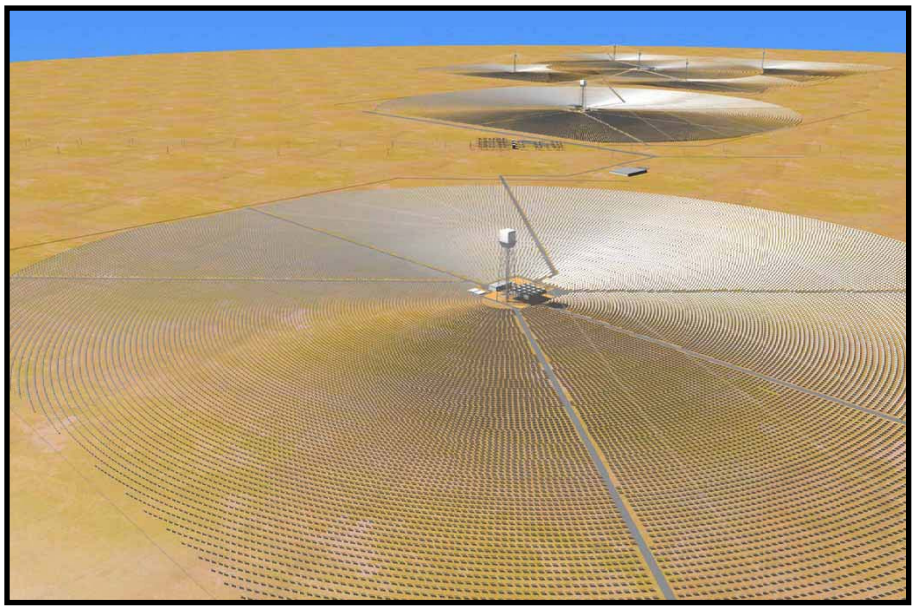
Preliminary Staff Assessment

IVANPAH SOLAR ELECTRIC GENERATING SYSTEM

Application For Certification (07-AFC-5)
San Bernardino County



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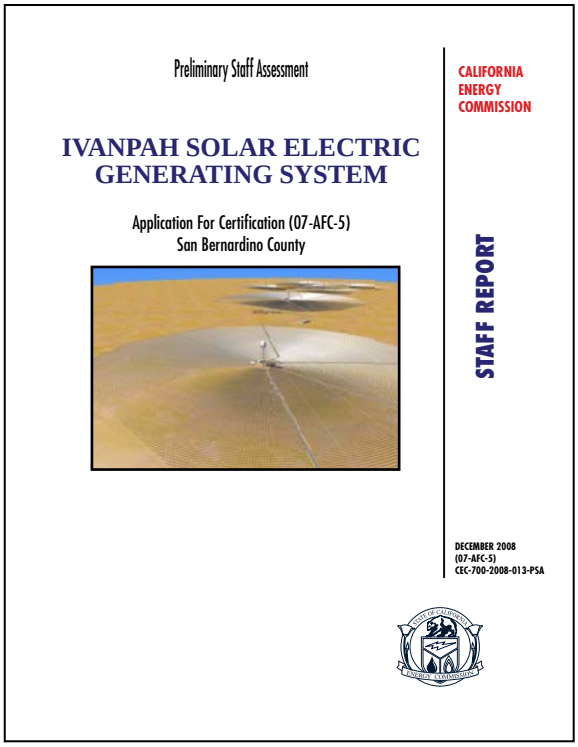

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IVANPAH SOLAR ELECTRIC GENERATING SYSTEM (ISEGS)
(07-AFC-5)
PRELIMINARY STAFF ASSESSMENT

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EXECUTIVE SUMMARY

Che McFarlin

INTRODUCTION

This Preliminary Staff Assessment (PSA) contains the California Energy Commission (Energy Commission) staff's evaluation of Solar Partners I, LLC; Solar Partners II, LLC; Solar Partners IV, LLC; and Solar Partners VIII, LLC (applicant), which are subsidiaries of BrightSource Energy, Inc., Application for Certification (AFC) (07-AFC-5) for the proposed Ivanpah Solar Electric Generating System (ISEGS). The proposed ISEGS project and related facilities are under the Energy Commission's jurisdiction and cannot be constructed or operated without the Energy Commission's certification. This PSA examines engineering, environmental, public health and safety aspects of the proposed project, based on the information provided by the applicant and other sources available at the time the PSA was prepared. The PSA contains analyses similar to those normally contained in an Environmental Impact Report (EIR) required by the California Environmental Quality Act (CEQA).

When considering a project for licensing, the Energy Commission is the lead state agency under CEQA, and its process is functionally equivalent to the preparation of an EIR. After a 30-day public comment period on the PSA, staff will prepare a document jointly with the Bureau of Land Management (BLM), which is the federal lead agency for compliance with the National Environmental Protection Act (NEPA). This project will also be reviewed by BLM staff pursuant to the Federal Land Policy and Management Act of 1976. The joint state and federal analysis will take the form of a Final Staff Assessment (FSA)/ Draft Environmental Impact Statement (DEIS). That document will then be circulated for a 90-day public comment period. Then a Final Environmental Impact Statement (FEIS) will be issued.

The Energy Commission staff has the responsibility to complete an independent assessment of the project's engineering design and its potential effects on the environment, the public's health and safety, and whether the project conforms with all applicable laws, ordinances, regulations and standards (LORS). The staff also recommends measures to mitigate potential significant adverse environmental effects and conditions of certification for construction, operation and eventual closure of the project, if approved by the Energy Commission.

This PSA is not the decision document for these proceedings nor does it contain findings of the Energy Commission related to environmental impacts or the project's compliance with local/state/federal legal requirements. The FSA will be the next iteration of staff's analysis, and will serve as staff's testimony in evidentiary hearings to be held by the Committee of two Commissioners who are overseeing this case. The Committee will hold evidentiary hearings and will consider the recommendations presented by staff, the applicant, all parties, government agencies, and the public prior to proposing its decision. The Energy Commission will make a final decision, including findings, after the Committee's publication of its proposed decision.

PROJECT LOCATION AND DESCRIPTION

The applicant has proposed to locate the ISEGS project in the Mojave Desert, near the Nevada border in San Bernardino County, California, on land administered by the Bureau of Land Management (BLM). The proposed project site is located 4.5 miles southwest of Primm, Nevada and 0.5 mile west of the Primm Valley Golf Club which is located just west of the Ivanpah Dry Lake. Access to site is from the Yates Well Road Interchange on I-15 via Colosseum Road.

The proposed ISEGS project is a solar concentrating thermal power plant, which is comprised of fields of heliostat mirrors focusing solar energy on boilers located on centralized power towers. Each mirror will track the sun throughout the day and reflect the solar energy to the receiver boiler. In each plant, one Rankine-cycle reheat steam turbine receives live steam from the solar boilers and reheats steam from the solar reheater. The solar field and power generation equipment would be put into operation each morning after sunrise and insolation build-up, and shut down in the evening when insolation drops. Electricity would be produced by each plant's solar receiver boiler and the steam turbine generator.

The applicant proposes to develop the ISEGS project in three phases which are designed to generate a total of 400 MW of electricity. The first two phases of the project, Ivanpah 1 and 2, are designed to provide 100 MW of electricity and would occupy approximately 914 acres and 921 acres respectively; the 200 MW phase, Ivanpah 3, would require occupy approximately 1,843 acres. All three phases would be share an administration building, an operation and maintenance building, substation, and detention ponds which would be located in between Ivanaph 1 and 2 requiring an additional area of approximately 66 acres. Another 316 acres is needed for construction staging activities. Established dirt roads account for an additional 5 acres. ISEGS total project footprint amounts to approximately 4,065 acres (approximately 6.4 square miles).

Ivanpah 1 and 2 would each have an electrical generation capacity of 100 MW. The plants each consist of approximately 110,000 heliostats (mirrors), double mounted on 55,000 poles, in a single array around a centralized solar power tower. Ivanpah 3 would have an electrical generation capacity of 200 MW. The plant would consist of approximately 208,000 heliostats (mirrors), double mounted on 104,000 poles, in five separate arrays. Each of the five arrays would be centralized around separate solar power towers. The solar power towers would be 459 feet tall (plus an additional 10 foot tall lightening rod that would extend above the top of the tower).

Each of the three solar-thermal plants would include the following equipment and facilities:

- A power block facility that would house the natural gas-fired start-up boiler, air emission control system for the combustion of natural gas in the start-up boiler, steam turbine generator, an air-cooled condenser, waste water treatment equipment, and auxiliary equipment (feed water heaters, a de-aerator, an emergency diesel generator, diesel fire pump, etc.);

- A raw water tank with a 250,000 gallon capacity of which only a portion would be used for the plant;
- Onsite access and maintenance roads (either dirt, gravel or paved);
- Storm water retention basins and diversion channels; and
- Perimeter fencing.

NATURAL GAS PIPELINE

The solar heat used in the boiler (steam) process would be supplemented by burning natural gas to heat a partial load steam boiler when solar conditions are insufficient. Each plant within the project includes a small package, natural gas-fired start-up boiler to provide additional heat for plant start-up and during temporary cloud cover. Natural gas would be obtained by installing an underground distribution pipeline from the existing Kern River Gas Transmission pipeline which runs approximately 0.5 mile north of the Ivanpah 3 site.

AIR POLLUTION CONTROL

Air pollution emissions from the combustion of natural gas in the start-up boiler would be controlled using best available control technology. To ensure that the systems perform correctly, continuous emission monitoring for nitrogen oxides (NO_x) and carbon monoxide (CO) would be performed. Boiler use would not exceed four hours on any given day, and average boiler use will be less than one hour per operating day.

WATER SUPPLY AND DISCHARGE

The applicant proposes to draw groundwater from one of two wells which would be constructed at the northwest corner of Ivanpah 1. Each of the three power blocks would be connected to the ground water wells by underground water pipelines. The applicant estimates project water consumption to be no more than 100 acre-feet per year for all three solar plants combined, which would primarily be used to provide water for washing heliostats (mirrors) and to replace boiler feed water blow-down. Groundwater would go through a treatment system for use as boiler make-up water and to wash the heliostats. The only wastewater expected to be generated by the system would be treated and used for landscape irrigation.

WASTE MANAGEMENT

All operational wastes produced at ISEGS would be properly collected, treated (if necessary), and disposed of in a closed system. Wastes include process and sanitary wastewater, nonhazardous waste and hazardous waste, both liquid and solid.

A sewage package treatment plant would be located at the administration building/operations and maintenance area, located between Ivanpah 1 and 2. This primary wastewater collection system would collect process wastewater from all equipment, including the boilers and water treatment equipment. Additionally, each solar plant would include a small onsite wastewater plant located in the power block that would treat wastewater from domestic waste streams such as showers and toilets. Sewage sludge would be removed from the site by a sanitary service provider. All wastewater would be recycled in the system, except for a small stream that would be

treated and used for landscape irrigation. If necessary, a small filter/purification system would be used to provide potable water at the administration building. Any reject streams from water treatment would be trucked offsite for treatment or disposal. Additionally, there are two concrete-lined holding basins, approximately 40 feet by 60 feet in size, which are part of each power block facility and can serve for boiler commissioning and emergency outfalls from any of the processes.

HAZARDOUS WASTE MANAGEMENT

Several methods would be used to properly manage and dispose of hazardous wastes. Waste lubricating oil would be recovered and recycled by a waste oil recycling contractor. Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals would be stored in large storage tanks, while most other chemicals would be stored in smaller returnable delivery containers. All chemical storage areas would be designed to contain leaks and spills in concrete containment areas.

FIRE PROTECTION

The fire protection system would be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water would be the raw water storage tank to be located in each power block. An electric jockey pump and electric-motor-driven main fire pump would be provided to increase the water pressure in the plant fire main to the level required to serve all fire fighting systems. In addition, a back-up diesel engine-driven fire pump would be provided to pressurize the fire loop if the power supply to the electric-motor-driven main fire pump fails.

VEHICLE TRAILS

Vehicle trails run through the proposed project site. To allow continued use and access the applicant would reroute three public trails and one trail that serves as an access to a mining claim. Colosseum Road would be rerouted between Ivanaph 1 and 2. The other trails that would be rerouted are: 1) trail 699226, which passes through the northern third of Ivanpah 3, would be rerouted along the northern border of Ivanpah 3; 2) trail 699198, which passes between Ivanpah 2 and 3, would be rerouted between those two proposed plants; and 3) an unnumbered trail on the east side of Ivanpah 3 would be relocated outside the project site so that it would provide continued access to the limestone outcroping.

TRANSMISSION SYSTEM INTERCONNECTION AND UPGRADES

The ISEGS project would deliver power on three new 115 kilovolt (kV) transmission generation tie lines to a new Ivanpah substation. In order to accommodate the load expected to be generated by ISEGS and other planned electricity generation projects the California Independent System Operator (California ISO) has identified that approximately 35 miles of transmission line would need to be upgraded from 115 kV to 220 kV. Southern California Edison is in the process of developing a project to upgrade the transmission system which includes removing the existing 115 kV transmission lines and constructing a new double-circuit 220 kV transmission line between the existing Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California. A conceptual scope of work and a general analysis is provided in the **Downstream**

Impacts Analysis which is Appendix-A of this document. Additional upgrades may be required as mitigation prior to final approval of interconnection to California ISO and Non-California ISO controlled facilities.

TELECOMMUNICATIONS FACILITIES

The proposed Ivanpah substation would also require new telecommunication infrastructure to be installed to provide protective relay circuit, a Supervisory Control and Data Acquisition (SCADA) circuit together with data and telephone services. The telecommunication path from Ivanpah substation to the local carrier facility interface at Mountain Pass area consists of approximately 8 miles of fiber optic cable to be installed overhead on existing poles, and through new underground conduits to be constructed in the substation and telecom carrier interface point. This fiber optic route consists of two segments. The first segment is from Ivanpah substation to Mountain Pass substation using the existing Nipton 33 kV distribution line poles built along the transmission line corridor that crosses between Ivanpah 1 and 2. The second segment is from Mountain Pass substation to the telecommunications facility approximately 1.5 miles away at an interface point to be designated by the local telecommunication carrier. The fiber cable would be installed on the existing 12 kV distribution line poles. A conceptual scope of work and a general analysis of this work is also provided in the **Downstream Impacts Analysis** which is Appendix-A of this document.

PUBLIC AND AGENCY COORDINATION

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

The PAO's public outreach is an integral part of the Energy Commission's AFC review process. The PAO reviewed information provided by the applicant and conducted outreach efforts to identify and locate local elected and certain appointed officials, as well as "sensitive receptors" (including schools, community, cultural and health facilities, daycare and senior-care centers, as well as environmental and ethnic organizations). No sensitive receptors were identified within a six-mile radius of the proposed site for the project.

The AFC was sent to the main county libraries in San Bernardino, Barstow, Fresno, and Eureka, the main branchs of the San Diego and San Francisco public libraries, the University Research Library at UCLA, as well as the California State Library, the Energy Commission's library in Sacramento, BLM's field office in Needles, and several public agencies. The AFC and other project documents are located on the Energy Commission's website at http://www.energy.ca.gov/sitingcases/ivanpah/index.html.

Coordination has occurred with numerous local, state and federal agencies and officials that have an interest in the project. In particular staff has worked with the Bureau of Land Management, National Park Service, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Federal Aviation Administration, State Water Resources Control Board, **Lahontan** Regional Water Quality Control Board, California Department of Fish and Game, California Department

of Transportation, California Air Resources Board, Mojave Desert Air Quality Management District, the County of San Bernardino, and the California Independent System Operator (CAISO) to identify and resolve issues of concern.

Notices for workshops and hearings have been and will continue to be distributed to those agencies, individuals, and businesses which are currently on or request to be placed on the project's mailing list. Notices were distributed for the Informational Hearing and Site Visit which was conducted on January 4, 2008 in Primm, NV and the June 23, 2008 data response workshop which was also held in Primm. Public Service Announcements were also utilized to advertise the January 4th Informational Hearing and Site Visit.

Several agencies and members of the public have submitted comments on the proposed ISEGS project since the AFC was filed. Staff has considered these comments in preparing its analysis. This PSA provides agencies and the public with an opportunity to review the Energy Commission staff's analysis of the proposed project. Comments received on this PSA will be taken into consideration in preparing the subsequent project documents.

ENVIRONMENTAL JUSTICE

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

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

- the minority population of the affected area is greater than 50 percent of the affected area's general population; or
- the minority population percentage of the area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis; or
- when one or more U.S. Census blocks in the potentially affected area have a minority population of greater than 50 percent.

California Statute, Section 65040.12 (c) of the Government Code, defines "environmental justice" to mean "fair treatment of people of all races, cultures, and

incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies."

The steps recommended by these guidance documents to assure compliance with the Executive Order are: (1) outreach and involvement; (2) a screening-level analysis to determine the existence of a minority or low-income population; and (3) if warranted, a detailed examination of the distribution of impacts on segments of the population. Though the Federal Executive Order and guidance are not binding on the Energy Commission, staff finds these recommendations helpful for implementing this environmental justice analysis. Staff has followed each of the above steps for the following 11 sections in the PSA: Air Quality, Hazardous Materials, Land Use, Noise, Public Health, Socioeconomics, Soils and Water, Traffic and Transportation, Transmission Line Safety/Nuisance, Visual Resources, and Waste Management.

According to the Census 2000 data there were 36 people within six miles of the proposed project site which resided within California. Ten of these individuals or 27.8 percent of the total California residents were classified as minority (see **SOCIOECONOMICS Figure 1**). No census blocks within a six-mile radius of the proposed ISEGS site contain minority populations greater than 50 percent. The 2000 Census block data did not identify any California residents living below the designated poverty level within a six-mile radius of the project site.

STAFF'S ASSESSMENT

Each technical area section of the PSA contains a discussion of the project setting, impacts, and where appropriate, mitigation measures and conditions of certification. The PSA includes staff's assessment of:

- the environmental setting of the proposal;
- impacts on public health and safety, and measures proposed to mitigate these impacts;
- environmental impacts, and measures proposed to mitigate these impacts;
- the engineering design of the proposed facility, and engineering measures proposed to ensure the project can be constructed and operated safely and reliably;
- project closure;
- project alternatives;
- compliance of the project with all applicable laws, ordinances, regulations and standards (LORS) during construction and operation;
- environmental justice for minority and low income populations, when appropriate; and
- proposed conditions of certification.

SUMMARY OF PROJECT RELATED IMPACTS

Staff's preliminary analysis shows that, with the exception of Air Quality, Biological Resources, Cultural Resources, Land Use, Soils and Water Resources, Traffic, Transmission System Engineering, and Visual Resources, the ISEGS project's potential impacts will be mitigated to a less than significant level. With the exception of Visual Resources staff is currently unable to determine if these impacts can be mitigated to a less than significant level pending resolution of the issues discussed below. Staff believes the impacts to Visual Resources are unmitigatable. Staff's preliminary analysis has identified cumulative impacts which are likely to occur in the areas of Biological Resources, Land Use, Traffic, and Visual Resources.

Staff's analysis also shows that the ISEGS project would not comply with the applicable laws, ordinances, regulations, and standards (LORS) that pertain to Visual Resources. Staff is currently unable to determine whether or not ISEGS would comply with the LORS pertaining to Biological Resources, Land Use, and Transmission System Engineering.

The following table summarizes the potential environmental impacts and LORS compliance for each technical section. Following the table is a discussion of those areas with potentially significant impacts and the technical areas in the PSA that staff has identified as having outstanding issues that require either additional data, further discussion and analysis, or are awaiting conditions from a permitting agency prescribing mitigation. Please see the appropriate section of this document for more detailed discussions.

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

In addition to the potential impacts contained in this PSA there are additional areas of concern which will be assessed in the forthcoming FSA/DEIS such as recreation, grazing, wild horses and burros, and mineral resources.

AIR QUALITY

Construction of the ISEGS project would cause particulate matter (PM) emissions which are 10 micrometers in diameter that would add to the existing violations of the ambient PM10, air quality standards. Therefore, the project PM10 emission impacts due to construction of the project would be significant. Staff believes that the implementation of proposed specific mitigation measures during construction of the facility as identified in the conditions of certification would reduce the short-term impacts of PM10 to a level of less than significant.

One aspect of the construction phase of the project that has not been quantified is the criteria emissions from the delivery of the considerable amount of materials, particularly the heliostat framework materials and mirrors to the site. If diesel powered truck delivery of these materials are the chosen method, then there could be considerable emissions associated with truck deliveries within the Mojave Desert Air Basin. Staff will work with the applicant to quantify those emissions and address any impacts and mitigation measures, if necessary, in the FSA.

Staff believes that the project's ozone precursors and PM10 emissions during operation are minimal, but would likely be significant. Additionally, staff believes a solar renewable project, which would have a 30 to 40-year life in a setting likely to continue to be impacted by both local and upwind emission sources, should address its contribution to a potentially ongoing non-attainment of the PM10 and ozone standards. Implementation of the staff recommended mitigation measures would reduce the facility emissions of ozone precursors from the proposed 14.86 tons per year (TPY) to 2.04 TPY (86 percent), and would reduce the facility PM10 emissions from 19.6 TPY to 4.72 TPY (76 percent). Similarly, carbon monoxide (CO), PM2.5, and carbon dioxide (CO_2) emissions would be significantly reduced while the applicant may realize a cost saving of the maintenance equipment. Staff believes that the implementation of its recommended mitigation measures would reduce the facility potential emission impacts of ozone and PM10 to a level of less than significant.

BIOLOGY

The ISEGS project would have major impacts to the biological resources of the Ivanpah Valley, significantly affecting many sensitive plant and wildlife species and eliminating a broad expanse of relatively undisturbed Mojave Desert habitat. Approximately 4,065 acres of occupied desert tortoise habitat would be permanently lost and a minimum of 25 desert tortoises would need to be moved to a location yet to be determined. These actions would require state and federal endangered species "take" authorization. In addition to direct loss of habitat, the project would fragment and degrade adjacent habitat, and could promote the spread of invasive non-native plants and desert tortoise predators such as ravens.

Special-status wildlife species such as burrowing owl, loggerhead shrike, Crissal thrasher, golden eagle, and American badger would lose breeding and/or foraging

habitat. Ten special-status plant species would be directly impacted by construction of ISEGS, and staff considers impacts to four of these (Rusby's desert-mallow, cave evening-primrose, Mojave milkweed, and desert pincushion) to be significant because the project would eliminate a substantial portion of known occurrences in the state. In the case of the California endemic Rusby's desert-mallow, the project would eliminate 11 percent of the known population in the world. The project would also affect approximately 2,000 ephemeral drainages on the ISEGS site, resulting in impacts to 198 acres of waters of the state. Staff considers the 4,065-acre ISEGS project would be a substantial contributor to the cumulatively significant loss of Ivanpah Valley's biological resources, including the threatened desert tortoise and other special-status species.

Impact avoidance and minimization measures described in staff's analysis and included in the conditions of certification would help reduce impacts to sensitive biological resources. However, these measures alone cannot offset project-related losses to less-than-significant levels without compensatory mitigation, nor can they assure compliance with state and federal laws such as the federal and state endangered species acts, state streambed alteration agreement regulations, and sections 401 and 404 of the Clean Water Act.

The applicant has not yet provided specific information on how to compensate for loss of habitat for desert tortoise, for loss of rare plants and other sensitive species, or for impacts to state waters. However, the Application for Certification and the draft Biological Assessment indicated compensation for loss of desert tortoise habitat would occur through an assessed financial contribution based on the final construction footprint at a 1:1 ratio, consistent with the Bureau of Land Management's (BLM's) guidance and policies in the Northern and Eastern Mojave Planning Area. Presumably the applicant's proposed 1:1 mitigation would involve acquisition and protection/enhancement of approximately 4,065 acres. The applicant has not specified the mechanism by which compensatory mitigation might occur, nor the location(s), or characteristics of potential acquisition lands.

Staff has concluded that applicant's proposed mitigation, acquisition, and enhancement of approximately 4,065 acres would be insufficient to avoid significant direct, indirect, and cumulative impacts to biological resources of the Ivanpah Valley, and fails to meet the California Department of Fish and Game's full mitigation standard for desert tortoise. Staff also believes this proposed mitigation will be inadequate to compensate for cumulatively significant impacts to other special-status plant and animals inhabiting the project site and to offset permanent loss of waters of the state.

Staff proposes development of a compensatory mitigation approach that includes appropriate levels of suitable habitat acquisition and enhancement in order to ensure those lands are managed and maintained for the covered species in perpetuity. Efforts are also ongoing to analyze the opportunity for other agency-sponsored actions that would benefit desert tortoise and Mojave Desert plant and animal communities in the Ivanpah Valley. In addition to land acquisitions and actions to mitigate impacts to desert tortoise, the compensatory mitigation package must also include measures that would mitigate impacts to special-status plants and wildlife and to waters of the state. Staff will work closely and cooperatively with BLM, the California Department of Fish and Game,

the U. S. Fish and Wildlife Service, and the applicant to develop a compensatory mitigation approach.

