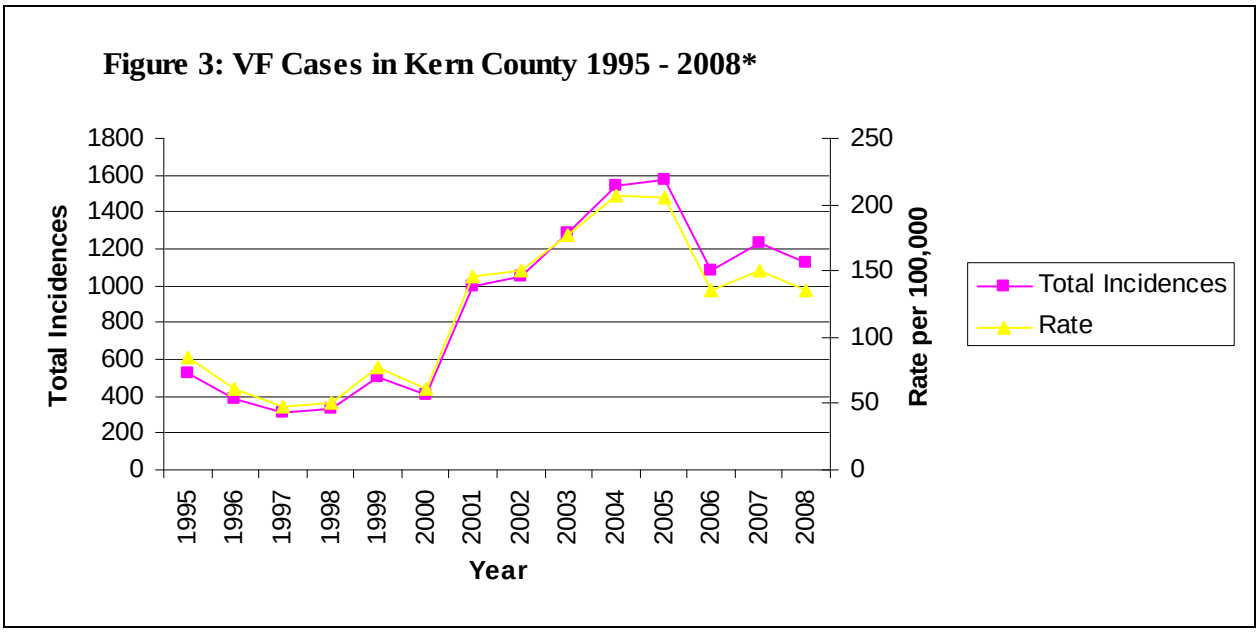
Data from the Kern County Department of Public Health (KCDPH) on the period between 1995 and 2008 shows that VF cases increased in Kern County during the early 1990's, decreased during the late 1990's, increased again between 2000 and 2005, and have been declining slightly in the last several years. 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



*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's region may have an elevated

risk for exposure, despite the fact that the nearby Ridgecrest area 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 Revised SA 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

Foreseeable Projects in the Project Area

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

Comment: A member of the public has commented on the emergency preparedness of the proposed project. He indicated that there was a recent explosion at the existing solar plant and that the local residences were not notified or provided with any information about it. His concern regards how the new solar plant will notify the local

residences in the event of an emergency (a siren, a house visit, a phone call, etc.) and whether there is an evacuation plan for the local residence is case of a fire or emergency releasing toxins into the air. In addition he is concerned that the Hinkley Fire Department would not be able to respond to a hazardous materials incident so that response would take much longer (over an hour). He raised doubts as to the assurances we have that the Hinkley Fire Department will indeed respond and that they are capable of handling an emergency involving toxic hazardous materials at this plant (JR2010a).

Response

In response to the first concern about implementing a public notification system whenever a hazardous material spill occurs, as staff mentioned at the SA Workshop, the Energy Commission believes that the notification to the public should be made on a case-by-case basis by the local authorities, in this case the SBCFD. Staff has found that this procedure works best and encourages the local community to voice it's wishes to the SBCFD and to the project owner to establish criteria for when and how the public will be notified.

Regarding proper response to a spill or release of a hazardous material, as can be found in the SA section on ***HAZARDOUS MATERIALS MANAGEMENT****, 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. In the event of an accidental spill of a hazardous material, the first response will be by the facility staff who will be trained as a hazardous materials response team. If a large incident involving hazardous materials occurs, 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 (SBCFD 2010).*

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**-8**, 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 (SBCFD) 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 SBCFD a copy of the Construction Fire Prevention Plan and Emergency Action Plan for review and comment and a copy of the Project Construction Safety and Health Program to the CPM for review and approval. .

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 SBCFD for review and comment.

Verification: At least 30 days prior to the start of commissioning, the project owner shall submit to the SBCFD the final Operations Fire Prevention Plan and Emergency Action for review and the final Project Operations and Maintenance Safety and Health Program to the CPM for approval.

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, although the plans themselves may be administered by someone different (i.e. Plant Safety Representative or Designee).

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 first responders who are certified in first aid and CPR requirements. 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 30 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; and

ii) 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.

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.

WORKER SAFETY-8 The project owner shall participate in joint training exercises with the SBCFD. The project owner shall coordinate this training with other Energy Commission-licensed solar power plants within San Bernardino County such that this project shall host the annual training on a rotating yearly basis with the other solar power plants.

Verification: At least 10 days prior to the start of commissioning, the project owner shall submit to the CPM proof that the joint training with the SBCFD is established and shall include the date, list of participants, training protocol, and location in the yearly compliance report to the CPM.

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PREPARATION TEAM

ABENGOA MOJAVE SOLAR
09-AFC-5
PREPARATION TEAM

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Traffic and Transportation	Steven Brown
Visual Resources	William Kanemoto, James Jewell and Tom Packard
Waste Management	Ellie Townsend-Hough
Worker Safety	Alvin J. Greenberg, Ph.D.
Transmission System Engineering	Ajoy Guha, P.E. and Mark Hesters
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 III).

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** and **Transmission System Engineering Appendix A** 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: 5/5/10 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
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: May 5, 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)

Liquefied Natural Gas (LNG)

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)

Hazardous Materials Assessments, Waste Management Assessments, Worker Safety and Fire Protection Assessments, and Public Health Impacts Assessments

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
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 **Noise and Vibration** for the **Abengoa Mojave Solar Project** based on my independent analysis of the Application for Certification, Transmission System Engineering Appendix A, 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: April 29, 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
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: 4/29/10 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
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: May 5, 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: ___7 May, 2010_____ Signed: Original signed by J. E. 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: May, 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: 5/6/10 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

Continuing Education

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.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
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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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DECLARATION OF SERVICE

I, April Albright, declare that on May 12, 2010, I served and filed copies of the attached Supplemental Staff Assessment – Part A. 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 electronically to all email addresses on the Proof of Service list;

_____ by personally delivery;

✓ 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
docket@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