The most critical information needed by staff to complete its analysis is a compensatory mitigation and enhancement plan; a Desert Tortoise Translocation Plan; a Revegetation and Reclamation Plan; a complete project description that incorporates a comprehensive drainage, erosion and sediment control plan, a description of linear facility impacts and proposed future maintenance activities; and establishment of a funding mechanism for the facilities closure plan.

CULTURAL RESOURCES

Staff tentatively concludes that the ISEGS project would have a significant direct impact on one historically significant built-environment resource, the Hoover Dam-to-San Bernardino transmission line. The adoption and implementation of conditions of certification would reduce the potential impact of the proposed project on the resource to less than significant.

The conclusions here are tentative due to outstanding reports on the inventory and the historical significance evaluation of ethnographic resources that are in the project area of analysis. Preliminary results that the applicant provides indicate that there may be no historically significant ethnographic resources in the project area of analysis, but staff cannot definitively conclude the analysis of such resources absent the final results of recent field efforts.

LAND USE

Land use staff cannot yet conclude whether or not the proposed project is in conformance with the BLM's California Desert Conservation Area (CDCA) Plan of 1980 or the Northern and Eastern Mojave Desert Management Plan, the key land use plans affecting this project. These plans require that potentially significant impacts in various environmental resource areas be addressed and mitigated. The existing BLM CDCA Plan does not allow the construction of new power plant projects within Multiple Use Class L (Limited Use). BLM would have to amend the CDCA plan prior to approving any right-of-way grant for a solar power project on public land. The amendment decision would be part of the BLM Record of Decision for the issuance of a right-of-way grant.

Impacts of the ISEGS project would combine with impacts of present and reasonably foreseeable projects to result in a significant contribution to local cumulative impacts related to land use. When combined with impacts of the future solar and wind development projects that are currently proposed on over one million acres of land within southeastern California, southern Nevada, and western Arizona, regional impacts of the ISEGS project to land use would be cumulatively considerable and unavoidable.

SOILS AND WATER RESOURCES

Soil losses would develop during construction and grading activities and there would be ongoing soil loss after the project is constructed. Use of construction Best Management Practices (BMPs) in these areas are expected to control soil losses during construction and to mitigate potential impacts to air and surface water resources. Soil loss and erosion due to project activities could be significant and would need to be mitigated.

Staff recommends conditions of certification to ensure BMPs are in place to mitigate soil erosion by wind and water. Pending staff's receipt and review of revised grading plans, Storm Water Pollution Prevention Plans, and the Drainage, Erosion, and Sediment Control Plan, additional conditions of certification may be necessary in order to avoid potential erosional impacts to the soil.

Potable water would be supplied from an unknown source. Because the potable water source is unknown, staff cannot evaluate the potential environmental impacts associated with using this water. Given the estimated number of employees and duration of construction there could be a significant impact if a local water supply is proposed.

Staff understands that use of the wells at the Primm Golf Course has been reduced due to intrusion of brackish water that was not suitable for landscape irrigation. The cause of the intrusion was believed to be due to pumping induced migration of saltier groundwater underlying the playa to the east. Staff is concerned that although the magnitude of drawdown at the existing wells is minimal, there is a potential for migration of brackish groundwater westward towards the existing and proposed wells due to existing and proposed pumping by ISEGS. Staff believes additional modeling is necessary to evaluate potential water quality impacts.

TRAFFIC AND TRANSPORTATION

The applicant has indicated that a potential source of glare for traffic on I-15 is the solar receivers installed on the top of the power towers. Staff continues to investigate this issue and will provide a complete analysis in the FSA.

During the operational phase, the project could adversely affect aviation operations at the proposed Ivanpah Valley Airport due to glare from the solar thermal arrays. Staff continues to investigate this issue and will provide a complete analysis in the FSA.

Staff has determined that, with the implementation of the traffic control plan proposed as a condition of certification, construction and operation of the ISEGS would not cause a direct significant impact on northbound I-15 on Friday afternoons, but would contribute to a cumulatively considerable significant impact on northbound I-15 on Friday afternoons.

TRANSMISSION SYSTEM ENGINEERING

The System Impact Study (SIS) for the entirety of the proposed ISEGS project is needed in order to provide conclusions or recommendations for the proposed project. However based upon the information currently available it is staff's understanding that Southern California Edison is proposing to upgrade approximately 35 miles of existing transmission line to 230 kilovolt (kV) transmission line and construct the new 230 kV/115 kV Ivanpah substation. The new double-circuit 230 kV transmission line would be approximately 35 miles long, and would be located between the existing Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California. The Eldorado-Ivanpah portion of the existing Eldorado–Baker–Coolwater-Dunn-Siding-Mountain Pass 115 kV transmission line would be removed and replaced with the 230

kV transmission line. The rest of the 115 kV line would remain unchanged west of the new Ivanpah Substation.

Staff's understanding of necessary transmission line upgrades beyond the first point of interconnection and the analysis of the potential impacts of that work is contained in the **Downstream Impacts Analysis,** Appendix-A of this PSA. The disciplines where potential impacts are of most concern are air quality, biological resources, cultural resources, and visual resources.

VISUAL RESOURCES

Staff concludes that the ISEGS project would not meet the visual objectives of the Visual Resource Management Classes assigned to the site and viewshed by BLM, as seen from several Key Observation Points in the Ivanpah Valley and Clark Mountains. As such the project would have a significant unmitigatable impact under CEQA. In addition, staff concludes that the project would not conform with applicable goals and policies of the San Bernardino General Plan Conservation and Open Space Elements. Finally, staff concludes that the project in combination with foreseeable future projects could have significant cumulative visual impacts. A final determination of potential glare-related aesthetic has not been completed in the PSA pending peer review of technical glare studies provided by the applicant.

NOTEWORTHY PUBLIC BENEFITS

ISEGS offers the benefit of providing a source of renewable energy with minimal use of natural gas when solar conditions are insufficient. ISEGS daylight operating hours generally coincide with the hours of peak energy demand when additional generation is brought on line to support the California ISO transmission grid. In addition, staff has identified the following public benefits:

1. ISEGS would contribute to meeting goals under California's Renewable Portfolio Standard Program (Senate Bill 1078), which establishes that the state's renewable energy must contribute 20 percent of the supply for meeting total state energy demands by 2010, and which also reduces our dependence on fossil fuels;

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

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

Staff has identified additional noteworthy Socioeconomics public benefits which would include both short term construction-related and long term operational-related increases in local expenditures and payrolls, as well as sales tax revenues.

RECOMMENDATIONS AND SCHEDULE

For a more detailed review of potential impacts, see staff's technical analyses in the PSA. Staff has listed the outstanding issues as applicable in the technical sections of the PSA. To resolve these issues, staff requires either additional data, further discussion and analysis, or is awaiting conditions from a permitting agency prescribing mitigation.

In conclusion, based on the information available at this time, staff will work to resolve the outstanding issues and to update our preliminary conclusions for the FSA. The project is being reviewed under the 12-month AFC process. However, consistent with the Governor's Executive Order #S-14-08, staff will expedite the schedule to the extent possible while not compromising the quality of staff's analysis in the interest of protecting the environment and local community interests. Staff will conduct a public workshop on the PSA on January 9, 2009. Staff anticipates publication of the joint FSA/DEIS in March 2009, which will address all comments on the PSA.

INTRODUCTION

Che McFarlin

PURPOSE OF THIS REPORT

When considering a project for licensing, the California Energy Commission is the lead state agency under the California Environmental Quality Act (CEQA), and the Energy Commission's process is functionally equivalent to the preparation of an Environmental Impact Report. This Preliminary Staff Assessment (PSA) is the Energy Commission staff's independent analysis of the proposed Ivanpah Solar Electric Generating System (ISEGS) project. After a 30-day public comment period on this PSA, staff will prepare a Final Staff Assessment (FSA) jointly with the Bureau of Land Management's (BLM) Draft Environmental Impact Statement (DEIS), which will be circulated for a 90-day public comment period. BLM is the federal lead agency for compliance with the National Environmental Policy Act (NEPA). After all of the comments are considered, BLM will issue a Final Environmental Impact Statement (FEIS).

This PSA is a staff document. It is neither a document of the California Energy Commission Siting Committee document, nor a draft decision. The PSA describes and evaluates the following:

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

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

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

ORGANIZATION OF THE PRELIMINARY STAFF ASSESSMENT

The PSA begins with an Executive Summary, Introduction, Project Description, and Cumulative Scenario. The environmental, engineering, and public health and safety analyses of the proposed project are contained in 20 separate chapters. They include the following: air quality, biological resources, cultural resources, hazardous materials management, land use, noise and vibration, public health, socioeconomics, soil and water resources, traffic and transportation, transmission line safety and nuisance, visual resources, waste management, worker safety and fire protection, facility design, geological and paleontological resources, power plant efficiency, power plant reliability, and transmission system engineering. These chapters are followed by a discussion of the alternatives analysis and general project conditions, as well as an appendix to the PSA, which discusses the potential indirect downstream impacts of the transmission line upgrades being undertaken by Southern California Edison (SCE). This is followed by a list of staff who contributed to the document.

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

- laws, ordinances, regulations and standards (LORS);
- the regional and site-specific setting;
- project specific and cumulative impacts;
- mitigation measures;
- closure requirements;
- conclusions and recommendations; and
- conditions of certification for both construction and operation (if applicable).

ENERGY COMMISSION SITING PROCESS

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

The Energy Commission's siting regulations require staff to independently review the AFC and assess whether the list of environmental impacts contained is complete and

whether additional or more effective mitigation measures are necessary, feasible, and available (Cal. Code Regs., tit. 20, §§ 1742 and 1742.5(a)).

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

Staff conducts its environmental analysis in accordance with the requirements of the California Environmental Quality Act (CEQA). No additional Environmental Impact Report (EIR) is required because the Energy Commission's site certification program has been certified by the California Resources Agency as meeting all requirements of a certified regulatory program (Pub. Resources Code, § 21080.5 and Cal. Code Regs., tit. 14, § 15251 (j)).

Staff's impact assessment, including the recommended conditions of certification, is only one piece of evidence that the Siting Committee will consider in reaching a decision on the proposed project and making its recommendation to the full Energy Commission. At the public hearings, all parties will be afforded an opportunity to present evidence and to rebut the testimony of other parties, thereby creating a hearing record on which a decision on the project can be based. The hearing before the Siting Committee also allows all parties to argue their positions on disputed matters, if any, and it provides a forum for the Committee to receive comments from the public and other governmental agencies.

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

AGENCY COORDINATION

As noted previously, the Energy Commission certification is in lieu of any permit required by state, regional, or local agencies and by federal agencies to the extent permitted by federal law (Pub. Resources Code, § 25500). However, the Commission typically seeks comments from and works closely with other regulatory agencies that administer LORS that may be applicable to the proposed project. These agencies include the Bureau of Land Management, National Park Service, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, State Water Resources Control Board/Regional Water Quality Control Board, California Department of Fish and Game, the California Air Resources Board, and the County of San Bernardino.

OUTREACH

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

LIBRARIES

The AFC was sent to the main county libraries in San Bernardino, Barstow, Fresno, and Eureka; the main branches of the San Diego and San Francisco public libraries; the University Research Library at UCLA; the California State Library, and the Energy Commission's library in Sacramento.

INITIAL OUTREACH EFFORTS

The PAO's public outreach is an integral part of the Energy Commission's AFC review process. The PAO reviewed information provided by the applicant and also conducted its own outreach efforts to identify and locate local elected and certain appointed officials, as well as "sensitive receptors" (including schools, community, cultural and health facilities and daycare and senior-care centers, as well as environmental and ethnic organizations). There were not any sensitive receptors identified within a six-mile radius of the proposed site for the project.

Notices for workshops and hearings have been and will continue to be distributed to those agencies, individuals, and businesses that are currently on or request to be placed on the project's mailing list. Notices were distributed for the Informational Hearing and Site Visit, which was conducted on January 4, 2008, in Primm, Nevada, and the June 23, 2008 Data Response and Issue Resolution workshop which was also held in Primm, Nevada. Public service announcements were also utilized to advertise the January 4 Informational Hearing and Site Visit.

Those agencies and individuals that have provided comments concerning the project have been considered in staff's analysis. This PSA provides agencies and the public with an opportunity to review the Energy Commission staff's analysis of the proposed project. Comments received on this PSA will be taken into consideration in preparing the subsequent project documents.

Energy Commission regulations require staff to notice, at a minimum, property owners within 1,000 feet of a project and 500 feet of a linear facility under its jurisdiction. This was done for the ISEGS project. Staff's ongoing public and agency coordination activities for this project are discussed under the Public and Agency Coordination heading in the **Executive Summary**.

The AFC, this PSA, and other project documents are located on the Energy Commission's website at http://www.energy.ca.gov/sitingcases/ivanpah/index.html.

ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," focuses federal attention on the

environment and human health conditions of minority communities and calls on federal agencies to achieve environmental justice as part of this mission. The order requires the U.S. Environmental Protection Agency (U.S. EPA) and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

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

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

PROJECT DESCRIPTION

Che McFarlin

INTRODUCTION

The applicant for this project consists of Solar Partners I, LLC; Solar Partners II, LLC; Solar Partners IV, LLC; and Solar Partners VIII, LLC (applicant), which are subsidiaries of BrightSource Energy, Inc. On August 31, 2007, the applicant filed an Application for Certification (AFC) with the California Energy Commission (Energy Commission) seeking permission to develop the Ivanpah Solar Electric Generating System (ISEGS) project. On October 31, 2007, the Energy Commission accepted the AFC as complete.

PROJECT PURPOSE AND OBJECTIVES

The objective of the proposed ISEGS project is to construct and operate a nominal 400-megawatt (MW) solar thermal electrical generation facility for the purpose of assisting electricity utility providers in California to increase their electrical supply generated from renewable resources, in conformance with state policies set forth in Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002) and Senate Bill 107 (Smitian and Perata, Chapter 464, Statutes of 2006). California's Renewables Portfolio Standard (RPS) requires electric utility providers to annually increase their procurement from eligible renewable energy generators, by at least one percent of the utility's annual retail sales, until they obtain a minimum of 20 percent of their electrical supply generated from renewable resources, which is mandated to be obtained by 2010.

PROJECT LOCATION

The applicant has proposed to locate the ISEGS project in the Mojave Desert, near the Nevada border in San Bernardino County, California, on land administered by the Bureau of Land Management (BLM). The proposed project site is located 4.5 miles southwest of Primm, Nevada, and 0.5 mile west of the Primm Valley Golf Club, which is located just west of the Ivanpah Dry Lake. Access to site is from the Yates Well Road Interchange on Interstate 15 via Colosseum Road. See **Project Description Figure 1**.

PROJECT DESCRIPTION

The proposed ISEGS project is a solar concentrating thermal power plant, which is comprised of fields of heliostat mirrors focusing solar energy on boilers located on centralized power towers. Each mirror tracks the sun throughout the day and reflects the solar energy to the receiver boiler. In each plant, one Rankine-cycle reheat steam turbine receives live steam from the solar boilers and reheats steam from the solar reheater.

The applicant proposes to develop the ISEGS project in three phases that are designed to generate a total of 400 megawatts (MW) of electricity. The first two phases of the

project, Ivanpah 1 and 2, are designed to provide 100 MW of electricity and would occupy approximately 914 acres and 921 acres respectively; the 200-MW phase, Ivanpah 3, would occupy approximately 1,843 acres. All three phases would share an administration building, an operation and maintenance building, substation, and detention ponds which would be located between Ivanaph 1 and 2, requiring an additional area of approximately 66 acres. Another 316 acres is needed for construction staging activities. Established dirt roads account for an additional 5 acres. The ISEGS total project footprint amounts to approximately 4,065 acres, or approximately 6.4 square miles (see **Project Description Figure 2)**.

SOLAR POWER PLANT PROCESS AND EQUIPMENT

Ivanpah 1 and 2 would each have an electrical generation capacity of 100 MW. The plants would each consist of approximately 110,000 heliostats (mirrors), double mounted on 55,000 poles, in a single array around a centralized solar power tower.

Ivanpah 3 would have an electrical generation capacity of 200 MW. The plant would consist of approximately 208,000 heliostats (mirrors), double mounted on 104,000 poles, in five separate arrays. Each of the five arrays would be centralized around separate solar power towers.

The seven solar power towers would each be 459 feet tall with an additional 10-foot-tall lightening rod that would extend above the top of the tower. The solar power tower would receive solar heat from the heliostats (mirrors) then convert the heat into steam by heating water in the solar boilers. In the secondary stage, the steam would be converted into electricity utilizing a Rankine-cycle reheat steam turbine electric generator, which would be housed in the power block facility of each plant.

Each of the three solar-thermal plants would include the following equipment and facilities:

- a power block facility that would house the natural gas-fired start-up boiler, the air emission control system for the combustion of natural gas in the start-up boiler, a steam turbine generator, an air-cooled condenser, waste water treatment equipment, and auxiliary equipment (feed water heaters, a de-aerator, an emergency diesel generator, diesel fire pump, etc.);
- a raw water tank with a 250,000 gallon capacity of which only a portion would be used for the plant;
- on-site access and maintenance roads (either dirt, gravel, or paved);
- storm water retention basins and diversion channels; and
- perimeter fencing.

Please see **Project Description Figure 3** through **Figure 6a**.

NATURAL GAS PIPELINE

The solar heat used in the boiler (steam) process would be supplemented by burning natural gas to heat a partial load steam boiler when solar conditions are insufficient. Each plant within the project would include a small package, natural gas-fired start-up boiler to provide additional heat for plant start-up and during temporary cloud cover. Natural gas would be obtained by installing an underground distribution pipeline from the existing Kern River Gas Transmission pipeline located approximately 0.5 mile north of the Ivanpah 3 site. New metering stations would be constructed to measure and record gas volumes, regulate pressure, and remove any liquids or solid particles.

AIR POLLUTION CONTROL

Air pollution emissions from the combustion of natural gas in the start-up boiler would be controlled using best available control technology. To ensure that the systems perform correctly, continuous emission monitoring for nitrogen oxides (NO_x) and carbon monoxide (CO) would be performed. Boiler use would not exceed four hours on any given day, and average boiler use would be less than one hour per operating day.

WATER SUPPLY AND DISCHARGE

Raw groundwater would be drawn from one of two wells that would be constructed at the northwest corner of Ivanpah 1, just outside the perimeter fence. Each of the three power blocks would be connected to the groundwater wells by underground water pipelines. The applicant estimates project water consumption to be no more than 100 acre-feet per year for all three solar plants combined, which would primarily be used to provide water for washing heliostats (mirrors) and to replace boiler feed water blow-down. Groundwater would go through a treatment system for use as boiler make-up water and to wash the heliostats. The only expected wastewater generated by the system would be treated and used for landscape irrigation.

WASTE MANAGEMENT

All operational wastes produced at ISEGS would be properly collected, treated (if necessary), and disposed of in a closed system. Wastes include process and sanitary wastewater, nonhazardous waste and hazardous waste, both liquid and solid.

A sewage package treatment plant would be located at the administration building/operations and maintenance area, located between Ivanpah 1 and 2. This primary wastewater collection system would collect process wastewater from all equipment, including the boilers and water treatment equipment. Additionally, each solar plant would include a small on-site wastewater plant located in the power block that would treat wastewater from domestic waste streams such as showers and toilets. Sewage sludge would be removed from the site by a sanitary service provider. All wastewater would be recycled in the system, except for a small stream that would be treated and used for landscape irrigation. If necessary, a small filter/purification system would be used to provide potable water at the administration building. Any reject streams from water treatment would be trucked off site for treatment or disposal. Additionally, two concrete-lined holding basins, approximately 40 feet by 60 feet in size,

would be part of each power block facility, and that would serve for boiler commissioning and emergency outfalls from any of the processes.

HAZARDOUS WASTE MANAGEMENT

Several methods would be used to properly manage and dispose of hazardous wastes. Waste lubricating oil would be recovered and recycled by a waste oil recycling contractor. Chemicals would be stored in appropriate chemical storage facilities. Bulk chemicals would be stored in large storage tanks, while most other chemicals would be stored in smaller returnable delivery containers. All chemical storage areas would be designed to contain leaks and spills in concrete containment areas.

FIRE PROTECTION

The fire protection system would be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water would be the raw water storage tank to be located in each power block. An electric jockey pump and electric motor-driven main fire pump would be provided to increase the water pressure to the level required to serve all fire fighting systems. In addition, a backup diesel engine-driven fire pump would be provided to pressurize the fire loop if the power supply to the electric motor-driven main fire pump fails.

VEHICLE TRAILS

Vehicle trails run through the proposed project site. To allow continued use and access, the applicant would reroute three public trails and one trail that serves as an access to a mining claim. Colosseum Road would be rerouted between Ivanaph 1 and 2. The other trails that would be rerouted are: 1) trail 699226, which passes through the northern third of Ivanpah 3, would be rerouted along the northern border of Ivanpah 3; 2) trail 699198 would be rerouted, and 3) an unnumbered trail on the east side of Ivanpah 3 would be relocated outside the project site so that it would provide continued access to the limestone outcrop.

TRANSMISSION SYSTEM INTERCONNECTION AND UPGRADES

The ISEGS project would deliver power on three new 115-kilovolt (kV) transmission generation tie lines to a new Ivanpah substation and upgrade approximately 36 miles of Southern California Edison's (SCE) from a 115-kV transmission line to 220 kV. SCE will seek a Certificate of Public Convenience and Necessity from the California Public Utilities Commission(CPUC) for the transmission line upgrade. The CPUC will serve as the lead agency for CEQA compliance for the approximately five-mile portion of the transmission line work within California. BLM will serve as the lead agency for National Environmental Policy Act compliance.

In order to accommodate the anticipated load generation by ISEGS and other planned electricity generation projects, the California Independent System Operator (California ISO) has identified approximately 36 miles of transmission line that would need to be upgraded from 115 kV to 220 kV. SCE is in the process of developing a project to upgrade the transmission system, which includes removing the existing 115-kV

transmission lines and constructing a new double-circuit 220-kV transmission line between the existing Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California. A conceptual scope of work and a general analysis is provided in the **Downstream Impacts Analysis** appendix to this document. Additional upgrades may be required as mitigation prior to final approval of interconnection to California ISO and Non-California ISO controlled facilities.

TELECOMMUNICATIONS FACILITIES

The proposed Ivanpah Substation would also require that new telecommunication infrastructure be installed to provide protective relay circuit and a supervisory control and data acquisition (SCADA) circuit, together with data and telephone services. The telecommunication path from Ivanpah Substation to the local carrier facility interface at Mountain Pass area consists of approximately eight miles of fiber optic cable to be installed overhead on existing poles and through new underground conduits to be constructed in the substation and telecom carrier interface point. This fiber optic route consists of two segments. The first segment is from Ivanpah Substation to Mountain Pass Substation using the existing Nipton 33-kV distribution line poles built along the transmission line corridor that crosses between Ivanpah 1 and 2. The second segment is from Mountain Pass Substation to the telecommunications facility approximately 1.5 miles away at an interface point to be designated by the local telecommunication carrier. The fiber cable would be installed on the existing 12-kV distribution line poles.

REFERENCES

BSE2007a – Bright Source Energy / J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Dated 8/28/2007.

CEC2008o – California Energy Commission / M. Jones (tn: 48836). System Impact Study Application for Confidentiality. Dated 10/30/2008.

CH2MHILL2008b – CH2M Hill/ J. Carrier (tn: 45305). Data Response Set 1B. Dated 2/11/2008.

CH2MHILL2008e – CH2M Hill/ J. Carrier (tn: 45322). Attachment DR 93-1B, Interconnection System Impact Study. Dated 2/11/2008.

CH2MHILL2008g – CH2M Hill/ / J. Carrier (tn: 46239). Data Responses Set 1D. Dated 5/09/2008.

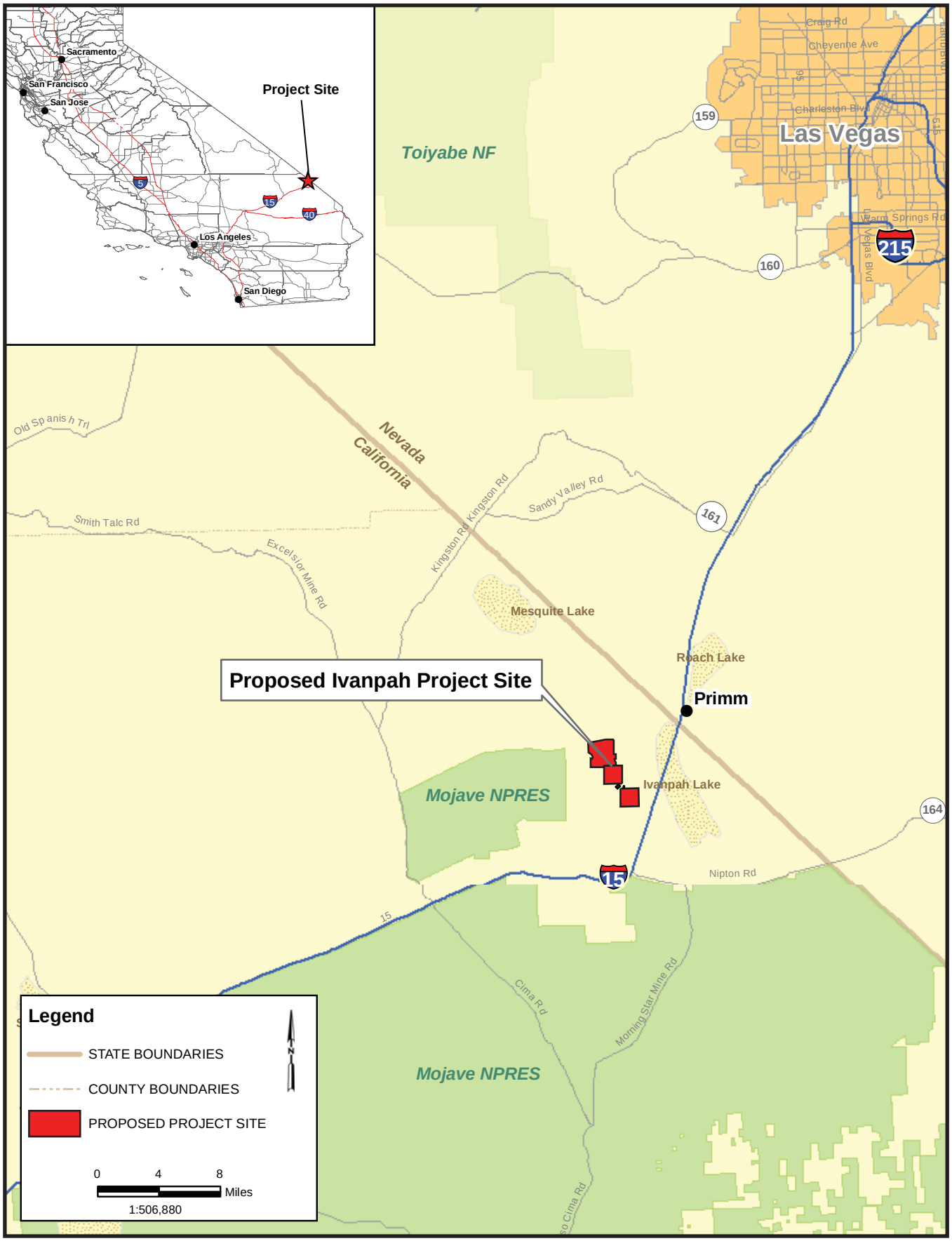
CH2MHILL2008i – CH2M Hill/ J. Carrier (tn: 46666). Data Responses, Set 2A. Dated 6/10/2008.

CH2MHILL2008m – CH2M Hill / J. Carrier (tn: 47190). Data Response, Set 2B. Dated 7/22/2008.

CH2MHILL2008u – CH2M Hill/ J. Carrier (tn: 48033). Data Responses Set 2D. Dated 09/12/2008.

PROJECT DESCRIPTION - FIGURE 1

Ivanpah Solar Electric Generating System - Project Location

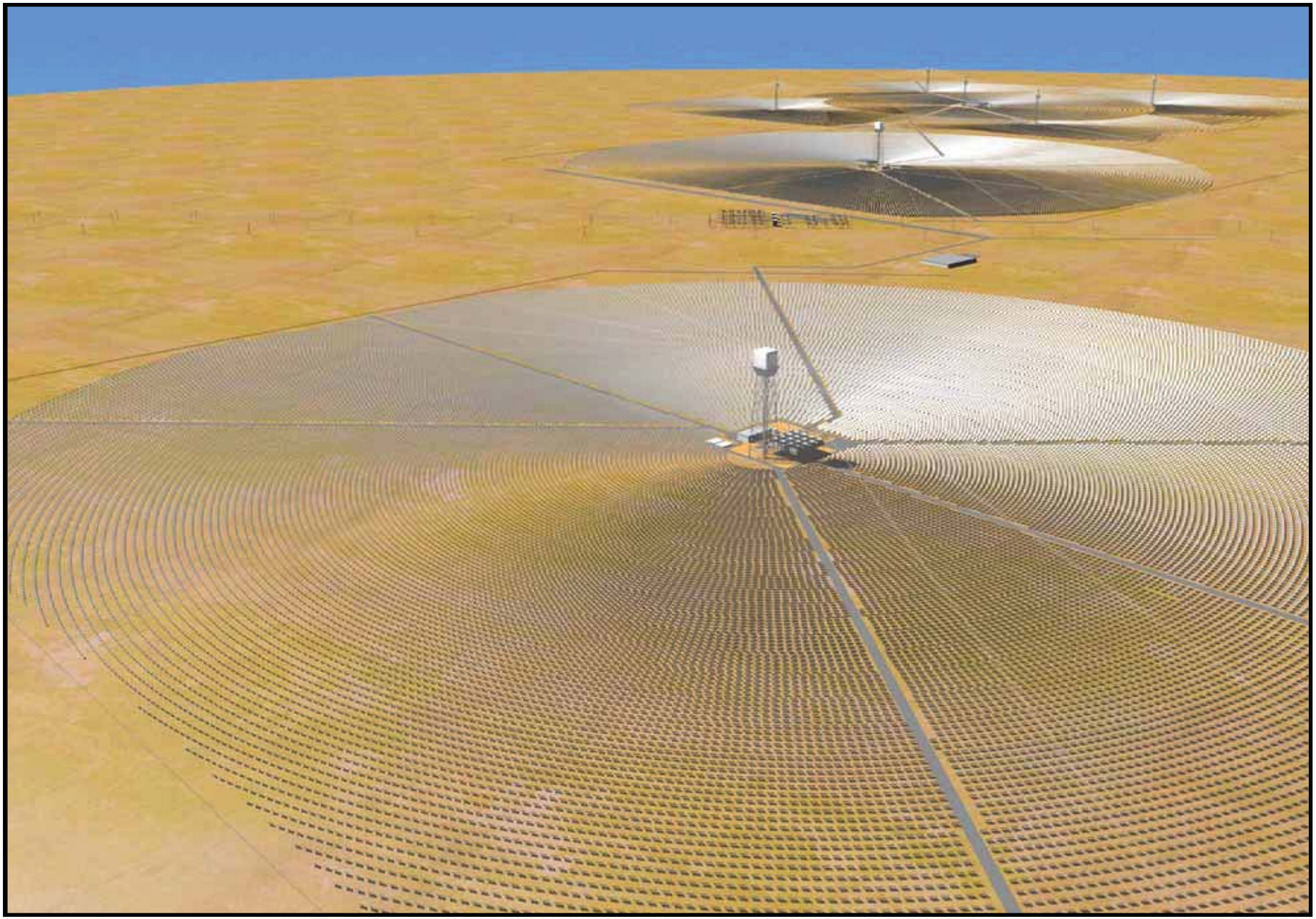


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: AFC Figure 1

PROJECT DESCRIPTION - FIGURE 2

Ivanpah Solar Electric Generating System - Visual Simulation

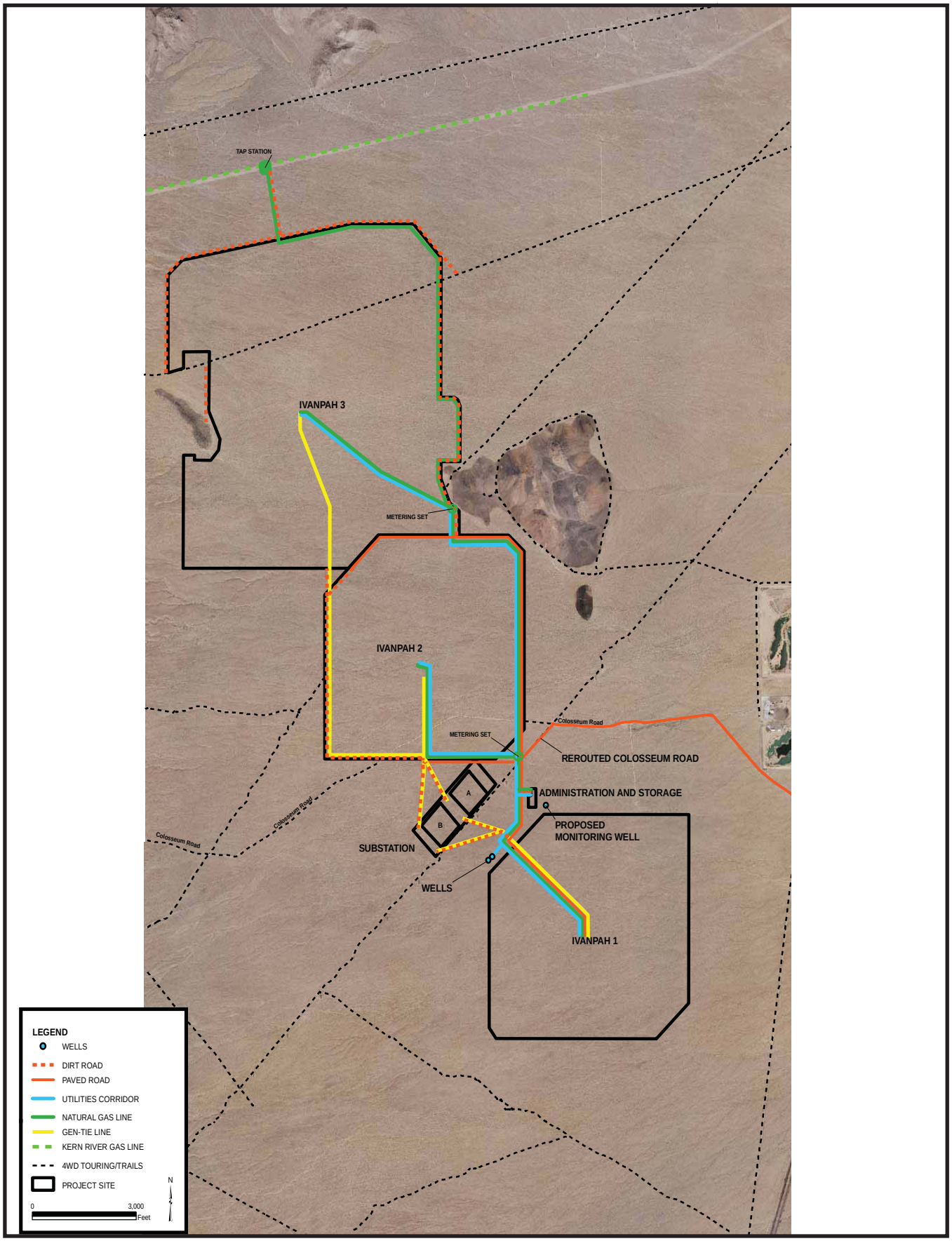


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: Data Response Set 1D- Figure DR4-5

PROJECT DESCRIPTION - FIGURE 3

Ivanpah Solar Electric Generating System - Site Plan and Linear Facilities

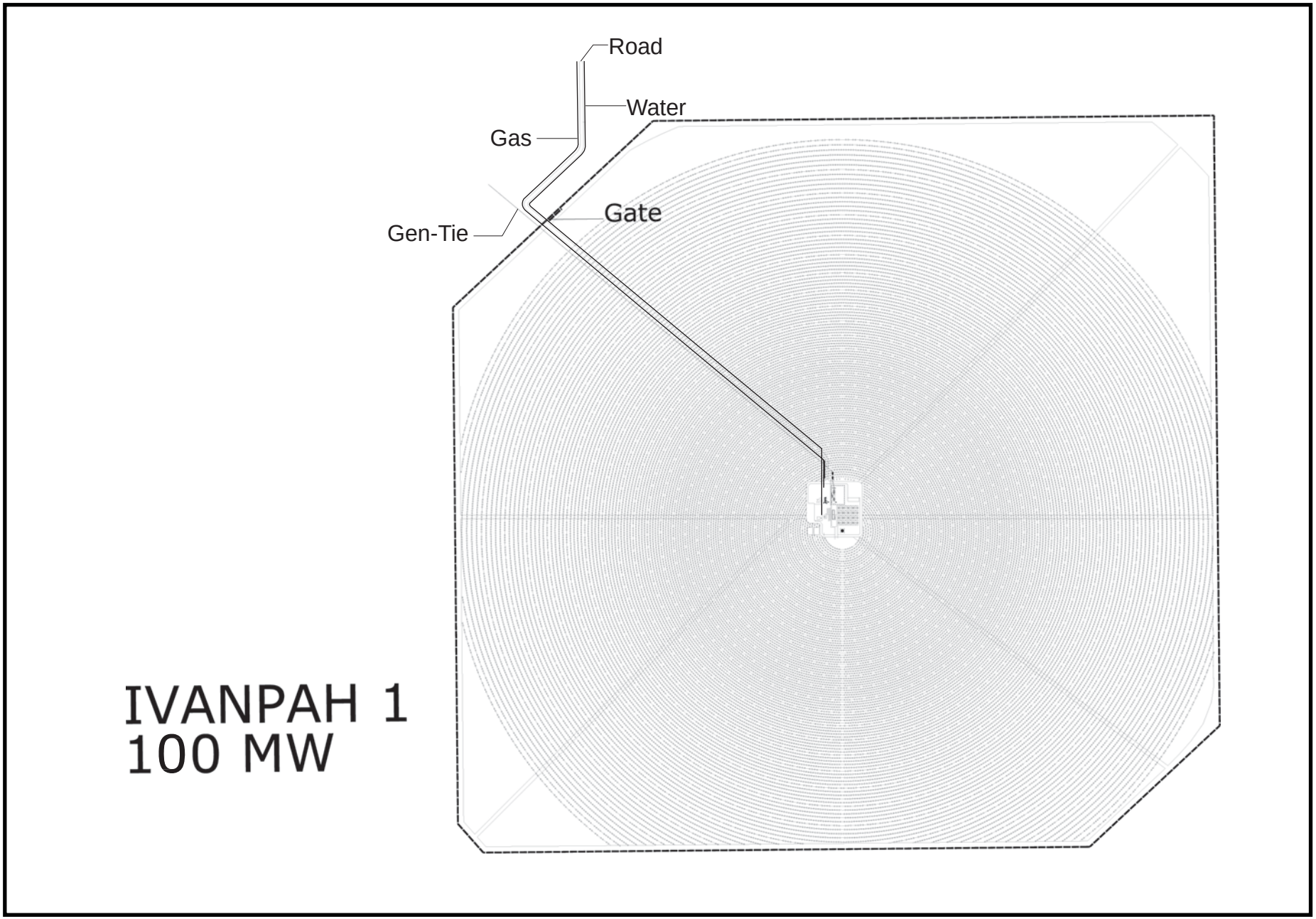


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: Data Response Set 1D- Figure DR4-8

PROJECT DESCRIPTION - FIGURE 4

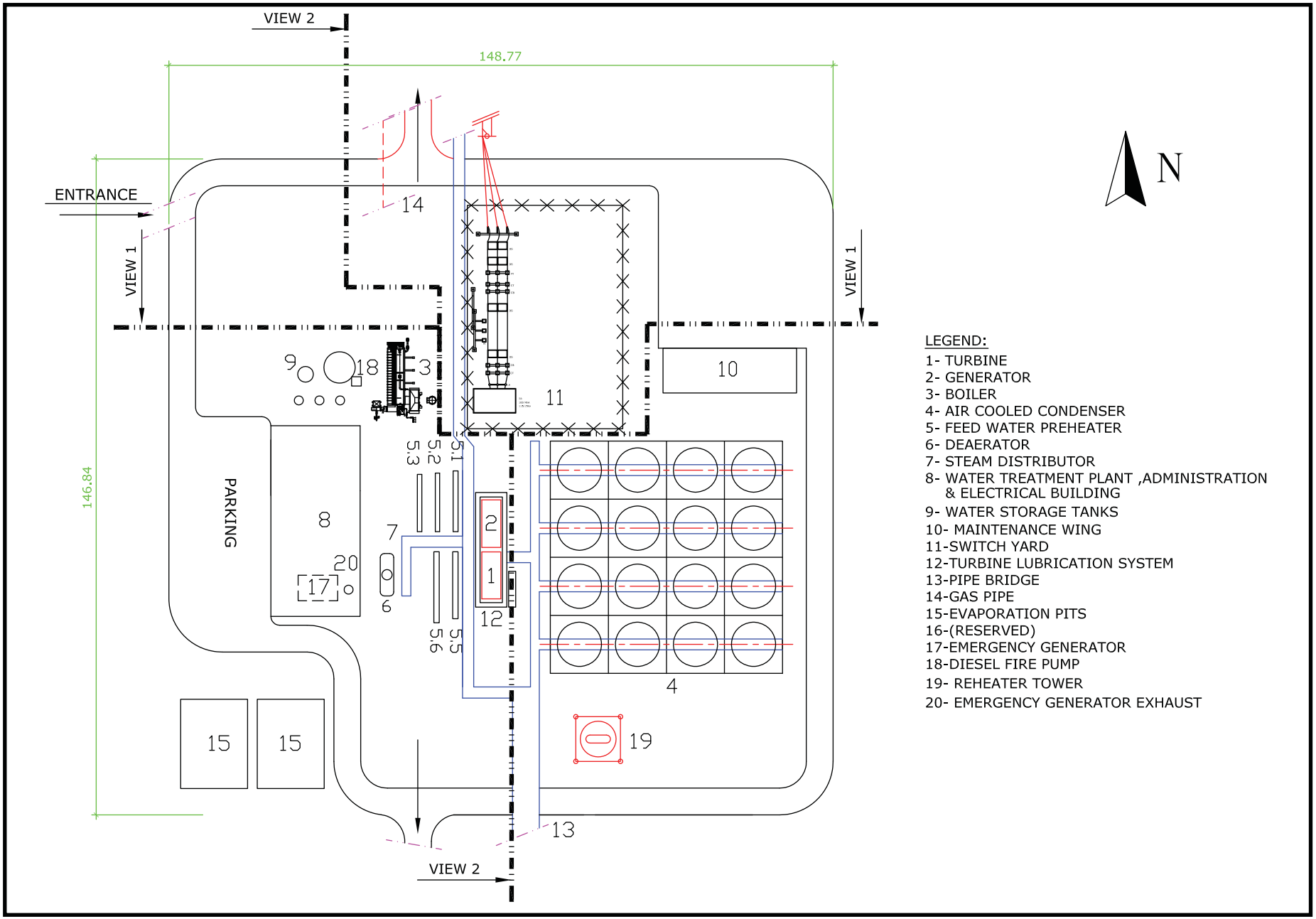
Ivanpah Solar Electric Generating System - Ivanpah 1 Solar Field



SOURCE: Data Response Set 1D- Figure DR4-1

PROJECT DESCRIPTION - FIGURE 4a

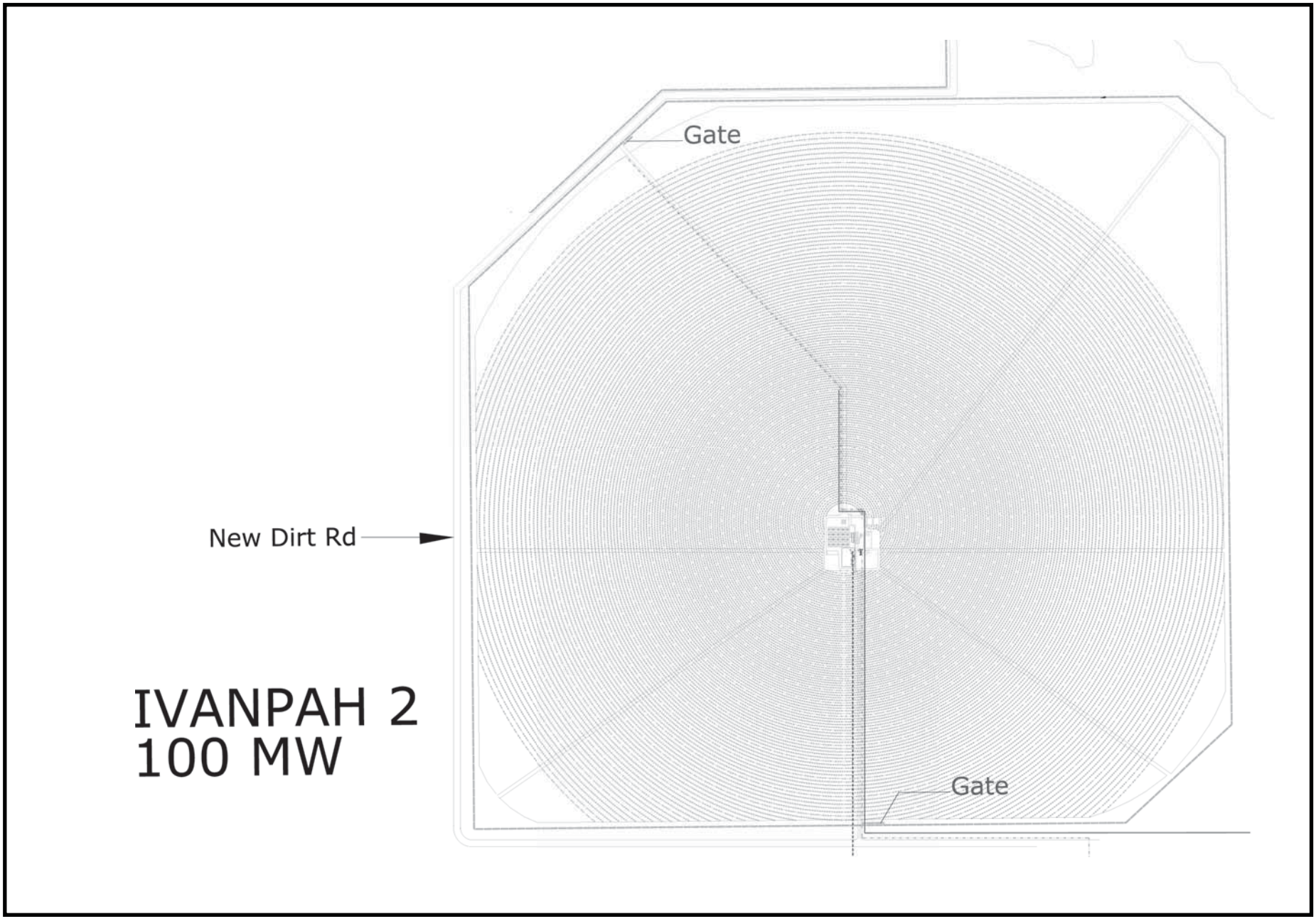
Ivanpah Solar Electric Generating System - Ivanpah 1 Power Block



SOURCE: AFC Figure 2.2-1b

PROJECT DESCRIPTION - FIGURE 5

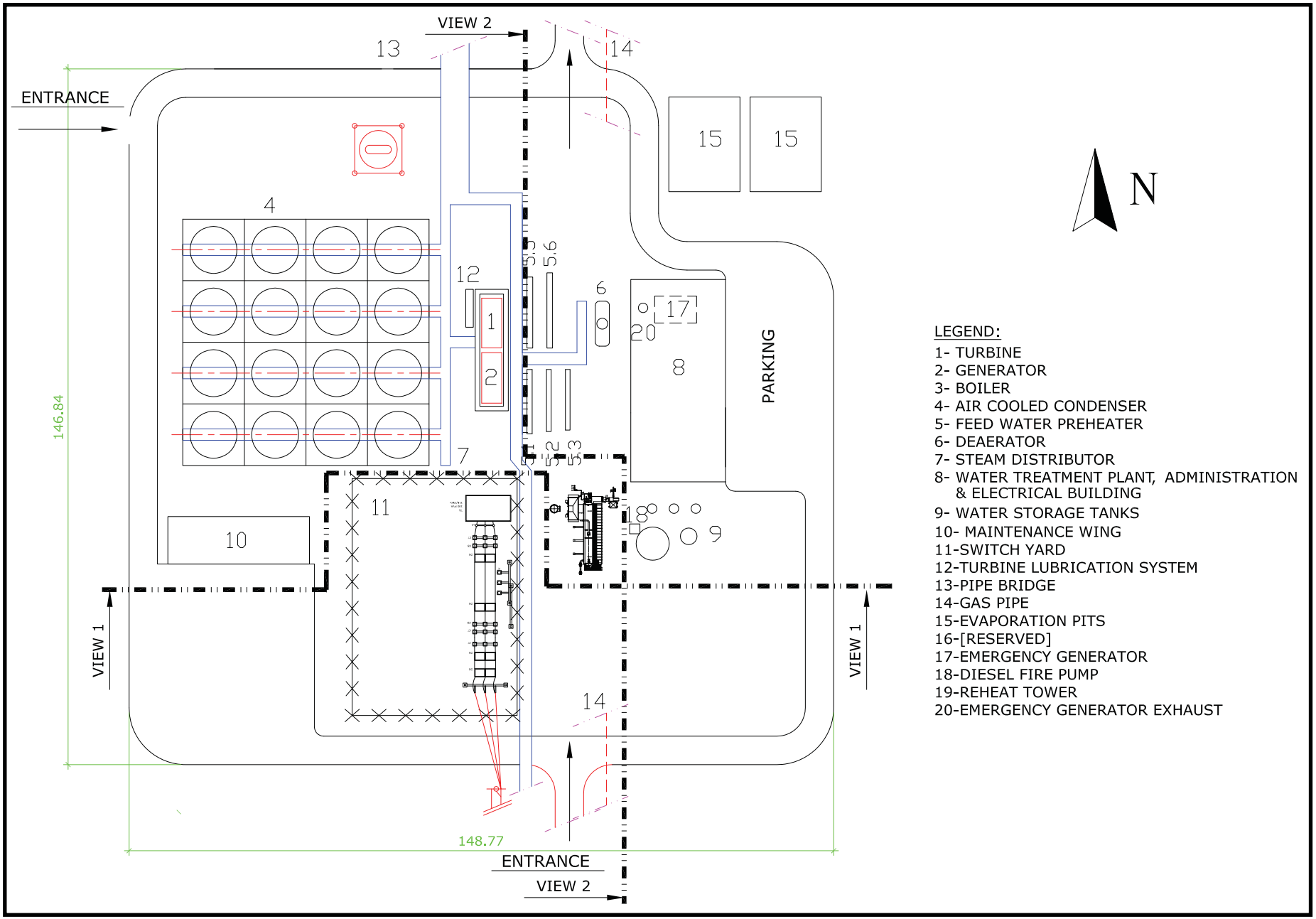
Ivanpah Solar Electric Generating System - Ivanpah 2 Solar Field



SOURCE: Data Response Set 1D- Figure DR4-2

PROJECT DESCRIPTION - FIGURE 5a

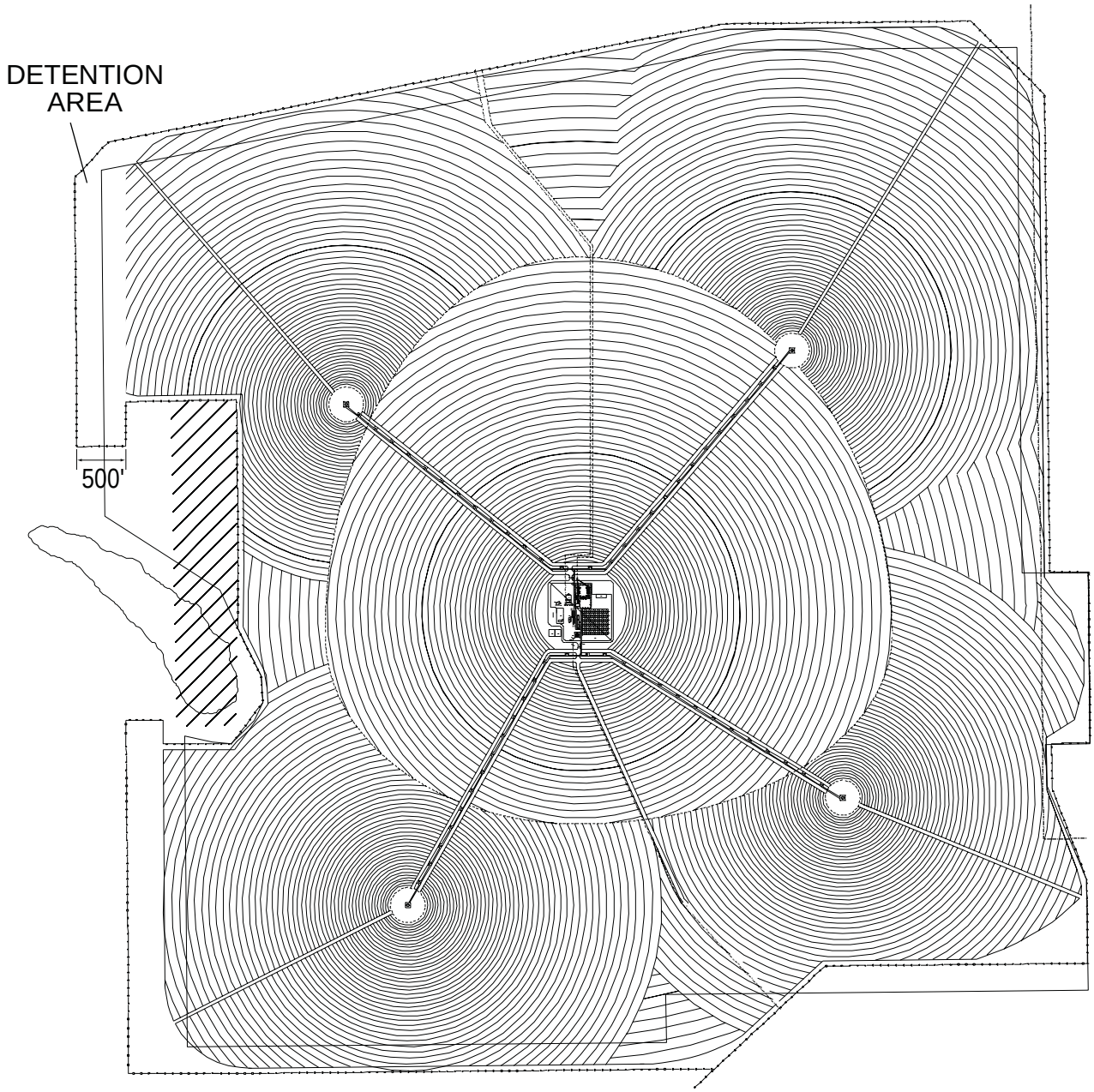
Ivanpah Solar Electric Generating System - Ivanpah 2 Power Block



SOURCE: AFC Figure 2.2-2b

PROJECT DESCRIPTION - FIGURE 6

Ivanpah Solar Electric Generating System - Ivanpah 3 Solar Field

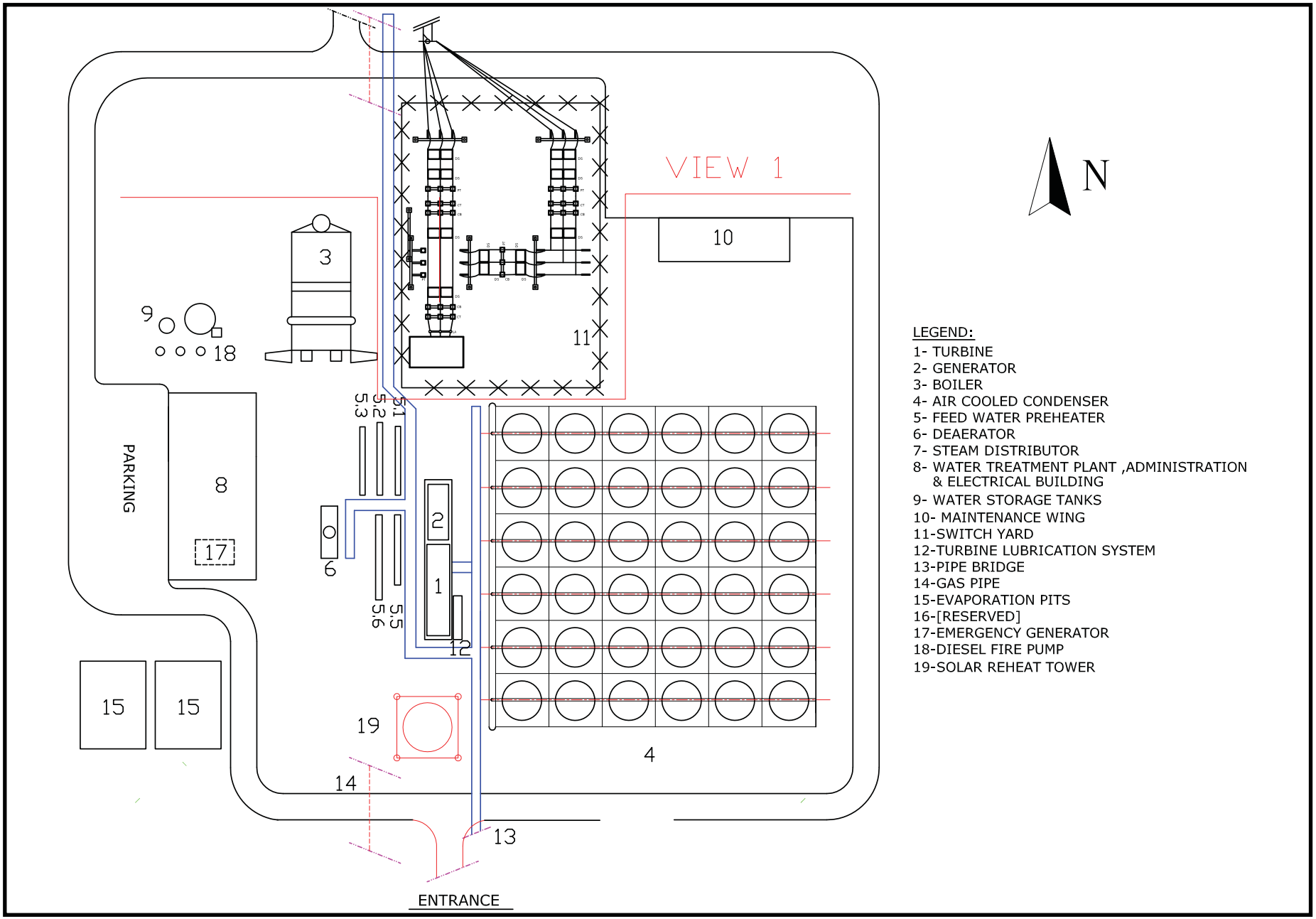


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: Data Response Set 1D- Figure DR4-3

PROJECT DESCRIPTION - FIGURE 6a

Ivanpah Solar Electric Generating System - Ivanpah 3 Power Block



SOURCE: AFC Figure 2.2-3b

CUMULATIVE SCENARIO

Susan V. Lee

REQUIREMENTS FOR CUMULATIVE IMPACT ANALYSIS

Preparation of a cumulative impact analysis is required under both CEQA and NEPA. “Cumulative impact” is the impact on the environment that results from the incremental impact of the proposed project when considered with other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such other actions.

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

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

DEFINITION OF A CUMULATIVE PROJECT SCENARIO

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

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

Preliminary Staff Assessment (PSA) uses the “list approach” to provide a tangible understanding and context for analyzing the potential cumulative effects of the project.

In order to provide a basis for cumulative analysis for each discipline (e.g., biological resources, air quality), this section provides information on other projects in both maps and tables. Projects are defined within a geographic area that has been identified by the Energy Commission and the Bureau of Land Management (BLM) as covering an area large enough to provide a reasonable basis for evaluating cumulative impacts for all disciplines, as shown in three maps and accompanying tables. **Cumulative Figures 1, 2, and 3** are on the following pages, and **Cumulative Tables 1, 2, and 3** are presented at the end of this section.

- **Cumulative Impacts Figure 1**, **Regional Renewable Applications,** and **Cumulative Impacts Table 1, Renewable Energy Projects in the CDD**. The analysis of cumulative effects for some disciplines requires consideration of the numerous solar and wind development applications for use of BLM land, including approximately 1 million acres of the CDD Area. Additional BLM land in Nevada and Arizona also has applications for solar and wind projects.
- **Cumulative Impacts Figure 2**, **Regional Renewable Applications (Detail)** illustrates the challenges of siting large renewable projects in the desert. This map shows the boundaries of the renewable applications in the eastern Mojave Desert as well as the current land use designations of BLM and non-BLM land in the desert region. This map highlights land uses that may not be appropriate for large scale renewable projects (e.g., National Park Service land, wilderness areas, desert wildlife management areas), and shows the limited land areas that remain after these potentially incompatible areas are removed from consideration for renewable development.
- **Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/ Foreseeable Projects** and **Cumulative Impacts Tables 2 and 3** list foreseeable future projects in the immediate Ivanpah area. Table 2 presents existing projects in the Ivanpah Valley, and Table 3 presents future foreseeable projects in the Ivanpah Valley area. Both tables indicate each project name and project type, as well as its location and status.

APPROACH TO CUMULATIVE IMPACT ANALYSIS

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

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

2. Evaluate the effects of the ISEGS project in combination with past and present (existing) projects in the Ivanpah Valley.

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

Each of these steps is described below.

Geographic Scope of Cumulative Analysis

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

The analysis of cumulative effects considers a number of variables including geographic (spatial) limits, time (temporal) limits, and the characteristics of the resource being evaluated. The geographic scope of each analysis is based on the topography surrounding the ISEGS project and the characteristics of each resource.

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

Project Effects in Combination with Foreseeable Future Projects

Each discipline evaluates the impacts of the proposed project on top of the current baseline—the past, present (existing), and future projects near the Ivanpah site as illustrated in **Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects** and listed in **Table 2 Existing Projects in the Ivanpah Valley**.

Reasonably foreseeable projects that could contribute to the cumulative effects scenario depend on the extent of resource effects, but could include projects in the immediate Ivanpah area as well as other large renewable projects in the California, Nevada, and Arizona desert regions. These projects are illustrated in **Cumulative Impacts Figures 1, 2, and 3**.

Ivanpah area projects are illustrated in **Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future Foreseeable Projects.** As shown in the map and table, there are a large number of projects in the immediate area around Ivanpah whose impacts could combine with those of the proposed ISEGS project. As shown on **Cumulative Impacts Figure 1** and in **Table 1**, solar and wind development applications for use of BLM land have been submitted for approximately one million acres of the California Desert Conservation Area. Additional BLM land in Nevada also has applications for solar and wind projects, as shown in Figure 1.

LIKELIHOOD OF RENEWABLE PROJECT APPROVAL AND CONSTRUCTION

NEPA and CEQA require that cumulative analysis consider both the severity of impacts and the likelihood of their occurrence. The numerous renewable projects now described in applications to the BLM and on private land are competing for utility Power Purchase Agreements, which will allow utilities to meet the state-required Renewable Portfolio

Standard. While Cumulative Impacts Figures 1 and 2 and Table 1 show a very large number of applications to BLM, it is unlikely that all of these projects will be constructed for the following reasons:

- Not all developers will develop the detailed information necessary to meet BLM and Energy Commission standards. Most of the solar projects with pending applications are proposing generation technologies that have not been implemented at large scales. As a result, preparing complete and detailed PODs is difficult, and completing the required NEPA and CEQA documents is especially time-consuming.
- After approval by the appropriate Lead Agency under CEQA or NEPA (generally the Energy Commission and/or BLM, all permits must be obtained. The large size of these projects may result in permitting challenges related to endangered species, mitigation requirements, and other issues.
- Also after project approval, construction financing must be obtained (if it has not been obtained earlier in the process). The availability of financing will be dependent on the status of competing projects, the laws and regulations related to renewable project investment, and the time required for obtaining permits.

Analysis of Cumulative Impacts

The analysis presented for each discipline (e.g., air quality, biological resources) describes the geographic area of effect for that discipline and the potential cumulative effects of the ISEGS project with the other existing and future projects defined on the tables and maps presented in this section. Where appropriate, conditions of certification (mitigation measures) are recommended to reduce cumulative effects.

Cumulative Impacts Tables 1, 2, and 3 on the following pages were assembled using the following information:

- Table 1, Renewable Energy Projects in the California Desert Conservation Area, identifies solar and wind renewable projects as listed on the BLM California Desert District Alternative Energy website (BLM 2008).
- Table 2, Existing Projects in the Ivanpah Valley, identifies already existing projects within the Ivanpah Valley. These projects were identified through a variety of sources including the San Bernardino and Clark County websites, BLM website and personal communication, personal communication with Clark County personnel, and individual project websites.
- Table 3, Future Foreseeable Projects in the Ivanpah Valley, identifies future foreseeable projects within the Ivanpah Valley. These projects were identified through a variety of sources including the San Bernardino and Clark County websites, BLM website and personal communication, personal communication with Clark County personnel, and individual project websites.

Table 1

. Renewable Energy Projects in the California Desert Conservation Area

Solar Energy (Updated November 2008): Total Acreage 689,910
Barstow Field Office
• Stirling engines by Stirling Energy Systems, Inc. Solar 1 (6,500 acres near Pisgah), 750 MW • Solar trough by Solar Investments VI LLC (6,400 acres near Baker), 800 MW • Parabolic trough by Solar Investments, Inc. (9,600 acres near Silurian Valley), 1,000 MW • Parabolic trough by Solar Investments XI LLC (10,000 acres near Salt Hills), 1200 MW • Photovoltaic by OptiSolar, Inc. (14,400 acres near Opal), 1,205 MW • Photovoltaic by OptiSolar, Inc. (15,280 acres near Desert Ruby), 1,000 MW • Power tower by DPT Broadwell Lake LLC (BrightSource) (5,130 acres near Broadwell Lake), 500 MW • Photovoltaic by OptiSolar, Inc. (5,120 acres near Desert Onyx), 585 MW • Parabolic trough by FPL Energy, LLC (7,680 acres south of Silurian Dry Lake), 1,200 MW • Photovoltaic by Cannon Power, Inc. (13,440 acres near Lucerne Valley), 1,000 MW • Photovoltaic by OptiSolar, Inc. (9,520 acres near Jasper), 500 MW • Photovoltaic by OptiSolar, Inc. (17,920 acres near Amber), 500 MW • Stirling Engines by Stirling Energy Systems, Inc. Solar 3 (4,810 acres), 605 MW • Stirling Engines by Stirling Energy Systems, Inc. Solar 6 (12, 365 acres), 692 MW • Stirling Engines by Stirling Energy Systems, Inc. Solar 8 (10,044 acres), 1,631 MW • Photovoltaic by Chevron Energy Solutions Co. (367 acres), 40 MW • Photovoltaic by Caithness Soda Mtn, LLC (formerly Solenergis, LLC) (1,664 acres near Soda Mountain/ Rasor), 350 MW • Parabolic trough by EnXco Development, Inc. (3,840 acres near Troy Lake), 1,000 MW • Photovoltaic by Bull Frog Green Energy LLC (8,999 acres near Bristol – Barstow), 300 MW • Photovoltaic by Bull Frog Green Energy LLC (11,523 acres near Silver Mts Vista), 300 MW • Parabolic trough by LSR Pisgah, LLC (10,044 acres near Pisgah), 300 MW
Eagle Lake
• Solar Hydrogen by DBK Solar Utilities of California (720 acres), 200 MW
El Centro Field Office
• Stirling Engines by Stirling Energy Systems, Inc. Solar Two LLC (6,500 acres), 750 MW • Photovoltaic by BioRenewable Projects LLC (609 acres), 20 MW • Photovoltaic by BCL & Associates (5,587 acres), 500 MW • Undecided by SkyGen Solar LLC, c/o Invenergy (1,040 acres), 50 MW • Photovoltaic by OptiSolar, Inc. (2,560 acres), 1,500 MW • Solar trough by Pacific Solar Investments Inc (Iberdrola) (28,000 acres), 1,500 MW • Power tower by Solar Reserve, LLC (4,000 acres), 120 MW • Photovoltaic by Bull Frog Green Energy LLC (2,600 acres), 250 MW • Parabolic trough by Power Partners Southwest LLC, c/o enXco (540 acres), 300 MW • Photovoltaic by Sempra Generation (11,000 acres), 500 MW • Parabolic trough by LightSource Renewables LLC (3,020 acres), 400 Mw
Needles Field Office
• Power tower by Solar Partners Ivanpah SEGS (DPT Ivanpah LLC) (6,720 acres near Ivanpah Dry Lake), 400 MW • Photovoltaic by OptiSolar, Inc. (4,160 acres near Ivanpah Dry Lake), 350 MW • Parabolic trough by Cogentrix/Solar Investments VIII LLC (8,000 acres near Mesquite Hills), 1,000 MW • Parabolic trough by Cogentrix/Solar Investments XIII LLC (8,960 acres near New York Mountains), 1,000 MW

Solar Energy (Updated November 2008): Total Acreage 689,910
• Parabolic trough by Cogentrix/Solar Investments I LLC (10,880 acres near Amboy), 1,000 MW • Parabolic trough by Cogentrix/Solar Investments I LLC (5,440 near Arrowhead), 1,000 MW • Power Tower by Leopold Companies, Inc. (37,120 acres near Ward Valley), 4,100 MW • Parabolic trough by Boulevard Associates, LLC (7,200 acres near Mesquite Hills), 1,000 MW • Parabolic trough by Boulevard Associates, LLC (12,160 acres near Killbeck), 1,000 MW • Parabolic trough by Boulevard Associates, LLC (35,200 acres near Cadiz Lake), 1,000 MW • Solar trough by Solel, Inc. (14,080 acres Stedman), 600 MW • Technology neutral by PG&E (18,880 acres near Mesquite Lake) • Parabolic trough by Iberdrola Renewables (14,720 acres near Cadiz Lake) • Solar trough by Boulevard Associates, LLC (9,600 acres near Kellbaker), 1,000 MW • Technology neutral by PG&E (5,120 acres near Cadiz/ Trilobite), 800 MW • Parabolic trough by NextLight Renewable Power, LLC (7,750 acres near Ludlow), 500 MW • Parabolic trough by NextLight Renewable Power, LLC (12,960 acres near Iron Mountain), 500 MW • Parabolic trough by Iberdrola Renewable (12,720 acres near Cadiz-East), 1,000 MW • Technology neutral by Ewind Farm, Inc. (Clean Air Solar I) (12,640 acres near Iron Mountain), 800 MW • Technology neutral by Ewind Farm, Inc. (Clean Air Solar II) (13,240 acres near Iron Mountain), 900 MW • Technology neutral by Ewind Farm, Inc. (Clean Air Solar III) (21,440 acres near Iron Mountain), 1,700 MW
Palm Springs Field Office
• Photovoltaic by OptiSolar, Inc. (7,040 acres near Desert Center Area), 350 MW • Parabolic trough by Florida Power & Light (7,773 acres near Blythe), 250 MW • Photovoltaic by Chuckwalla Solar LLC (4,098 acres near Desert Center Area I), 200 MW • Parabolic trough by Chevron Energy Solutions Co. #2 (3,119 acres in Eastern Riverside County), 100 MW • Parabolic trough by Chevron Energy Solutions Co. #1 (3,119 acres near Blythe), 100 MW • Parabolic trough by Florida Power & Light (4,491 acres near Blythe), 250 MW • Photovoltaic by Bullfrog Green Energy, LLC (6,629 acres near Blythe), 2,500 MW • Photovoltaic by OTB Power Holdings, Inc. (8,742 acres near Blythe), 1,000 MW • Photovoltaic by OptiSolar, Inc. (3,840 acres near Blythe), 600 MW • Parabolic trough by Solar Millennium, LLC (2,753 acres near Blythe), 500 MW • Parabolic trough by EnXco Development, Inc. (2,070 acres near Blythe), 300 MW • Parabolic trough by EnXco Development, Inc. (11,603 acres near Blythe), 300 MW • Parabolic trough by EnXco Development, Inc. (12,879 acres near Blythe), 300 MW • Parabolic trough by EnXco Development, Inc. (1,071 acres near Blythe), 300 MW • Parabolic trough by EnXco Development, Inc. (1,216 acres near Blythe), 300 MW • Parabolic trough by Solel Inc. (8,775 acres near Desert Center N. on Hwy 177), 500 MW • Parabolic trough by Solel Inc. (7,511 acres near Desert Center N. on Hwy 177), 500 MW • Photovoltaic by Bull Frog Green Energy, LLC (22,912 acres near Blythe), 2,500 MW • Parabolic trough by Lightsource Renewables, LLC (7,920 acres near Blythe), 550 MW
Ridgecrest Field Office
• Photovoltaic by OptiSolar, Inc. (5,760 acres Mojave area near Hwy. 14), 745 MW • Parabolic trough by Solar Millennium, LLC (11,000 acres near Ridgecrest City), 745 MW • Photovoltaic by OptiSolar, Inc. (6,600 acres near Kramer Junction), 745 MW • Photovoltaic by OptiSolar, Inc. (7,183 acres near China Lake Naval Weapons Center), 600 MW • Photovoltaic by Corum Solar Array LLC (1,200 acres near Edwards Air Force Base), 100 MW

Wind Energy (Updated November 2008) – Total Wind Acreage 473,084
Barstow Field Office
• AES Seawest, Inc., 4,231 acres near Daggett Ridges • Granite Wind LLC, 1,968 acres near Granite Mountains • BP Alternative Energy, 2,442 acres near Sidewinder Mountain • Horizon Wind Energy, 4,479 acres near Daggett • Horizon Wind Energy, 27,808 acres near Calico Mountains • Horizon Wind Energy, 10,073 acres near Iron Mountain • Horizon Wind Energy, 720 acres near Waterman Hills • AES Seawest, LLC, 2,929 acres near Sand Ridge • FPL Energy, 2,449 acres near West Fry Mountains • First Wind, 15,837 acres near Stoddard Mountains • First Wind, 6,820 acres near Granite Mountains • First Wind, 10,946 acres near Fry Mountains • First Wind, 3,458 acres near Rodman Mountains • Pacific Wind Development LLC (Iberdrola), 5,258 acres near Waterman Hills • Pacific Wind Development LLC (Iberdrola), 2,749 acres near Elephant Mountains • Pacific Wind Development LLC (Iberdrola), 6,623 acres near Silurian Hills • Sierra Renewables, 1,968 acres near Granite Mountains • Power Partners SW (enXco), 10,240 acres near Granite Mountains • Power Partners SW (enXco), 10,240 acres near Lone Mountain • AES Seawest, Inc., 2,930 acres near Troy Lake • Oak Creek Energy, 17,290 acres near Black Lava • Orion BP Alternative Energy, 2,442 acres near Black Butte • Oak Creek Energy Systems, Inc., 28,160 acres near Sidewinder • Renewergy, LLC, 3,920 acres near Black Lava Butte • West Fry Wind, LLC (FPL Energy), 3,248 acres near West Fry Mountains • GreenWing Energy, 9,546 acres near Calico Dry Lakebed • GreenWing Energy, 9,553 acres near Mojave Valley • Desert Power, LLC (Globalwinds), 2,500 acres near Mojave River • Verde Resources, Inc., 3,295 acres near Barstow/ Stoddard • Horizon Wind Energy, 20,811 acres near Stoddard/ Daggett • Airtricity, Inc., 14,080 acres near North Peak • AES Wind Generation, Inc., 2,930 acres near Daggett • Debenham Energy, 1,508 acres near Ryan
El Centro Field Office
• Clipper Windpower, Inc., 1,318 acres near NECO Southeastern Imperial County • Wind Hunter, 6,280 acres near Ocotillo, Western Imperial County • Renewergy, LLC, 11,187 acres near Eastern Imperial County • Renewergy, LLC, 3,219 acres near Ocotillo, Western Imperial County • Superior Renewable, 187 acres near Ocotillo, Western Imperial County • Imperial Wind, 1,960 acres near Black Mountain, Eastern Imperial County • Pacific Wind (Iberdrola), 17,000 acres near Eastern San Diego County • Pacific Wind (Iberdrola), 9,000 acres near Eastern San Diego County

Solar Energy (Updated November 2008): Total Acreage 689,910
Needles Field Office
• PPM Energy (Iberdrola), 2,330 acres near Mountain Pass • First Wind, 10,720 acres near Bristol Mountains • Renewergy, LLC, 7,760 acres near Bristol Mountains • Renewergy, LLC, 2,080 acres near Iron Mountain • Renewergy, LLC, 17,320 acres near Homer Mountain • Oak Creek Energy, 7,660 acres near Castle Mountains • Oak Creek Energy, 25,600 acres near South Ludlow • eWindFarm, Inc., 6,460 acres near Iron Mountain • Little Mountain Wind Power LLC, 15,000 near Bristol Lake
Palm Springs Field Office
• Edom Hill, 360 acres • Mark Tech, 74 acres • AES Seawest, 265 acres • Sierra Renewables LLC, 5,300 acres
Ridgecrest Field Office
• Oak Creek Energy, 160 acres near Tehachapi Mountains • Oak Creek Energy, 4,208 acres near Mojave/ Tehachapi • Sierra Renewables LLC, 8,835 near Rose Valley • Sean Roberts, Renewable Land LLC, 467 near Mojave • Boulevard Associates, 2,678 near Tehachapi Mountains • Oak Creek Energy, 6,826 near Lucchese • Oak Creek Energy, 1,800 near Soledad Mountain • Oak Creek Energy, 19,565 near Rand Mountain • Renewergy, LLC, 14,209 near Rand Mountain • Wind Power Partners, 2,080 near Short Canyon • Competitive Power Ventures LLC, 5,000 near Bird Spring • Power Parters SW (enXco), 1,816 near Soledad • Sierra Renewables LLC, 2,554 near Inyokern

Source: BLM 2008

Table 2. Existing Projects in the Ivanpah Valley					
ID #	**Project Name; Agency ID**	**Location**	**Ownership**	**Status**	**Project Description**
1	Bighorn Electric Generating Station	Primm, Nevada	Reliant Energy Wholesale Generation, LLC	Existing	Operating natural gas power plant, uses dry cooling system
2	Primm Casinos: Buffalo Bill's, Primm Valley, Whiskey Pete's	I-15 at state line, NV 31900 Las Vegas Blvd. South. Primm	Terrible's Primm Valley Casino Resorts (MGM Mirage)	Existing, undergoing renovation	Two existing Resort and Casinos and one existing Hotel and Casino
3	Primm Valley Golf Course	3 miles south of state line in California	Terrible's Primm Valley Casino Resorts (MGM Mirage)	Existing	Existing golf course located south of the California/Nevada border along I-15, opened in 1997.
4	Primm Outlet Mall	Primm, Nevada 32100 Las Vegas Blvd. S. Primm, NV	Fashion Outlets (MGM Mirage)	Existing	Existing shopping outlet with over 100 stores. Connected to the Primm Casinos by monorail.
5	Recreation Activities	Ivanpah Dry Lake	BLM	Ongoing	Approximately 200 Casual Use permits are issued annually (these cover between 1 individual to 6 individuals) and approximately 5000 annual visitors. Approximately 12 Permitted and Organized events occur on the Dry Lake annually on both east and west sides. (Approximately 50% of these permitted and organized events occur on the west side and 50% on the east side, although the largest of the events tend to occur on the east side of the Dry Lake.) Permits are also given out that include use of both sides. • Examples of such events include • Championship Racing • Archery events • Kite buggying • Land Sailing

Table 2. Existing Projects in the Ivanpah Valley					
ID #	**Project Name; Agency ID**	**Location**	**Ownership**	**Status**	**Project Description**
6	Molycorp (Now Chevron-Texaco)	Mountain Pass, Sulphide Queen Property	Chrevron-Texaco	Ongoing	Existing mining operation on Mountain pass, property was acquired by Molycorp in 1950 and has been mined since, Molycorp was acquired by Unocal in 1977 which was acquired by Chevron-Texaco in 2005.
7	Colosseum Mine	12 miles west of Primm, Nevada (approximately 6 to 7 miles from Ivanpah site)	Lac Minerals	Inactive	Mining facilities occupy 284 acres on a 3,316 acre private parcel.
8	Clark Mountain and Crescent Peak Allotment 10 Year Lease CA-690-EA06-25	Northern Clark Mountain Range		Ongoing	Grazing Lease
9	Molycorp (Now Chevron-Texaco) Evaporation pond	Southeast of the Ivanpah Dry Lake	Molycorp	Active	
10	AT&T Fiber-optic replacement of cables	Along the west side of the Ivanpah Dry Lake and of I-15	AT&T	Environmental Assessment of project due for release In January 2009. Expected to be completed before permitting for Ivanpah SEGS is finished.	Existing direct buried fiber-optic cable will be replaced from Nevada border to the Halloran Summit, including a segment adjacent to the ISEGS project to the west of the Ivanpah Dry Lake. Use existing 10 foot ROW with some temporary larger ROW for where existing cable must be replaced.
11	Existing 115-kV transmission line from El Dorado substation	Through Ivanpah SEGS site	SCE	Active	
12	Molycorp (Now Chevron-Texaco) pipeline	Runs from Molycorp south of I-15, through the Mojave National Desert Preserve to the Evaporation pond	Molycorp	Active	

Table 3. Future Foreseeable Projects in the Ivanpah Valley Area					
ID #	**Project Name; Agency ID**	**Location**	**Ownership**	**Status**	**Project Description**
A	GEN 3 Solar, Inc CACA 48669	Ivanpah, south of Calif./Nevada line T17N/R14E	OptiSolar	¼ cost recovery received ($40,767) Plan of Development letter sent 07/31/08	300 MW Photovoltaic 4,160 acres land requested
B	Ivanpah Airport (Southern Nevada Supplemental Airport)	30 miles South of the McCarran International Airport - Note outline of purple around the project depicts the airport noise compatibility area	Clark County Department of Aviation	Draft EIS in progress, Scoping Report available. Preparing Draft EIS: Draft Alternatives Working Paper is available. Construction expected to begin 2012.	International Airport to supplement the McCarran International Airport in Las Vegas • 5,934 acre site • 17,000 acre sphere of influence • Adjacent to desert tortoise relocation site
C	Victorville-Las Vegas High Speed Train	Train along the I-15 between Victorville and Las Vegas	DesertXpress Enterprises	Draft EIS in progress..	DesertXpress would run from Victorville to Las Vegas. It hopes to operational by 2012.
D	Pipeline Restoration	Adjacent to the ISEGS property	Mojave Pipeline	Meeting in Jan or Feb to discuss what must be provided to gain ROW	Pipeline restoration, similar footprint to when laying the original pipeline.
E	Joint Port of Entry CA-690-EA06-01	Between Mt. Pass and Primm, Nevada	CALTRANS, California Dept of Food and Ag (CDFA)	Caltrans is reconsidering proposal as a phased project based on funding availability (2006) Temporary Use Permit for Geotechnical Testing and Soil Sampling in Progress	Joint Port of Entry would include an Agricultural Inspection Facility and a Commercial Vehicle Enforcement Facility located on the north side of Interstate 15 between Nipton Road and Yates Well Road.
F	Temporary Batch plant	Behind Casino Whiskey Pete, in Primm	CALTRANS	Caltrans widening of the I-15.	

Table 3. Future Foreseeable Projects in the Ivanpah Valley Area					
ID #	**Project Name; Agency ID**	**Location**	**Ownership**	**Status**	**Project Description**
G	Mixed-use Development	166 acres near Jean, Nevada	MGM Mirage and Jeanco Realty Development, LLC	Demolition of the Nevada Landing Casino as the first phase of the proposed new development to begin in April. Note: On hold due to International Airport plans, will not be replaced at least until building of new airport is begun if not complete.	MGM Mirage announced a joint-venture partnership with two Las Vegas-based developers to turn undeveloped land on both sides of Interstate 15 into a community that features affordable housing, commercial businesses, shops and a new hotel-casino. This would include the demolition of two casinos MGM Mirage currently owns in Jean.
H	Clark Mountain and Crescent Peak Allotment 10 Year Lease CA-690-EA06-25	Northern Clark Mountain Range		In Progress	Grazing Lease
I	Ivanpah Energy Center	Primm, Nevada	Diamond Generating Corporation	Construction was to begin in the first quarter of 2006. No construction currently taking place	• 500 Mw gas-turbine combined-cycle power plant
J	Wind energy power plant CACA 44988	Mountain Pass T15N/R14E R151/2N/R14E	PPM Energy	Application received 10/15/02 & 08/04/06 Testing & monitoring – 2nd Term	• 75 Mw wind energy project • 2,330 acres • Military: Red
K	Wind energy power plant CACA 44236	Mountain Pass T16N/R13E T16N/R14E T17N/R14E	Clipper Wind	Application received 3/6/02 & 5/1/06 Testing & monitoring – 2nd term	• 50 Mw wind energy project • 3,360 acres • Military: Red
L	I-15 Mountain Pass Truck Lane 4393U	San Bernardino County, near Wheaton Springs (from 2.4 km south of Bailey Rd. overcrossing to 1.2 km north of Yates Well Road Overcrossing)	CALTRANS	Bid for contractor out Sept. 2007	NB Truck Descending Lane and Pavement rehab. Construction not expected to start before August 2008. Work is expected to continue until 2010

Table 3. Future Foreseeable Projects in the Ivanpah Valley Area					
ID #	**Project Name; Agency ID**	**Location**	**Ownership**	**Status**	**Project Description**
N	Upgrade to existing 115-kV transmission line from El Dorado substation	Along northern transmission lines of Southern California Edison (SCE)	SCE	According to the CPUC website, the projected filing date would be early 2009, and the projected online date would be 2013.	Construct a new Ivanpah Substation sized to accommodate 230 / 115 kV facilities. Removal approximately 36 miles of a portion of the Eldorado leg of the existing Eldorado-Baker-Cool Water - Dunn Siding - Mountain Pass 115 kV line and construct a double circuit 230 kV line.
O	Mixed Use - Recreation	Ivanpah Dry Lake	BLM	Numbers are approximate for annual use. The use is expected to continue into the foreseeable future.	Approximately 200 Casual Use permits are issued annually (these cover between 1 individual to 6 individuals). Approximately 12 Permitted and Organized events occur on the Dry Lake annually on both east and west sides. (Approximately 50% of these permitted and organized events occur on the west side and 50% on the east side, although the largest of the events tend to occur on the east side of the Dry Lake.) Permits are also given out that include use of both sides. Annual dry-sailing and buggy events, examples from 2006 includes: • Ivanpah Playa Commercial Landsailing Tours • 2006 north American Buggy Expo Windjet Land Sailing Speed Trial
P	New fast food restaurant	Primm, NV	Unknown	In permitting process, application received by the Clark County permitting office 2/7/08	Fast food restaurant to be built adjacent to the Primm Outlet Mall (32100 S. Las Vegas Blvd.)
Q	Primm Solar Generating Plant	Just south of Primm, Nevada, on the California/ Nevada border	NextLight Renewable Power, LLC	Application in to the Las Vegas BLM Field Office	250 MW solar trough project on approximately 2,500 acres. Construction expected to take 32 months.

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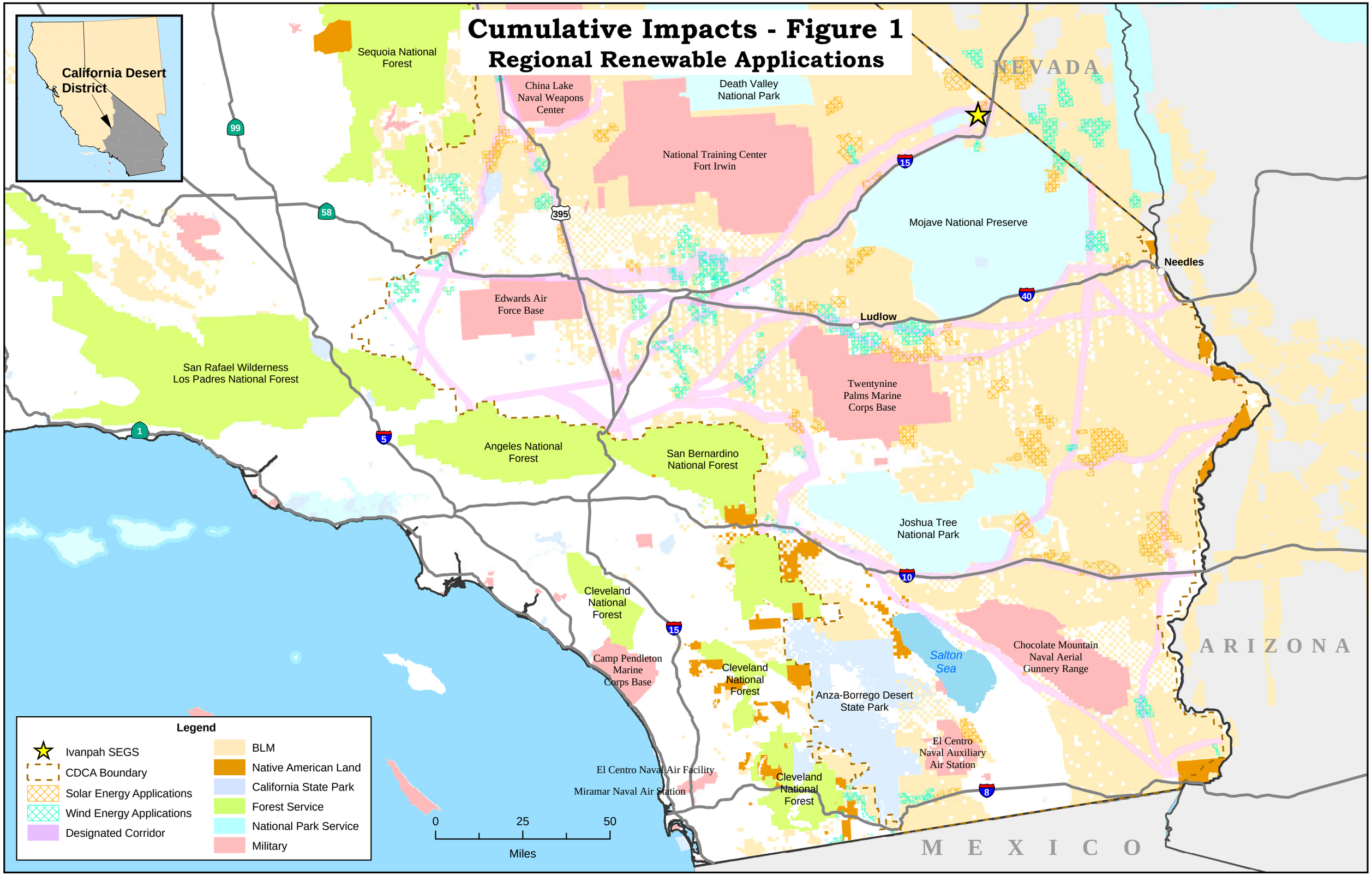
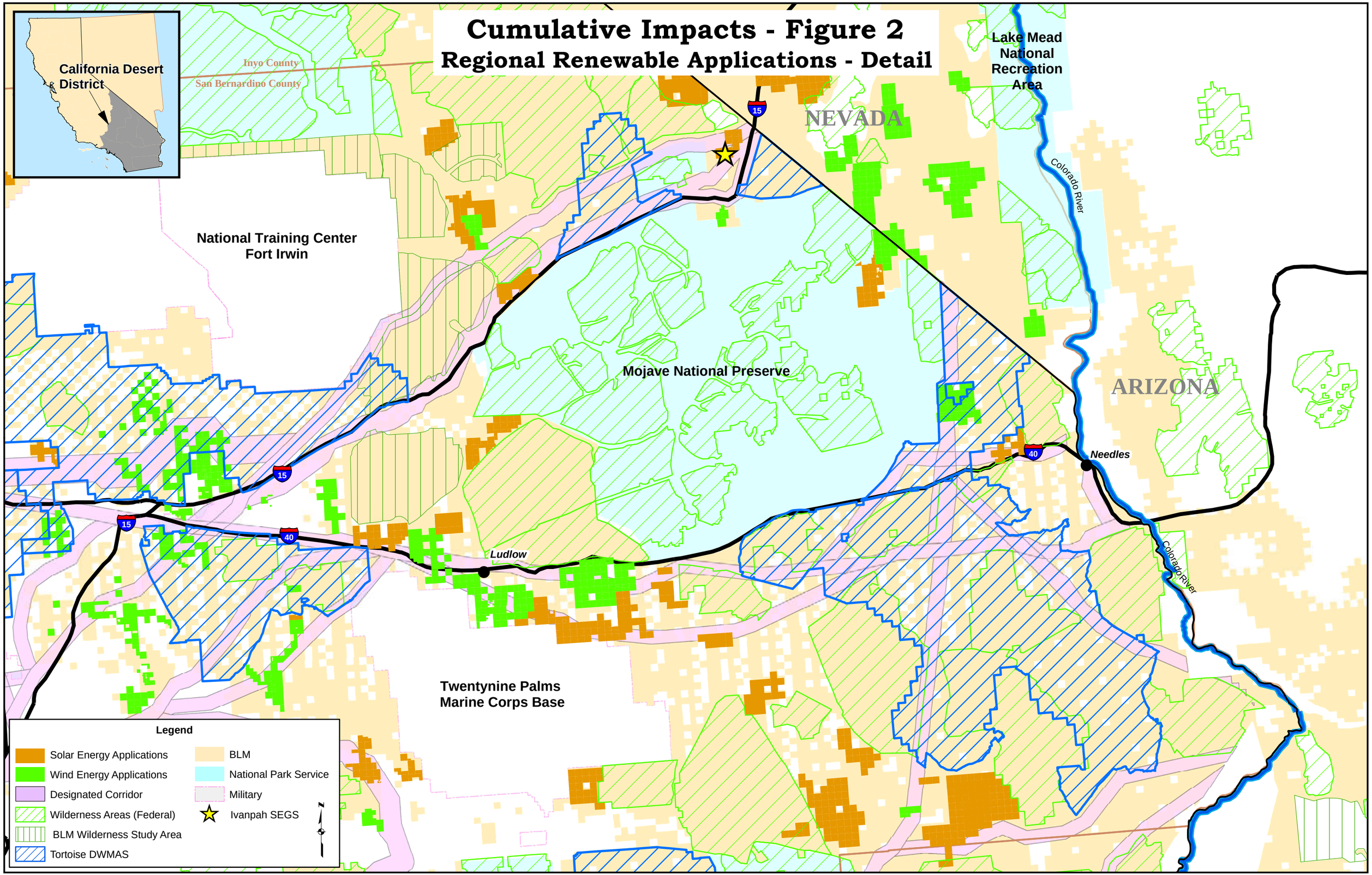
Cumulative Impacts - Figure 1
Regional Renewable Applications

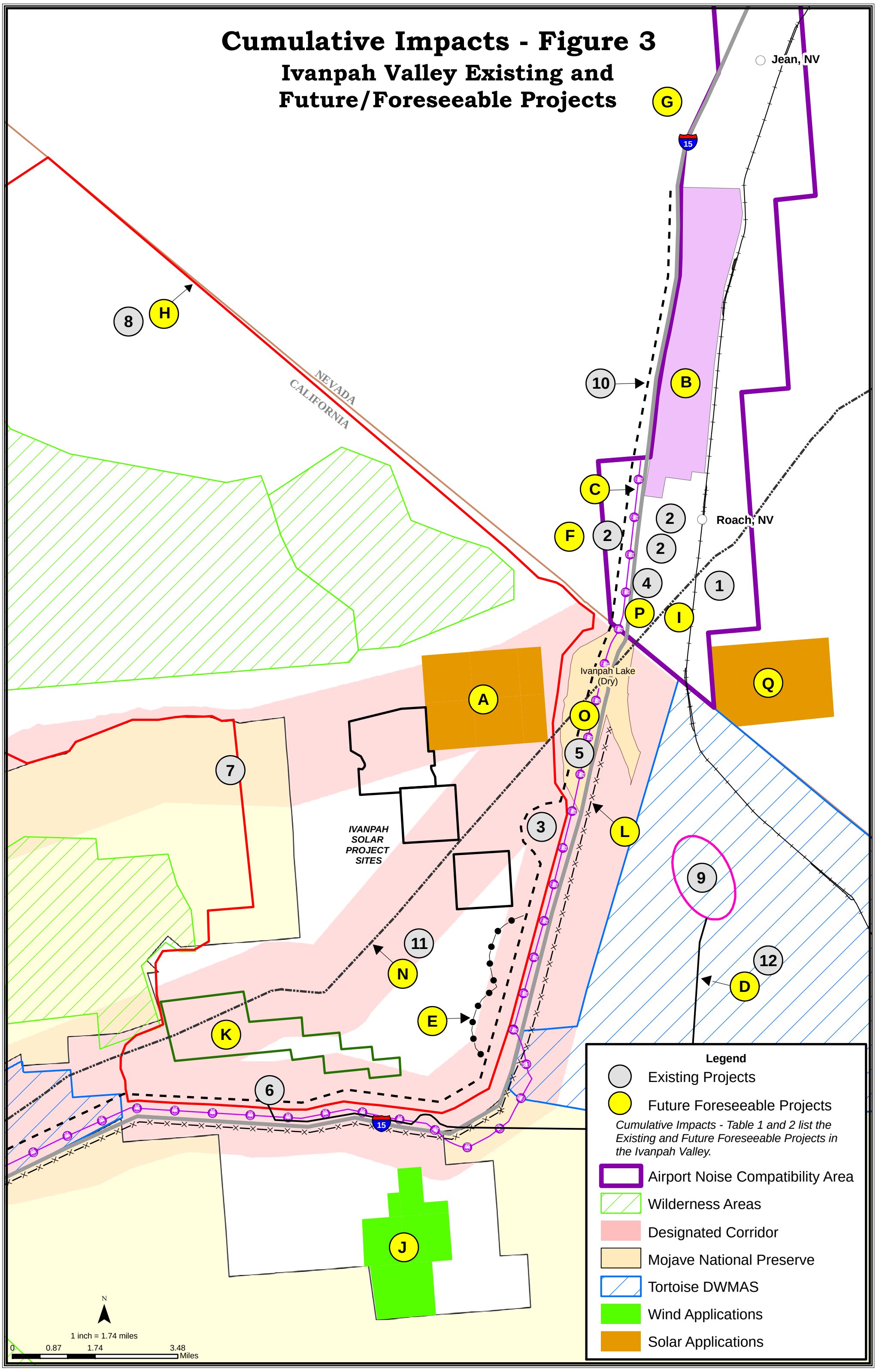


Cumulative Impacts - Figure 2
Regional Renewable Applications - Detail



Cumulative Impacts - Figure 3

Ivanpah Valley Existing and Future/Foreseeable Projects



ENVIRONMENTAL ASSESSMENT

AIR QUALITY

Tuan Ngo, P.E. and Matthew Layton, P.E.

SUMMARY OF CONCLUSIONS

Staff finds that with the adoption of the attached conditions of certification the proposed Ivanpah Solar Electric Generating System project (ISEGS) would comply with all applicable laws, ordinances, regulations, and standards (LORS) and would not result in any significant air quality-related impacts. Staff also finds that:

- The project would comply with the Mojave Desert Air Quality Management District (District) Rules and Regulations, including the New Source Review requirements;
- The project would not cause new violations of any nitrogen dioxide (NO_2), sulfur dioxide (SO_2), or carbon monoxide (CO) ambient air quality standards, and therefore, its emission impacts are not significant for those pollutants;
- The project's particulate matter of less than 10 and 2.5 microns (PM10/PM2.5), and ozone precursor emissions (oxides of nitrogen [NOx] and volatile organic compounds [VOC]) emissions contribution would not be significant with the implementation of staff recommended mitigation measures.
- The proposed ISEGS project would be part of the state's efforts to incorporate renewable energy generation into its energy mix, thereby improving its energy diversity and reducing natural gas use and emissions of greenhouse gas emissions from the electricity generation sector.

Appendix Air-1 - Greenhouse Gas Emissions[1] discusses global climate change and greenhouse gas (GHG) emissions from the project. The ISEGS project would emit significantly fewer greenhouse gases[2] than fossil-fueled generation resources in California. The project is not subject to the requirements of SB 1368 (Perata, Chapter 598, Statutes of 2006) and the Emission Performance Standard; nevertheless it would easily be consistent with the Emission Performance Standard.

INTRODUCTION

On August 28, 2007, BrightSource Energy (applicant) submitted an Application for Certification (AFC) to construct and operate ISEGS in the Mojave Desert region near the border of California and Neveda in San Bernardino County. The applicant proposes to develop this project in three phases, which together would produce approximately 400-megawatt (MW) of electrical power. The project would include heliostat mirror fields, spread over approximately 4,065 acres, focusing solar energy on power tower receivers producing steam for turbine generators.

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

HG standards and requirements.

This analysis evaluates the expected air quality impacts from the emissions of criteria air pollutants from both the construction and operation of the ISEGS project. Criteria air pollutants are defined as air contaminants for which the state and/or federal governments have established an ambient air quality standard to protect public health.

The criteria pollutants analyzed are nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and particulate matter (PM). Two subsets of particulate matter are inhalable particulate matter (less than 10 microns in diameter, or PM10) and fine particulate matter (less than 2.5 microns in diameter, or PM2.5). Nitrogen oxides (NOx, consisting primarily of nitric oxide [NO] and NO_2) and volatile organic compounds (VOC) emissions readily react in the atmosphere as precursors to ozone and, to a lesser extent, particulate matter. Sulfur oxides (SOx) readily react in the atmosphere to form particulate matter and are major contributors to acid rain.

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

- whether the ISEGS project is likely to conform with applicable federal, state, and Mojave Desert Air Quality Management District (District) air quality laws, ordinances, regulations and standards (Title 20, California Code of Regulations, section 1744 (b));
- whether the ISEGS project is likely to cause new violations of ambient air quality standards or contribute substantially to existing violations of those standards (Title 20, California Code of Regulations, section 1743);
- whether mitigation measures proposed for the project are adequate to lessen potential impacts to a level of insignificance (Title 20, California Code of Regulations, section 1742 (b)).

Greenhouse gas (GHG) emissions are not criteria pollutants. However, the state has demonstrated a clear willingness to address greenhouse gases and global climate change though research, adaptation and inventory reductions. In that context, staff evaluates in the attached **Appendix Air-1** the GHG emissions from the proposed project, presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Air Quality Table 1 summarizes the applicable LORS. The District issued its Preliminary Determination of Compliance (PDOC) (MDAQMD2008a) for the project on February 15, 2008. The PDOC, or determination of compliance with District rules and regulations, included a set of air quality permit conditions that ensure continuous compliance during construction of the facility and operation of permitted equipment. Staff incorporated the District conditions in this Preliminary Staff Assessment.

SETTING

CLIMATE AND METEOROLOGY

The project is located in the southern California Mojave Desert, about three and one-half miles west of the California-Nevada border at approximately 900 feet above sea level. Relatively high daytime temperatures, large variations in relative humidity, large and rapid diurnal temperature changes, occasional high winds, and sand, dust, and thunderstorms characterize the climate of the Mojave Desert area. The aridity of the region is influenced by a sub-tropical high-pressure system typically off the coast of California and topographical barriers that effectively block the flow of moisture to the region. Seasonally, the precipitation totals in the area range from lows of 0.5 inch in the spring to as high as 8 inches in the winter.

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

Applicable LORS	Description
Federal	New Source Review: Best Available Control Technology (BACT) and Offset requirements
	Title V: federal permit
	New Source Performance Standard: 75 parts per million (ppm) NO_x and 150 ppm SOx @15% oxygen (O_2).
State	California Health and Safety Code: Permitting of source needs to be consistent with approved Clean Air Plan.
Local	Regulation IV: Particulate Matter and Visible Emissions: Emissions shall not be darker than Ringelmann No. 1 for a continuous three-minutes, and no more than 0.01 grains PM per standard dry cubic foot.
	Regulation XI: Standards for Electric Utility Operations and Stationary Gas Turbines: NOx emissions from these sources shall not exceed 42 ppm@15%O_2
	Regulation XII: Federal Operating Permits: Acid Rain: Requires continuous emission monitoring system
	Regulation XIII: New Source Review: BACT, offsets, and new sources shall not cause or make worse a violation of an ambient air quality standard.

The most recent meteorological (weather) data, collected at the Jean, Nevada monitoring station 16 miles northeast of the project site, was for 2001 through 2002. The measured wind data are graphically represented by quarterly wind roses, provided in the AFC Figures 5.1-1 and 5.1-2 (BSE2007a). These wind roses show that for most of the year, the winds are from the west-southwest, although between November through March, winds are predominately from the northeast. Mixing heights in the area, which represent the altitudes where different air masses mix together, are estimated to be on average 230 feet (70 meters) in the morning to as high as 5,250 feet (1,600 meters) in the afternoon.

EXISTING AMBIENT AIR QUALITY

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

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

ISEGS is located in the Mojave Desert Air Basin and is under the jurisdiction of the Mojave Desert Air Quality Management District. This area is designated as non-attainment for the state annual PM2.5 standard, non-attainment for both the state and the federal (1-hour and 8-hour) ozone and 24-hour PM10 standards, attainment for the state's CO, NO_2, SO_2, SO_4 and lead (Pb) standards, and unclassified for the federal PM2.5, CO, NO_2 and SO_2 standards. **Air Quality Table 3** summarizes the area's attainment status for various applicable state and federal standards.

Ambient air quality monitoring data for ozone, PM10, PM2.5, CO, NO_2, and SO_2, compared to most restrictive applicable standards for the year between 2000 through 2006 (the last year for which the complete annual data is currently available) at the Park Avenue, Victorville monitoring station are shown in **Air Quality Figure 1**. This monitoring station is located nine miles south of the project site and is operated by the District staff. In this figure, the highest measured ambient concentrations of various criteria air contaminants were divided by their applicable standard and provided as a graphical point. Any point on the chart that is greater than one (e.g., ozone and PM10) means that the measured concentrations of such air contaminant exceed the standard, and any point that is less than one (e.g., CO, SO_2, and NO_2) means that the respective standard is not exceeded. Measured state PM2.5 levels are close to one, but the region is designated non-attainment, as shown in **Air Quality Table 3**, meaning that from a regulatory standpoint, the standard is being violated.

Air Quality Table 2
Ambient Air Quality Standards

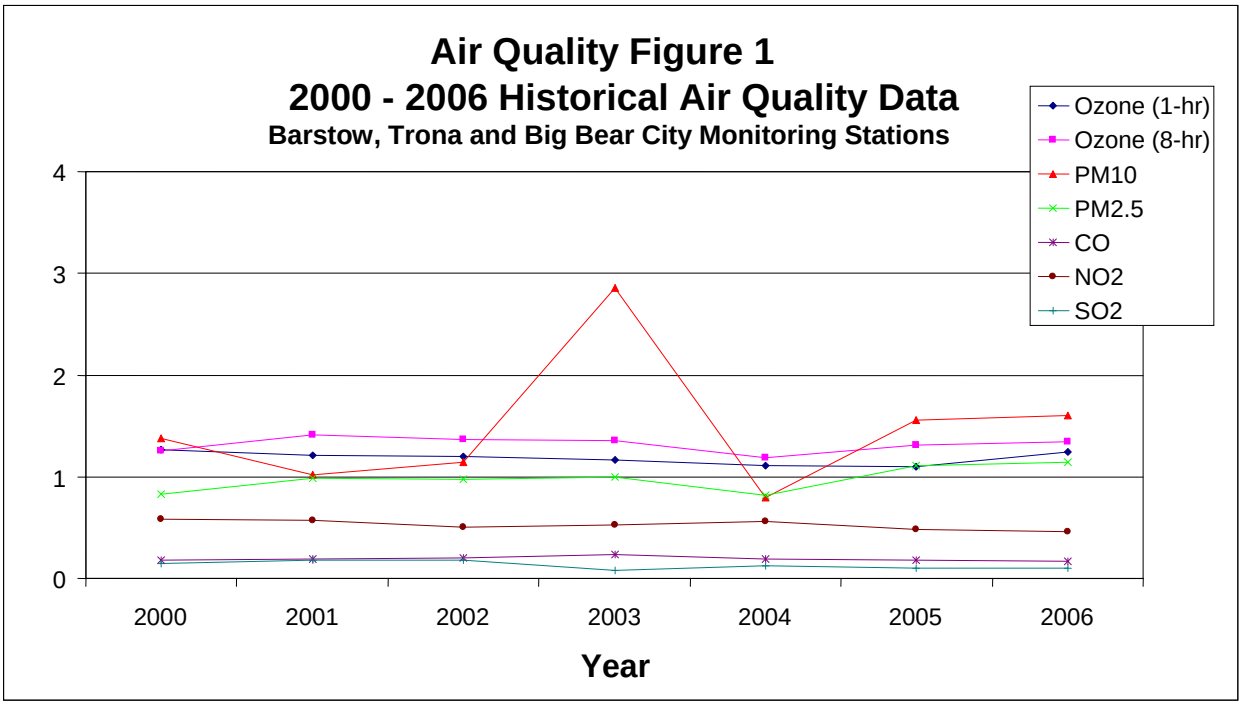
Pollutant	Averaging Time	California Standards	Federal Standards	
			Primary	Secondary
Ozone(O_3)	1-hour	0.09 ppm (180 $\mu g/m^3$)	None	Same as primary
	8-hour	0.07 ppm (137 $\mu g/m^3$)	0.08 ppm (157 $\mu g/m^3$)	
Particulate Matter (PM10)	Ann.Geo. Mean	20 $\mu g/m^3$	---	Same as primary
	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$	
	Ann.Arit. Mean	---	50 $\mu g/m^3$	
Fine Particulate Matter (PM2.5)	24-hour	No separate standard	35 $\mu g/m^3$	Same as primary
	Ann.Arit. Mean	12 $\mu g/m3$	15 $\mu g/m^3$	
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	---
	8-hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	
Nitrogen Dioxide (NO_2)	1-hour	0.25 ppm (470 $\mu g/m^3$)	---	Same as primary
	Ann.Arit. Mean	---	0.053 ppm (100 $\mu g/m^3$)	
Lead(Pb)	30-day	1.5 $\mu g/m^3$	---	Same as primary
	Cal. Quarter	---	1.5 $\mu g/m^3$	
Sulfur Dioxide (SO_2)	Ann.Arit. Mean	---	0.03 ppm (80 $\mu g/m^3$)	---
	24-hour	0.04 ppm (105 $\mu g/m^3$)	0.147 ppm (365 $\mu g/m^3$)	---
	3-hour	---	---	0.5 ppm (1300 $\mu g/m^3$)
	1-hour	0.25 ppm (655 $\mu g/m^3$)	---	---
Sulfates	24-hour	25 $\mu g/m^3$	No federal standard	
H_2S	1-hour	0.03 ppm (42 $\mu g/m^3$)	No federal standard	

Source: California Air Resources Board

Air Quality Table 3
Mojave Desert Attainment Status

Pollutant	Averaging Time	California Status	Federal Status
Ozone (O_3)	8 Hour	Non-attainment	Non-attainment
	1 Hour	Non-attainment	N/A
Carbon Monoxide (CO)	8 Hour	Attainment	Attainment
Nitrogen Dioxide (NOx)	Annual	N/A	Attainment
	1 Hour	Attainment	N/A
Sulfur Dioxide (SO_2)	Annual	N/A	Attainment
	24 Hour	Attainment	Attainment
	1 Hour	Attainment	N/A
PM10	Annual	Non-attainment	N/A
	24 Hour	Non-attainment	Non-attainment
PM2.5	Annual	Non-attainment	Unclassified/Attainment
	24 Hour	N/A	Attainment

Notes: N/A= no standard applies or not applicable



Source: California Air Resources Board

Carbon Monoxide

The area is classified attainment of the state 1-hour and 8-hour carbon monoxide (CO) standards. The CO concentration levels measured in the air basin have never exceeded the standards (see **Air Quality Figure 1**). The highest concentrations of CO occur when low wind speeds and a stable atmosphere trap the pollution emitted at or near ground level. These conditions occur frequently in the wintertime late in the afternoon, persist during the night and may extend one or two hours after sunrise.

Particulate Matter (PM10)

The area is non-attainment for both the state and the federal PM10 standards. PM10 can be emitted directly as fugitive dust or combustion particulates, or it can be formed many miles downwind from emission sources when various precursor pollutants interact in the atmosphere. Gaseous emissions of pollutants like NOx, SOx and VOC from combustion sources, and ammonia (NH_3) from human and animal wastes or combustion NOx control equipment can, given the right meteorological conditions, form particulate matter known as nitrates (NO_3), sulfates (SO_4), and organic compounds. These pollutants are known as secondary particulates, because they are not directly emitted but are formed through complex chemical reactions between directly emitted pollutants in the atmosphere.

Air Quality Figure 1 indicates that the state 24-hour ambient air quality standard for PM10 was exceeded every year from 2000 through 2006, with highs close to four times the state 24-hour PM10 standard. The available ambient PM10 data also indicate that violations of the state 24-hour PM10 standard tend to spread out over the entire year, with peaks occurring during different months for different years. Some violations can be attributed to frequent and severe dust storms that occur throughout the year. Therefore, it could be that while the District is non-attainment of the PM10 standard, PM10 air quality may not be as poor at the project site and may not be attributable to permitted emission sources adjacent to the site.

Fine Particulate Matter (PM2.5)

Fine particulate matter, or PM2.5 (particulate matter less than 2.5 microns in diameter), is derived either mainly from the combustion of materials, or from precursor gases (SOx, NOx, and VOC) through complex reactions in the atmosphere. PM2.5 consists mostly of sulfates, nitrates, ammonium, elemental carbon, and a small portion of organic and inorganic compounds. Some PM2.5 emissions come from fugitive dust sources such as unpaved roads and construction sites.

The U.S. EPA has promulgated a 35 $\mu g/m^3$ 24-hour PM2.5 standard and a 15 $\mu g/m^3$ annual PM2.5 standard, and has recently classified the district as unclassified (attainment) for both its annual and 24-hour PM2.5 standards. The California Air Resources Board (ARB) recently adopted a new annual PM2.5 standard of 12 $\mu g/m^3$, but has not set any new 24-hour PM2.5 standard. **Air Quality Figure 1** shows that the PM2.5 concentrations, measured from 2000 through 2006, are hovering near the federal 24-hour PM2.5 standard with a slight downward trend.

Nitrates and Sulfates

PM nitrate (mainly ammonium nitrate) is formed in the atmosphere from the reaction of NOx and ammonia. NOx, as emitted from combustion sources, is mainly in the form of nitric oxide (NO). NO converts to NO_2 primarily by reacting with ozone in the ambient air and sunlight. The formed NO_2 can convert back to NO, which sustains the ozone formation reactions. NO_2 can also form organic nitrates, or be reduced to nitric acid by available hydroxyl (OH) radicals in the ambient air. Nitric acid reacts with ammonia in ambient air to form ammonium nitrate. Ammonium nitrate, in its particulate form, can remain suspended in the ambient air and/or be transported long distance downwind as PM2.5. Ammonium nitrate, under certain conditions of heat and humidity, breaks down to NOx and starts a new ozone cycle again.

PM sulfate (mainly ammonium sulfate) is formed in the atmosphere from the oxidation of SO_2 and subsequent neutralization by ammonia in the atmosphere. The oxidation of SO_2 depends on many factors, which include the availability of sulfur, hydroxyl (OH), hydroperoxy (HO_2) and methylperoxy (CH_3OH) radicals, and atmospheric humidity.

PROJECT DESCRIPTION

The proposed 400-MW project includes three solar concentrating thermal power plants, based on distributed power tower and heliostat mirror technology, in which heliostat (mirror) fields focus solar energy on power tower receivers near the center of each heliostat array. ISEGS 1 and 2, are designed to provide 100 MW of electricity and would occupy approximately 914 acres and 921 acres respectively; the 200-MW phase, ISEGS 3, would require occupy approximately 1,843 acres. All three phases would share an administration building, an operation and maintenance building, substation, and detention ponds that would be located in between Ivanaph 1 and 2, requiring an additional area of approximately 66 acres. Another 316 acres is needed for construction staging activities. Established dirt roads account for an additional five acres. ISEGS total project footprint amounts to approximately 4,065 acres (approximately 6.4 square miles).

Each plant includes a natural gas-fired steam boiler equipped with a low-NOx burner/air recirculation system to maintain NOx emissions below 9 ppm. These boilers provide thermal input to the turbine during the morning start-up cycle and during transient cloudy conditions. The operation of these boilers would not exceed four hours each day and 5percent of the facility annual's heat input from the sun.

Each plant also includes a diesel-fired 240-horsepower (hp) fire pump engine and a 3,750-hp emergency generator engine.

Construction of each of the three phases of the facility would last about 24 months, with a 12 months overlapping between each phase. Thus, the construction of the entire facility would last up to four years.

Using the applicant provided construction schedule and operating hours, staff estimated the facility's maximum daily and annual emissions in **Air Quality Table 4** for NOx, VOC, SOx, CO, PM10 and PM2.5.

Air Quality Table 4
Facility's Maximum Daily and Annual Emissions

Operation and Construction	NOx	VOC	SOx	CO	PM10	PM2.5
Ph1 Construction (lb/day)	363	23	1	117	190[a]	45
Ph1 Operation/Ph. 2 Construction (lb/day)	373	23	4	134	216[b]	52[c]
Ph1/Ph2 Operation/Ph3 Construction (lb/day)	383	24	7	151	244[d]	59[d]
Operation						
Total Daily Operating Emissions (lbs/day)[e]	60	15.5	10.3	209	109	52.5
Total Annual Operating Emissions (tons/year)	12	2.86	1.85	37.8	19.6	9.5

Notes:

a. Emissions include fugitive dust from land clearing and vehicle movements.
b. Emissions include Phase I's 21 lbs/day of fugitive dust and combustion PM10 from facility maintenance activities.
c. Emissions include combustion PM2.5 from facility maintenance activities.
d. Emissions include Phase I and II's 41 lbs/day of fugitive dust and combustion PM10 from facility maintenance activities.
e. Including emissions from all three phases and boilers. The boilers operate no more than four hours per day and no more than 5 percent of solar input, or about one hour per day per year.

Sources: AFC (BSE2007a), and January 14, 2008 Data Response.

INITIAL COMMISSIONING AND CLOSURE

Initial commissioning refers to a period of approximately 60 days prior to beginning commercial operation when the equipment undergoes initial tuning and performance tests. Staff does not expect significant change of emissions from the facility commissioning to that of full production.

Eventually the facility will close, either at the end of its useful life or due to some unexpected situation such as a natural disaster or catastrophic facility breakdown. When the facility closes, all sources of air emissions would cease to operate and thus impacts associated with those emissions would no longer occur. The only other expected emissions would be equipment exhaust and fugitive particulate emissions from the dismantling activities. These activities would be of much a shorter duration than construction of the project.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

The two criteria that staff uses to determine whether project emissions would be significant are based upon the extensive federal and state regulatory programs designed to protect against adverse effects from air contaminants. The first is the status of the ambient air quality standards in the area. If the area is non-attainment for a certain air quality standard, it is most likely that the project's emissions of that air

contaminant and its precursors would contribute to the violations of that standard. For example, the area is currently non-attainment for the state ozone standards; therefore, all ozone precursors (NOx, and VOC) that the facility releases during construction and operation would potentially cause significant impacts through their contribution to the existing violations of the standards.

The second criterion is whether the project's construction and operational emissions would cause a new violation to the ambient air quality standards. Staff relies on air dispersion modeling in conducting this assessment. Air dispersion models provide a means of predicting the location and ground level magnitude of the impacts of a new emissions source. In general, the inputs for the modeling include stack information (exhaust flow rate, temperature, and stack dimensions), specific source (e.g., fire pump engine) emissions data, meteorological data, such as wind speed and atmospheric conditions; and site elevation. The model results are often described as a unit of mass per volume of air, such as micrograms per cubic meter ($\mu g/m^3$). Staff adds the modeled impacts to the available highest ambient background concentrations recorded during the previous three years from nearby monitoring stations. Staff compares the results with the ambient air quality standards for each respective air contaminant to determine whether the project's emission impacts would cause a new violation of the ambient air quality standards or if the emissions would contribute to an existing violation.

The ambient air quality standards that staff uses as a basis for determining project significance are health-based standards. They are set at levels to adequately protect the health of all members of the public, including those most sensitive to adverse air quality such as the aged, people with existing illnesses, and infants and children, while providing a margin of safety.

DIRECT/SECONDARY IMPACTS AND MITIGATION

Staff assessed three kinds of primary and secondary[3] impacts: construction, operational, and cumulative. Construction impacts result from the emissions occurring during site preparation and construction of the project. Operational impacts result from the emissions of the proposed project during normal operation, which include maintenance, start-ups, and shutdowns. Cumulative impacts result from the proposed project's incremental effect viewed over time, together with other closely related past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project (Pub. Resources Code § 21083; Cal. Code Regs., tit. 14, §§ 15064(h), 15065(c), 15130, and15355)

Construction Impacts

The ISEGS project consists of three phases, each of which would require approximately 24 months of partially overlapping construction (BSE2007a). Construction generally consists of two major activities: site preparation, and construction and installation of major equipment and structures. In addition to fugitive dust emissions resulting from the site preparation, emissions from construction equipment exhausts, such as vehicles and

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

internal combustion engines, are also expected during the project construction phase. In addition, a small amount of hydrocarbon emissions may occur because of the temporary storage of petroleum fuel at the site.

One aspect of the construction phase of the project has not been quantified, and staff over-looked this aspect of the project during discovery, are the criteria emissions from the delivery of the considerable amount of materials, particularly the heliostat framework materials and mirrors to the site. If diesel powered truck delivery of these materials are the chosen method, then there could be considerable emissions associated with truck deliveries within the Mojave Desert Air Basin. Staff will work with the applicant to quantify those emissions and address any impacts and mitigation measures, if necessary, to be included in the Final Staff Assessment.

Using estimated peak hourly, daily, and annual construction equipment exhaust emissions, the applicant performed a modeling analysis. The results are presented in **Air Quality Table 5**. The modeling analysis included both the fugitive dust and vehicle exhaust emissions, which include PM10, NOx, and CO. In **Air Quality Table 5**, the first and second columns list the air contaminant, that is, NO_2, PM10, and CO, and the averaging time for each air contaminant analyzed. The third column presents the project emission impacts, and the fourth column presents the highest measured concentration of the criteria air contaminants in the ambient air (background). The fifth column presents the total impact, that is, the sum of project emission impact and background measured concentration.

Air Quality Table 5
Maximum Project Construction Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hour	124	190	314	338	93%
CO	8-hour	16	1,535	1,551	10,000	15%
PM10	24-hour	6.7	184.4	191.1	50	**380%**

Source: AFC, Table 5.1-27 (BSE2007a).

Staff reviewed the modeling and finds that construction of the facility would result in significant, unavoidable short-term PM10 impacts.

Construction Impacts Mitigation

To mitigate the impacts due to construction of the facility, the applicant has proposed to use the following mitigation measures from the South Coast Air Quality Management District CEQA Guidelines (CH2ML2008i):

A. All unpaved roads and disturbed areas in the project and linear construction sites will be watered until sufficiently wet to ensure that no visible dust plumes leave the project site.

B. Vehicle speeds will be limited to 10 miles per hour within the construction site.

C. All construction equipment vehicle tires will be washed or cleaned free of dirt prior to entering paved roadways.

D. Gravel ramps will be provided at the tire washing/cleaning station.

E. All entrances to the construction site will be graveled or treated with water or dust soil stabilization compounds.

F. Construction areas adjacent to any paved roadway will be provided with sandbags to prevent run-off to the roadway.

G. All paved roads within the construction site will be swept twice daily when construction activity occurs.

H. At least the first 500 feet of any paved public roadway, accessed from the construction site or from unpaved roads en route to the construction site and construction staging areas will be swept regularly on days when construction activity occurs.

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

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

K. Wind erosion control techniques such as windbreaks, water, chemical dust suppressants, and vegetation will be used on all construction areas that may be disturbed. Any windbreaks used will remain in place until the soil is stabilized or permanently covered with vegetation.

L. Construction equipment will be shut down to avoid excessive idling emissions.

M. Construction equipment will use low sulfur, low aromatic diesel fuel.

N. Construction equipment will be maintained in top service shape.

O. Construction equipment used will meet state and federal emission standards for Tier II and Tier III.

Staff recommends the implementation of mitigation measures contained in Conditions of Certification **AQ-SC1 to AQ-SC5** to reduce the impacts from the construction of the proposed project. These conditions include all of the applicant's proposed mitigation measures and staff suggested modifications.

The construction of the project would cause particulate matter emissions that would add to the existing violations of the ambient PM10 air quality standards. Therefore, the project PM10 emission impacts due to construction of the project would be significant. Staff believes that the implementation of proposed specific mitigation measures during

construction of the facility as identified in the conditions of certification would eliminate the potential to cause the short-term impacts of PM10 to a level of less than significant.

Operational Impacts

During operations of the project, the facility's emissions would be from the power block maintenance activities, including mirror cleaning and minimal undesired vegetation removal, the weekly testing of the emergency generator and firewater pump, and, on the average, one hour per day of operation of each boiler. There would be 24 diesel-powered tractors pulling water tanks to clean the mirrors and approximately 12 gasoline-powered trucks providing facility maintenance. The facility emissions, including those from fugitive PM10 emissions, are estimated and summarized in **AIR QUALITY Table 4**.

The applicant has provided a modeling analysis using the EPA-approved AERMOD model to estimate the impacts of the project's NOx, PM10, CO, and SOx emissions resulting from project operation (CH2ML2008h). Similar to the assessment of construction impacts, staff added the modeled impacts to the available highest ambient background concentrations recorded during the previous three years from nearby monitoring stations to assess the project operational impacts.

Staff tabulated the maximum results of the facility's modeling analysis in **Air Quality Table 6**. The analysis shows that the project does not cause any new violations of NO_2, PM2.5, CO or SO_2 air quality standards even with worst-case ambient concentrations recorded over 100 miles from the project. The project, however, would contribute to existing violations of the air basin state 24-hour PM10 air quality standards, and the state 1-hour and the federal 8-hour ozone standards. However, it is unlikely that local ambient air quality levels would be as high as those measured over 100 miles from the project site.

Air Quality Table 6
Project Operation Emission Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impacts ($\mu g/m^3$) [c]	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hour	150.4	190.1	304.5	338 [a]	90%
	Annual	Neg	43.3	43.3	56 [a]	77%
SO_2	1-hour	3.9	60.3	64.4	655 [a]	10%
	24-hour	Neg	13.1	13.1	105 [a]	13%
CO	1-hour	319	4,010	4,329	23,000 [a]	19%
	8-hour	54.9	1,535	1,590	10,000 [a]	16%
PM10	24-hour	3.3	184	187	50 [a]	**375%**
	Annual	0.5	25.4	25.9	20 [a]	**130%**
PM2.5	24-hour	0.2	28.8	29	35 [b]	83%
	Annual	Neg	10.6	10.6	12 [a]	88%

Notes
a. State standards
b. Federal standards
c. Include impacts from emergency and fire pump engines.
Source: AFC Air Quality Modeling Analysis (CH2ML2008h).

Staff Discussion of the Project Impacts

As discussed in the SETTING section of this analysis, and because of the lack of industrial activities in the project area, staff believes that:

- Violations of the ambient air quality standard for ozone in the District are due largely to transport of pollution from the SCAQMD and from emission sources and activities in area upwind of the project site.
- Violations of the ambient air quality standard for PM10 in the District are due largely to fugitive dust from frequent and severe dust storms that occur throughout the year.

As mentioned earlier in the discussions of the ozone and PM10 impacts, staff believes that the project's ozone precursors and PM10 emissions are minimal, but would likely be significant. Additionally, staff believes a solar renewable projects, which would have a 30 to 40-year life in a setting likely to continue to be impacted by both local and upwind emission sources, should address it contribution to a potentially ongoing non-attainment of the PM10 and ozone standards. Therefore, staff recommends the following additional mitigation measures:

1. Use gasoline powered, or as an option, natural gas powered light trucks (equivalent to a Ford F150, or F250) to pull trailers used in the cleaning of mirrors. This mitigation measure would significantly reduce the ozone precursors and PM10 emissions from the facility while representing a cost saving to the applicant.[4]

2. Use electric [battery] powered vehicles, similar to those used golf courses, to transport maintenance crew within the facility, thereby eliminating almost all the emissions during operation, and knobby, off-road tires that could disturb stabilized soil and roads:

3. Use Tier II or Tier III internal combustion engines for the fire pumps and emergency generators.

4. Use wind erosion control techniques such as windbreaks, water, and chemical dust suppressants on areas that could be disturbed by vehicles or wind. Any windbreaks used would remain in place until the soil or road is stabilized:

5. Limit vehicle speeds within the facility to no more than 10 miles per hour to address fugitive PM emissions from the site.

Staff estimated the facility emissions of ozone precursors, CO and PM10 after the implementation of the staff suggested mitigation measures above (see **Appendix Air-2)** and tabulated them in **Air Quality Table 7**. Staff recommendations are specified in Conditions of Certification **AQ-SC6** and **AQ-SC-7**.

[4] The cost of a light truck is less than the cost of a tractor, and the cost of the golf cart is less than the cost of a gasoline powered light truck.

Air Quality Table 7
Facility's Annual Emissions After Implementation of Staff Suggested Mitigations

	NOx and VOC	SOx	CO	PM10	PM2.5
Proposed Facility Emissions (tons/year)	14.86	1.85	37.8	19.6	9.5
Emissions Reduction from Proposed Mitigation (tons/year)	<12.82>	0	<36.0>	<14.9>	<8.04>
Facility Emissions after Staff Suggested Mitigations (tons/year)	**2.04**	**1.85**	**1.82**	**4.72**	**1.46**

As presented in **Air Quality Table 7**, implementation of the staff recommended mitigation measures would reduce the facility emissions of ozone precursors from the proposed 14.86 tons per year (TPY) to 2.04 TPY (86 percent), and would reduce the facility PM10 emissions from 19.6 to 4.72 TPY (76 percent). Similarly, CO, PM2.5, and CO_2 emissions would be significantly reduced while the applicant may realize a cost saving of the maintenance equipment. Staff also believes that the implementation of its recommended mitigation measures would reduce the facility potential emission impacts on ozone and PM10 to a level of less than significant.

Applicant Proposed Operational Mitigation Is Without Merit

Staff notes that the applicant believes that its ISEGS solar project, with its limited criteria air pollutants displaces other criteria emitting projects to such a degree that the ISEGS project offsets its criteria air pollutant emissions. Staff strongly disagrees. The applicant compares its project and its air emissions to a "well-controlled gas turbine" on an energy basis (BSE2007a). However, staff finds the comparison without merit, as the 250-MW combined cycle that the applicant compares cannot match the 400 MW capacity of ISEGS. The comparison should consider both capacity and energy. Moreover, a reasonable comparison should also consider the dispatchability of the projects and any emissions and impact of the firming[5] capacity needed to integrate a low capacity and often-intermittent power plant such as ISEGS. Further, a comparable 400 MW natural gas-fired project, or the natural gas-fired 250-MW combined cycle could trigger District offset requirements, at which point its net criteria emissions would be zero while the ISEGS project, without any mitigation, would still result in a net emissions increase in a non-attainment air district for ozone and particulate matter.

Lastly, the operation of the ISEGS project would affect power plants throughout the interconnected Western Electricity Coordinating Council electricity system. Existing power plants may alter their operations. Decisions about building new or retiring existing power plants would be affected. However, it appears that the applicant is suggesting that a ton of NOx in an ozone attainment area of Utah, for example, has the same value or ability to mitigate an impact as a ton of NOx in the ozone non-attainment area of the Mojave Desert air district. This argument may work for greenhouse gases where the location is not critical to a GHG emission increase or a GHG reduction to the global

[5] Firming capacity and energy backstop intermittent generation resources like wind and solar to the degree that the grid and user are protected from supply interruptions.

impacts or mitigation. Electricity system displacement does not work for criteria pollutants where impacts are local, and measured against very specific standards based on the exposure and health of an exposed individual. Staff recommends the mitigation in Conditions of Certification **AQ-SC6** and **AQ-SC-7** to address any potential impacts from criteria air pollutants.

Cumulative Impacts and Mitigation

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

This analysis is concerned with criteria air pollutants. Such pollutants have impacts that are usually (though not always) cumulative by nature. Rarely would a project cause a violation of a federal or state criteria pollutant standard. However, a new source of pollution may contribute to violations of criteria pollutant standards because of the existing background sources or foreseeable future projects. Air districts attempt to attain the criteria pollutant standards by adopting attainment plans, which comprise a multi-faceted programmatic approach to such attainment. Depending on the air district, these plans typically include requirements for air offsets and the use of Best Available Control Technology (BACT) for new sources of emissions, and restrictions of emissions from existing sources of air pollution.

The applicant, in consultation with the District, has conducted a survey of stationary sources that are either under construction, or have received permits to be built or operate in the near future and that have the potential for emissions of criteria air contaminants within six miles of the project site. The survey results indicate that no such sources exist within the 6-miles radius[6] of the proposed project site.

No additional cumulative air quality impact modeling analysis was performed, and no significant cumulative impacts are expected However, staff is aware of a tremendous potential development of wind and solar in the desert southwest of the United States, and in the California Desert Conservation Area where ISEGS would be located. While the number of renewable project filings significantly dwarfs what will eventual be built and operated in the desert southwest, staff believes it is appropriate to construct and operate the desert renewable projects with best practices to reduce any potential cumulative effects, including criteria pollutants and their contributions to region ozone and particulate matter and haze. Staff recommends Conditions of Certification **AQ-SC1** and **AQ-SC-7** as best practices for the construction and operation of the ISEGS desert solar project, which may be one of many in the area and greater southwest region.

[6] Staff assumes that impacts from projects beyond six miles would not affect the modeling analysis on a cumulative basis.

CONCLUSIONS

- The project would comply with applicable District rules and regulations, including New Source Review requirements.
- The project's construction activities would contribution to significant adverse PM10 impacts. Staff recommends Conditions of Certification **AQ-SC1** to **AQ-SC5** to mitigate the potential impacts.
- The project would not cause new violations of any NO_2, SO_2, PM2.5 or CO ambient air quality standards, and therefore, the project direct operational NOx, SOx, PM2.5 and CO emission impacts would not be significant.
- The project's direct and indirect, or secondary emissions contribution to existing violations of the ozone and PM10 ambient air quality standards would likely be significant. Therefore, staff recommends the use of gasoline-fueled light trucks to pull the water tanks (for washing of mirrors), the use of electric-powered vehicles, soil stabilizers for the mirror areas and roads, and on-site speed limits (Conditions of Certification **AQ-SC6** and **AQ-SC7**) to ensure that the potential ozone and PM10 impacts are mitigated to a less than significant level over the life of the project.
- Greenhouse gas emissions are addressed in Appendix Air-1.
- As noted in the Construction Impacts of this assessment is the need to address the materials delivery, particularly of the heliostat frameworks and mirrors to the site, and the associated emissions and impacts of such deliveries. This issue will be analyzed as part of the Final Staff Assessment.

CONDITION OF CERTIFICATIONS

STAFF CONDITIONS OF CERTIFICATION

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

Verification: At least 60 days prior to the start of ground disturbance, the project owner shall submit to the CPM for approval, the name, resume, qualifications, and contact information for the on-site AQCMM and all AQCMM Delegates.

AQ-SC2 Air Quality Construction Mitigation Plan (AQCMP): The project owner shall provide an AQCMP, for approval, which details the steps that will be taken

and the reporting requirements necessary to ensure compliance with Conditions of Certification **AQ-SC3**, **AQ-SC4, AQ-SC5** and **AQ-SC6**.

Verification: At least 60 days prior to the start of any ground disturbance, the project owner shall submit the AQCMP to the CPM for approval. The District will notify the project owner of any necessary modifications to the plan within 30 days from the date of receipt.

AQ-SC3 Construction Fugitive Dust Control: The AQCMM shall submit documentation to the CPM in each Monthly Compliance Report that demonstrates compliance with the following mitigation measures for the purposes of preventing all fugitive dust plumes from leaving the project. Any deviation from the following mitigation measures shall require prior CPM notification and approval.

A. All unpaved roads and disturbed areas in the project and linear construction sites shall be watered as frequently as necessary to comply with the dust mitigation objectives of Condition of Certification **AQ-SC4**. The frequency of watering can be reduced or eliminated during periods of precipitation.

B. No vehicle shall exceed 10 miles per hour within the construction site.

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

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

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

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

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

H. Construction areas adjacent to any paved roadway shall be provided with sandbags or other measures as specified in the Storm Water Pollution Prevention Plan (SWPPP) to prevent run-off to roadways.

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

J. At least the first 500 feet of any paved public roadway exiting the construction site or exiting other unpaved roads en route from the construction site or construction staging areas shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs or on any other day when dirt or runoff

resulting from the construction site activities is visible on the public paved roadways.

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

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

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

Verification: The AQCMM shall provide the CPM a monthly compliance report to include:

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

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

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

AQ-SC4 Dust Plume Response Requirement: The AQCMM or an AQCMM Delegate shall monitor all construction activities for visible dust plumes. Observations of visible dust plumes that have the potential to be transported (1) off the project site or (2) 200 feet beyond the centerline of the construction of linear facilities or (3) within 100 feet upwind of any regularly occupied structures not owned by the project owner indicate that existing mitigation measures are not resulting in effective mitigation. The AQCMP shall include a section detailing how the additional mitigation measures will be accomplished within the time limits specified. The AQCMM or Delegate shall implement the following procedures for additional mitigation measures in the event that such visible dust plumes are observed:

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

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

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

Verification: The AQCMM shall provide the CPM a monthly compliance report to include:

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

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

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

AQ-SC5 Diesel-Fueled Engine Control: The AQCMM shall submit to the CPM in the Monthly Compliance Report, a construction mitigation report that demonstrates compliance with the following mitigation measures for the purposes of controlling diesel construction-related emissions. Any deviation from the following mitigation measures shall require prior CPM notification and approval.

A. All diesel-fueled engines used in the construction of the facility shall be fueled only with ultra-low sulfur diesel, which contains no more than 15 parts per million (ppm) sulfur.

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

C. All construction diesel engines, which have a rating of 100 hp or more, shall meet, at a minimum, the Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in California Code of Regulations, Title 13, section 2423(b)(1) unless certified by the on-site AQCMM that such engine is not available for a particular item of equipment. In the event a Tier 2 engine is not available for any off-road engine larger than 100 hp, that engine shall be equipped with a Tier 1 engine. In the event a Tier 1 engine is not available for any off-road engine larger than 100 hp, that engine shall be equipped with a catalyzed diesel particulate filter (soot filter), unless certified by engine manufacturers or the on-site AQCMM that the use of such devices is not practical for specific engine types. For purposes of this condition, the use of such devices is "not practical" if, among other reasons:

1. There is no available soot filter that has been certified by either the California Air Resources Board (ARB) or U.S. Environmental Protection Agency (EPA) for the engine in question; or

2. The construction equipment is intended to be on-site for 10 days or less.

3. The CPM may grant relief from this requirement if the AQCMM can demonstrate that he/she has made a good faith effort to comply with this requirement and that compliance is not possible.

D. The use of a soot filter may be terminated immediately if one of the following conditions exists, provided that the CPM is informed within 10 working days of the termination:

1. The use of the soot filter is excessively reducing normal availability of the construction equipment due to increased downtime for maintenance, and/or reduced power output due to an excessive increase in backpressure.

2. The soot filter is causing or is reasonably expected to cause significant engine damage.

3. The soot filter is causing or is reasonably expected to cause a significant risk to workers or the public.

4. The soot filter is causing any other seriously detrimental effect, where the CPM has reviewed and approved the termination prior to it being implemented on-site.

E. All heavy earthmoving equipment and heavy duty construction related trucks with engines meeting the requirements of (C) above shall be properly maintained and the engines tuned to the engine manufacturer's specifications.

F. All diesel heavy construction equipment shall not remain running at idle for more than five minutes, to the extent practical.

Verification: The AQCMM shall include in the Monthly Compliance Report:

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

B. a list of all heavy equipment used on site during that month, including the owner of that equipment and a letter from each owner indicating that equipment has been properly maintained; and

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

AQ-SC6 The project owner shall use gasoline powered light trucks, equivalent of the Ford F150 model, for mirror washing activities and facility maintenances. In

addition, only electrical powered all-terrain vehicles shall be used to support the maintenance crew within the facility.

Verification: At least 60 days prior to start commercial production, the project owner shall submit to the CPM a copy of the plan that identifies the size and type of the on-site electric and fossil-fueled vehicle and equipment fleet and the vehicle and equipment purchase orders and contracts and/or purchase schedule. The plan shall be updated every other year and submitted in the annual compliance report

AQ-SC7 The project owner shall provide a site dust control plan that:

A. describes the wind erosion control techniques such as windbreaks, water, and chemical dust suppressants that shall be used on areas that could be disturbed by vehicles or wind; and

B. identifies the location of signs throughout the facility that will limit traveling on unpaved portion of roadways to solar equipment maintenance vehicles only. In addition, vehicle speed shall be limited to no more than 10 miles per hour on these unpaved roadways.

Verification: At least 60 days prior to start of commercial operation, the project owner shall submit to the CPM a copy of the plan that identifies the dust and erosion control procedures that will be used during operation of the project and that identifies all locations of the speed limit signs. At least 60 days after commercial operation, the project owner shall provide to the CPM a report identifying the locations of all speed limit signs, and a copy of the project employee and contractor training manual that clearly identifies that project employees and contractors are required to comply with the dust and erosion control procedures and on-site speed limits.

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

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

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

DISTRICT CONDITIONS OF CERTIFICATION

CONDITIONS APPLICABLE TO ISEGS I, 2 AND 3 BOILERS

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

Verification: Not necessary.

AQB-2 The owner/operator shall operate this equipment in strict accord with the recommendations of the manufacturer or supplier and/or sound engineering principles and consistent with all information submitted with the application for this permit, which produce the minimum emission of air contaminants.

Verification: As part of the annual compliance report, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQB-3 This boiler shall use only natural gas as fuel and shall be equipped with a meter measuring fuel consumption in standard cubic feet.

Verification: As part of the Annual Compliance Report, the project owner shall include proofs that only pipeline quality, or Public Utility Commission regulated natural gas are used for the boilers.

AQB-4 The owner owner/operator shall maintain a current, on-site (at a central location if necessary) log for this equipment for five (5) years, which shall be provided to District, state or federal personnel upon request. This log shall include calendar year fuel use for this equipment in standard cubic feet, or BTU's, and daily hours of operation.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or Energy Commission staff.

AQB-5 Not later than 90 days after initial startup, the operator shall perform an initial compliance test on this boiler in accordance with the District Compliance Test Procedural Manual. This test shall demonstrate that this equipment does not exceed the following emission maximums:

	Pollutant	**Concentrations** ppmvd@3%O2	**Lb/MMBTU**	**Lb/hr**
Ivanpah Boilers I and 2	NOx	9.0	0.011	2.5
	SOx	1.7	0.003	0.6
	CO	25.0	0.018	4.2
	VOC	1.4	0.0006	0.1
	PM10	n/a	0.007	1.7
ISEGS Boiler 3	NOx	9.0	0.011	5
	SOx	1.7	0.003	1.3
	CO	25.0	0.018	8.5
	VOC	1.4	0.0006	0.3
	PM10	n/a	0.007	3.4

Verification: The project owner shall notify the District and the CPM within fifteen (15) working days before the execution of the compliance test required in this condition. The test results shall be submitted to the District and to the CPM within 60 days of the date of the tests.

AQB-6 Ivanpah 1 and 2 boilers shall be operated in compliance with all applicable requirements of 40 CFR 60 Subpart Db - Standards of Performance for Industrial Steam Generating Units (NSPS Db). Ivanpah 3 boiler shall be operated in compliance with all applicable requirements of 40 CFR 60 Subpart Da - Standards of Performance for Electric Utility Steam Generating Units (NSPS Da).

Verification: Not necessary.

AQB-7 Records of fuel supplier certifications of fuel sulfur content shall be maintained to demonstrate compliance with the sulfur dioxide and particulate matter emission limits.

Verification: Complying with Condition of Certification **AQB-3** shall be used to demonstrate compliance with this condition.

AQB-8 The owner/operator shall continuously monitor fuel flow rate and flue gas oxygen levels.

Verification: At least 120 days prior to construction of the boiler stacks, the project owner shall provide the District and CPM, for approval, a detailed drawing and a plan on how the measurements and recordings, required by this condition, will be performed by the chosen monitoring system.

AQB-9 The owner/operatorshall conduct an initial compliance test for NOx emissions within 180 days of startup. This initial compliance test shall be used to develop a relationship between fuel firing rate, flue gas oxygen, and flue gas NOx concentration. This relationship shall be used to determine compliance with NOx emission limits contained in this permit.

Verification: The project owner shall notify the District and the CPM within fifteen (15) working days before the execution of the compliance test required in this condition. The test results shall be submitted to the District and to the CPM within 60 days of the date of the tests.

AQB-10 The owner/operator shall comply with all applicable recordkeeping and reporting requirements of NSPS Db or Da requirements.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQB-11 This boiler shall not operate more than 4 hours in any single day, and no more than 1460 hours in any calendar year.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

CONDITIONS APPLICABLE TO ISEGS 1, 2, and 3 EMERGENCY FIRE PUMPS

AQFP-1 This system shall be installed, operated and maintained in strict accord with those recommendations of the manufacturer/supplier and/or sound engineering principles which produce the minimum emissions of

contaminants. Unless otherwise noted, this equipment shall also be operated in accordance with all data and specifications submitted with the application for this permit.

Verification: Not necessary.

AQFP-2 These engines may operate in response to notification of impending rotating outage if the area utility has ordered rotating outages in the area where the engines are located or expects to order such outages at a particular time, the engines are located in the area subject to the rotating outage, the engines are operated no more than 30 minutes prior to the forecasted outage, and the engines are shut down immediately after the utility advises that the outage is no longer imminent or in effect.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQFP-3 These engines may operate in response to fire suppression requirements and needs.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQFP-4 These units shall only be fired on ultra-low sulfur diesel fuel, whose sulfur concentration is less than or equal to 0.0015% (15) on a weight per weight basis per CARB Diesel or equivalent requirements.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQFP-5 A non-resettable four-digit (9,999) hour timer shall be installed and maintained on these units to indicate elapsed engine operating time.

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

AQFP-6 These units shall be limited to use for emergency power, defined as in response to a fire or when commercially available power has been interrupted. In addition, this unit shall be operated no more than 50 hours per year for testing and maintenance, excluding compliance source testing. Time required for source testing will not be counted toward the 50 hour per year limit.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQFP-7 The hour limit of Condition #6 can be exceeded when the emergency fire pump assemblies are driven directly by a stationary diesel fueled CI engine when operated per and in accord with the National Fire Protection Association (NFPA) 25 - "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2006 edition or the most current edition approved by the CARB Executive Officer. {Title 17 CCR 93115(c)16}

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQFP-8 The owner/operator shall maintain a operations log for these units current and on-site, either at the engine location or at a on-site location, for a minimum of two (2) years, and for another year where it can be made available to the District staff within 5 working days from the District's request, and this log shall be provided to District, State and Federal personnel upon request. The log shall include, at a minimum, the information specified below:

1. Date of each use and duration of each use (in hours);
2. Reason for use (testing & maintenance, emergency, required emission testing);
3. Calendar year operation in terms of fuel consumption (in gallons) and total hours; and,
4. Fuel sulfur concentration (the owner/operator may use the supplier's certification of sulfur content if it is maintained as part of this log).

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQFP-9 These fire protection units are subject to the requirements of the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (Title 17 CCR 93115). In the event of conflict between these conditions and the ATCM, the more stringent requirements shall govern.

Verification: Not necessary.

CONDITIONS APPLICABLE TO ISEGS 1, 2, and 3 EMERGENCY GENERATORS

AQEG-1 Engine may operate in response to notification of impending rotating outage if the area utility has ordered rotating outages in the area where the engine is located or expects to order such outages at a particular time, the engine is located in the area subject to the rotating outage, the engine is operated no more than 30 minutes prior to the forecasted outage, and the engine is shut down immediately after the utility advises that the outage is no longer imminent or in effect.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQEG-2 This unit shall only be fired on ultra-low sulfur diesel fuel, whose sulfur concentration is less than or equal to 0.0015% (15ppm) on a weight per weight basis per CARB Diesel or equivalent requirements.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQEG-3 This equipment shall be installed, operated and maintained in strict accord with those recommendations of the manufacturer/supplier and/or sound engineering principles which produce the minimum emissions of contaminants. Unless otherwise noted, this equipment shall also be operated in accordance with all data and specifications submitted with the application for this permit.

Verification: Not necessary.

AQEG-4 A non-resettable four-digit (9,999) hour timer shall be installed and maintained on this unit to indicate elapsed engine operating time.

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

AQEG-5 This unit shall be limited to use for emergency power, defined as in response to a fire or when commercially available power has been interrupted. In addition, this unit shall be operated no more than 50 hours per year, and no more than 0.5 hours per day for testing and maintenance, excluding compliance source testing, . Time required for source testing will not be counted toward the 50 hour per year limit.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQEG-6 The owner/operator shall maintain an operations log for this unit current and on-site (or at a central location) for a minimum of five (5) years, and this log shall be provided to District, State and Federal personnel upon request. The log shall include, at a minimum, the information specified below:

1. Date of each use and duration of each use (in hours);
2. Reason for use (testing & maintenance, emergency, required emission testing);
3. Calendar year operation in terms of fuel consumption (in gallons) and total hours; and,
4. Fuel sulfur concentration (the owner/operator may use the supplier's certification of sulfur content if it is maintained as part of this log).

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

AQEG-7 This genset is subject to the requirements of the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (Title 17 CCR 93115). In the event of conflict between these conditions and the ATCM, the more stringent requirements shall govern.

Verification: Not necessary.

AQEG-8 This unit shall not be used to provide power during a voluntary agreed to power outage and/or power reduction initiated under an Interruptible Service

Contract (ISC); Demand Response Program (DRP); Load Reduction Program (LRP) and/or similar arrangement(s) with the electrical power supplier.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, EPA or CEC staff.

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CH2ML2008a – CH2ML HILL/ J. Carrier (tn: 44310). Data Response Set 1A. Dated on 1/14/2008. Submitted to CEC / Docket Unit on 1/14/2008.

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CH2ML2008h – CH2ML HILL/ J. Carrier (tn: 45305). Data Response Set 1D. Dated on 5/9/2008. Submitted to CEC / Docket Unit on 5/9/2008.

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CH2ML2008j – CH2ML HILL/ J. Carrier (tn: 46667). Grading And Drainage Plans (part of Attachment DR 130-2). Dated on 6/10/2008. Submitted to CEC / Docket Unit on 6/10/2008.

MDAQMD2008a – Mojave Desert Air Quality Management District / J. Caswell (tn: 49276). Final Decision/Determination ISEGS Solar Electric Generating System. Dated on 12/3/2008. Submitted to CEC / Docket Unit on 12/5/2008.

APPENDIX AIR-1 - GREENHOUSE GAS EMISSIONS

Matthew Layton, P.E.

SUMMARY OF CONCLUSIONS

The Ivanpah Solar Energy Generating System (ISEGS) project would emit considerably less greenhouse gases (GHG) than existing fossil-fueled power plants and most other generation technologies, and thus would contribute to continued improvement of the overall western United States, and California specific, electricity system GHG emission rate average. The California Global Warming Solutions Act of 2006 (AB 32 Núñez, Chapter 488, Statutes of 2006), emphasizes that GHG emissions reductions must be "big picture" reductions that do not lead to "leakage" of such reductions to other states or countries. If a solar power plant is not built in California, electricity to serve the California load will come from another generating source. That could be renewable generation like wind or solar, but it could also be from higher carbon emitting sources such as out-of-state coal imports or old inefficient units that are a still a significant part of the resource mix that serves California.

Energy Commission staff recommends reporting of the GHG emissions as the California Air Resources Board develops greenhouse gas regulations and/or trading markets required by the California Global Warming Solutions Act of 2006 (AB 32 Núñez, Chapter 488, Statutes of 2006). The project may be subject to additional reporting requirements and GHG reductions or trading requirements as these regulations become more fully developed and implemented.

Staff concludes that the short-term emission of greenhouse gases typical during construction would likely be sufficiently reduced and would not be significant.

The ISEGS project, as a solar project with a nightly shutdown would operate less than 60 percent of capacity and is therefore not subject to the requirements of SB 1368 (Perata, Chapter 598, Statutes of 2006) and the Greenhouse Gas Emission Performance Standard. However, the project would easily be consistent with the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard.

INTRODUCTION

Greenhouse gas (GHG) emissions are not criteria pollutants, but they are discussed in the context of cumulative impacts. The state has demonstrated a clear willingness to address global climate change though research, adaptation and inventory reductions. In that context, staff evaluates the GHG emissions from the proposed project, presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

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

GLOBAL CLIMATE CHANGE AND ELECTRICITY PRODUCTION

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

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

Applicable Law	Description
State	
AB 32 Núñez, Chapter 488, Statutes of 2006	California Global Warming Solutions Act of 2006. This act requires Air Resources Board (ARB) to enact standards that will reduce GHG emission to 1990 levels. Electricity production facilities will be regulated.
SB 1368 Perata, Chapter 598, Statutes of 2006	Greenhouse Gas Emission Performance Standard. This regulation prohibits utilities from entering into long-term contracts with any baseload facility that does not meet a greenhouse gas emission standard of 0.5 metric tonnes carbon dioxide per megawatt-hour (0.5 mt CO_2/MWh) or 1,100 pounds carbon dioxide per megawatt-hour (1,100 lbs CO_2/MWh)

In 1998, the Energy Commission identified a range of strategies to prepare for an uncertain climate future, including a need to account for the environmental impacts associated with energy production, planning, and procurement (CEC 1998, p.5). In 2003, the Energy Commission recommended that the state require reporting of greenhouse gases (GHG) or global climate change[7] emissions as a condition of state licensing of new electric generating facilities (CEC 2003, IEPR p. 42). In 2006, California enacted the California Global Warming Solutions Act of 2006 (AB 32). It requires the California Air Resources Board (ARB) to adopt standards that will reduce statewide GHG emissions to statewide GHG emissions levels in 1990, with such reductions to be achieved by 2020.[8] To achieve this, ARB has a mandate to define the 1990 emissions levels and achieve the maximum technologically feasible and cost-effective GHG emissions reductions.

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

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

The ARB adopted early action GHG reduction measures in October 2007, adopted mandatory reporting requirements and the 2020 statewide target in December 2007, and plans to establish statewide emissions caps, by economic sectors, in 2008. By January 1, 2009, ARB will adopt a scoping plan that will identify how emission reductions will be achieved from significant sources of GHG via regulations, market mechanisms, and other actions. ARB staff will then draft regulatory language to implement its plan and will hold additional public workshops on each measure, including market mechanisms (ARB 2006). The regulations must be effective by January 1, 2011 and mandatory compliance commences on January 1, 2012.

Examples of strategies that the state might pursue for managing GHG emissions in California, in addition to those recommended by the Energy Commission and the Public Utilities Commission are identified in the California Climate Action Team's Report to the Governor (CalEPA 2006). Others are being established by ARB during its 2008 scoping plan development process. Some strategies focus on reducing consumption of petroleum across all areas of the California economy. Improvements in transportation energy efficiency (fuel economy) and land use planning and alternatives to petroleum-based fuels are slated to provide substantial reductions by 2020 (CalEPA 2006). It is possible that GHG reductions mandated by ARB will be non-uniform or disproportional across emitting sectors, in that most reductions will be based on cost-effectiveness (i.e., the greatest effect for the least cost). For example, the ARB proposes a 40 percent reduction in GHG from the electricity sector, even though that sector currently only produces about 25 percent of the state GHG emissions. In response, in September 2008 the Energy Commission and the Public Utilities Commission provided recommendations (CPUC 2008) to ARB on how to achieve such reductions through both programmatic and regulatory approaches, and identified regulation points should ARB decide that a multi-sector cap and trade system is warranted.

The Energy Commission's *2007 Integrated Energy Policy Report* (IEPR) also addresses climate change within the electricity, natural gas, and transportation sectors. For the electricity sector, it recommends such approaches as pursuing all cost-effective energy efficiency measures and meeting the Governor's stated goal of a 33 percent Renewable Portfolio Standard.

SB 1368[9], enacted in 2006, and regulations adopted by the Energy Commission and the Public Utilities Commission pursuant to the bill, prohibit California utilities from entering into long-term commitments with any baseload facilities that exceed the Emission Performance Standard of 0.500 metric tonnes CO_2 per megawatt-hour[10] (1,100 pounds CO_2/MWh). Specifically, the Emission Performance Standard (EPS) applies to base load power from new power plants, new investments in existing power plants, and new or renewed contracts with terms of five years or more, including contracts with power plants located outside of California.[11] If a project, instate or out of state, plans to sell base load electricity to California utilities, the utilities will have to demonstrate that the project complies with the EPS. *Base load* units are defined as

[9] Public Utilities Code § 8340 et seq.

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

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

units that operate at a capacity factor higher than 60 percent of the year. As a project operating less than 60 percent per year, ISEGS is not required to comply with the SB 1368 EPS.

In addition to these programs, California is involved in the Western Climate Initiative, a multi-state and international effort to establish a cap and trade market to reduce greenhouse gas emissions in the western United States and the Western Electricity Coordinating Council (WECC). The timelines for the implementation of this program are similar to those of AB 32, with full roll-out beginning in 2012. And as with AB 32, the electricity sector has been a major focus of attention.

PROJECT GREENHOUSE GAS EMISSIONS

The generation of electricity using fossil fuels, even in an auxiliary boiler and back-up generator at a thermal solar plant, produces air emissions known as greenhouse gases in addition to the criteria air pollutants that have traditionally been regulated under the federal and state Clean Air Acts. Greenhouse gas emissions contribute to the warming of the earth's atmosphere, leading to climate change. For fossil fuel-fired power plants and equipment, these include primarily carbon dioxide, with much smaller amounts of nitrous oxide (N_2O, not NO or NO_2, which are commonly known as NOx or oxides of nitrogen), and methane (CH_4 – often from unburned natural gas). Also included are sulfur hexafluoride (SF_6) from high voltage equipment, and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/chiller equipment. GHG emissions from the electricity sector are dominated by CO_2 emissions from the carbon-based fuels; other sources of GHG emissions are small and also are more likely to be easily controlled or reused/recycled, but are documented here as some of the compounds have very large relative global warming potentials. Global warming potential is a relative measure, compared to carbon dioxide, of a compound's residence time in the atmosphere and ability to warm the planet. Mass emissions of GHG are converted into carbon dioxide equivalent (CO_2-equivalnet) metric tonnes for ease of comparison.

Construction

Construction of industrial facilities such as power plants requires coordination of numerous equipment and personnel. The concentrated on-site activities result in short-term, unavoidable increases in vehicle and equipment emissions that include greenhouse gases. **Greenhouse Gas Table 2** does not yet contain GHG emissions from construction activities. Staff will work with the applicant to calculate construction GHG emission and include them in the Final Staff Assessment. The construction would last over 40 months. All emissions will be converted to CO_2-equivalent and totaled.

Greenhouse Gas Table 2
ISEGS Estimated Potential Construction Greenhouse Gas Emissions

Construction Element	CO_2 Equivalent (metric tonnes/year) [a]
On-Site Construction Equipment	To be determined
On-Site Worker Vehicles	To be determined
Off-Site Worker Commute	To be determined
Construction Total	To be determined

Source: To be determined.
[a] One metric tonne (mt) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms

Operations

Operation of the proposed ISEGS project would cause GHG emissions from the facility maintenance fleet, auxiliary boilers, diesel-fueled fire pump and the back-up generator engines, and sulfur hexafluoride emissions from new electrical component equipment.

Greenhouse Gas Table 3 shows what the proposed project, as permitted, could potentially emit in greenhouse gases on an annual basis. All emissions are converted to CO_2-equivalent and totaled. Electricity generation GHG emissions are dominated by CO_2 emissions from the carbon-based fuels; other sources of GHG are small and also are more likely to be easily controlled or reused/recycled, but are documented here as some of the compounds have very large relative global warming potentials.

The proposed project as permitted would emit over 25,000 metric tonnes of CO_2-equivalent per year if operated at its maximum permitted level. Since the ISEGS project, as a solar project with a nightly shutdown would operate less than 60 percent of capacity, the project is not subject to the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard. However, the project, at 0.027 mt CO_2-equivalent/MWh, would easily comply with the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard of 0.500 mt CO_2/MWh. This table does not include GHG emissions from the on-site dedicated vehicle fleet. These emissions will be calculated and included in the Final Staff Assessment. Staff will work with the applicant to quantify SF_6 emissions or use a default value bases on equipment sizing or usage.

Greenhouse Gas Table GHG-3
ISEGS Estimated Potential Greenhouse Gas Emissions

	Project Emissions (metric tonnes [a] per year)	Global Warming Potential [b]	CO_2 Equivalent (metric tonnes per year)
Carbon Dioxide (CO_2)	25,470	1	25,470
Methane (CH_4)	0.4704	21	11
Nitrous Oxide (N_2O)	0.4901	310	145
Hexafloride (SF_6)	---	23,900	---
Hydrofluorocarbons (HFCs)	---	--- [c]	---
Perfluorocarbons (PFCs)	---	7,850 [d]	---
Total Project GHG emissions – mt CO_2–eq per year			25,626

Total Project MWh per year (net) [e]	960,000
Project CO_2 Emissions Performance - mt CO_2/MWh	0.026
Project GHG Emissions Performance - mt CO_2-eq/MWh	0.027

Sources: BSE 20007a, where staff updated the natural gas GHG emissions factors to use the latest ARB recommendations (ARB 2008b).
a. One metric tonne (mt) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms.
b. The global warming potential is a measure of the chemicals' warming properties and lifetime in the atmosphere relative to CO_2. The value shown is based on the emission factors from the California Climate Action Registry's Appendix to the General Reporting Protocol: Power Utility Reporting Protocol (CCAR 2005).
c. Can vary from 150 to 10,000, depending on the specific HFC.
d. This figure is an average GWP for the two PFCs, CF_4 and C_2F_6.
e. Approximately a 28 percent capacity factor. BSE2007a.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Staff assesses three kinds of impacts: construction, operation, and cumulative effects. As the name implies, construction impacts result from the emissions occurring during the construction of the project. The operation impacts result from the emissions of the proposed project during operation. Cumulative impacts analysis assesses the impacts that result from the proposed project's incremental effect viewed over time.

CONSTRUCTION IMPACTS

Staff does not believe that the small GHG emission increases typical from construction activities would be significant for several reasons. First, the period of construction would be short-term and the emissions intermittent during that period, not ongoing during the life of the project. Additionally, control measures that staff recommends, such as limiting idling times and requiring, as appropriate, equipment that meet the latest emissions standards would further minimize greenhouse gas emissions since staff believes that the use of newer equipment will increase efficiency and reduce GHG emissions and be compatible with low-carbon fuel mandates (e.g., bio-diesel and ethanol) that will likely be part of the ARB regulations to reduce GHG from construction vehicles and equipment.

DIRECT/INDIRECT OPERATION IMPACTS AND MITIGATION

The proposed ISEGS project promotes the state's efforts to improve GHG electrical generation efficiencies and, therefore, reduce the amount of natural gas used by electricity generation and greenhouse gas emissions. As the *2007 Integrated Energy Policy* Report (CEC 2007a, p. 184) noted:

> New natural gas-fueled electricity generation technologies offer efficiency, environmental, and other benefits to California, specifically by reducing the amount of natural gas used—and with less natural gas burned, fewer greenhouse gas emissions. Older combustion and steam turbines use outdated technology that makes them less fuel- and cost-efficient than newer, cleaner plants.… The 2003 and 2005 IEPRs noted that the state could help reduce natural gas consumption for electric generation by taking steps to retire older, less efficient natural gas power plants and replace or repower them with new, more efficient power plants.

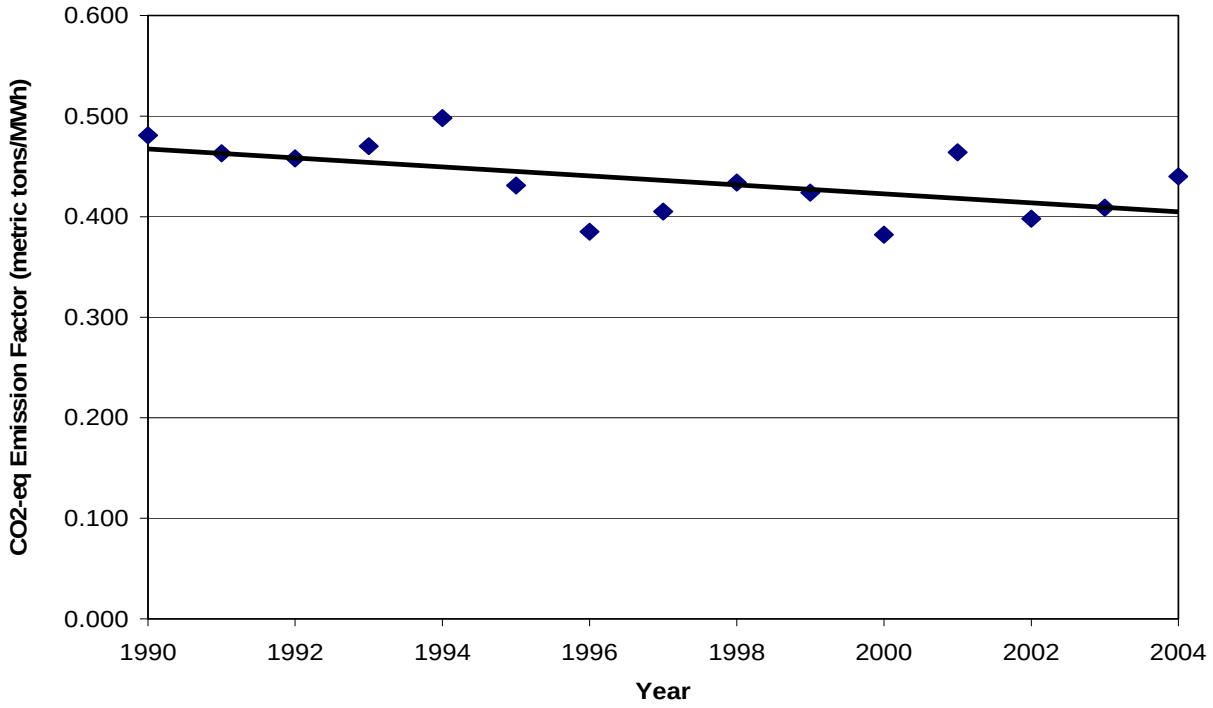
Thus, in the context of the Energy Commission's *Integrated Energy Policy Report*, the ISEGS project - solar-powered, with very limited natural gas use and GHG emissions, and likely replacement of older existing plant capacity, furthers the state's strategy to promote generation system efficiency and reduce fuel use and GHG emissions.

System Averages

Because most power plants are interconnected to a utility grid, and in turn to the WECC, it is also important to look at the proposed project in the context of all electricity systems delivering electricity to California consumers. **Greenhouse Gas Figure 1** shows the trends in GHG emission rates for each MWh consumed in California. From 1990 to 2004, California electricity became almost 20 percent cleaner on a GHG basis. This improvement was due in part to retirements of dirtier, less efficient plants, despite electricity demand growth of almost 20 percent from 1990 to 2004. Note that the trend line, a linear regression of the annual GHG emission rates, is a better representation of the statewide GHG emission rates than the actual number in any one year. GHG emissions and electricity consumption can vary from year to year due to variations in the availability of hydroelectric power, economic activity, and anomalous events such as the energy crisis of 2000-2001 and unusually warm weather conditions in 2004.

The proposed project, if it operates at its maximum permitted level, would have a GHG emission rate (0.027 mt CO_2-equivalent/MWh) that is significantly below the system-wide average (the trend line in 2004 is approximately 0.400 mt CO_2-equivalent/MWh), thus would likely contribute to improving the overall system average. Because of the complex interchange among facilities that make up California's electricity system, it is possible that this project could displace electricity that may otherwise be generated by more GHG intensive facilities, such as out-of-state coal plants or local old inefficient peaking units. However, even though staff can identify how many gross GHG emissions and emission rate are attributable to a project, it is difficult to determine whether this will result in a net increase or decrease of these emissions, and, if so, by how much. Thus, it would be speculative in this analysis to conclude that any given electricity generation project results in a cumulatively significant adverse impact resulting from greenhouse gas emissions.

Greenhouse Gas Figure 1
GHG Emissions per Megawatt Hour Consumed in California



Source: ARB 2008b and CEC 2007b.

Additionally, the quickly evolving GHG regulatory efforts currently being formulated may shortly establish the best *fora* for addressing GHG emissions from power plants rather than attempting to do so on an ad hoc or plant-by-plant basis. The applicant's goal is to have parts of ISEGS operational by late 2010, and the project fully online by the fourth quarter of 2012. ARB will have set forth each sector's reduction requirements as of January 2009, followed by the adoption of specific regulations by January of 2011.

Ultimately, ARB's AB 32 regulations will address both the degree of electricity generation emissions reductions, and the method by which those reductions will be achieved, through the programmatic approach currently under its development. That regulatory approach will presumably address emissions not only from the newer, more efficient, and lower emitting facilities licensed by the Energy Commission, but also the older, higher-emitting facilities not subject to any GHG reduction standard that this agency could impose. This programmatic approach is likely to be more effective in reducing GHG emissions overall from the electricity sector than one that merely relies on displacing out-of-state coal plants ("leakage") or older, higher emitting facilities.

As ARB codifies accurate GHG inventories and methods, it may become apparent that relative contributions to the inventories may not correlate to relative ease and cost-effectiveness of the GHG emission reductions necessary to achieve the 1990 GHG level. Though it has not yet been determined, the electricity sector may have to provide less or more GHG reductions than it would have otherwise been responsible for on a pro-rata basis.

To facilitate ARB's future regulatory regime, staff recommends Condition of Certification **GHG-1**, which requires the project owner to report the quantities of relevant GHGs emitted as a result of electric power production until such time that AB 32 is implemented and its reporting requirements are in force. It is possible that no reporting will ever be required by this condition if ARB's reporting requirements are in force prior to the first calendar year of plant operation. However, staff believes that **GHG-1**, with the reporting of GHG emissions, will enable the project to be consistent with the policies described above and the regulations that ARB adopts, and provide the information to demonstrate compliance with any applicable emission performance standard that could be enacted in the next few years. The GHG emissions to be reported in **GHG-1**, are carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs and PFCs emissions that are directly associated with the production and transmission of electric power.

CUMULATIVE IMPACTS

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

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

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The project would be subject to compliance with AB 32 requirements once they are determined by ARB. How the project would comply with these ARB requirements is speculative at this time but compliance will be mandatory. The GHG emissions reporting requirement under **GHG-1** does not imply that the project, as defined, would comply with the potential reporting and reduction regulations being formulated under AB 32. The project may have to provide additional reports and GHG reductions, depending on the reporting requirements of the new regulations expected from ARB.

Since this power project would be permitted for less than a 60 percent annual capacity factor, the project is not subject to the requirements of SB 1368 and the Emission Performance Standard.

NOTEWORTHY PUBLIC BENEFITS

Greenhouse gas related noteworthy public benefits include the construction of renewables and low-GHG emitting generation technologies and the potential for successful integration into the California and greater WECC systems.

CONCLUSIONS

The ISEGS project would emit considerably less greenhouse gases (GHG) than existing power plants and most other generation technologies, and thus would contribute to continued improvement of the overall western United States, and California specific, electricity system GHG emission rate average. AB 32 emphasizes that GHG emissions reductions must be “big picture” reductions that do not lead to “leakage” of such reductions to other states or countries. If a solar power plant is not built in California, electricity to serve the load will come from another generating source. That could be renewable generation like wind or solar, but it could also be from higher carbon emitting sources such as out-of-state coal imports or old inefficient units that are a still a significant part of the resource mix that serves California.

Staff recommends the interim reporting of the GHG emissions per Condition of Certification **GHG-1** as the Air Resources Board develops greenhouse gas regulations and/or trading markets required by the California Global Warming Solutions Act of 2006 (AB 32). The project may be subject to additional reporting requirements and GHG reduction or trading requirements as these regulations become more fully developed and implemented.

Staff does not believe that the GHG emission increases typical from construction activities would be significant for several reasons. First, the period of construction would be short-term and the emissions intermittent during that period, not ongoing during the life of the project. Additionally, control measures that staff recommends, such as limiting idling times and requiring, as appropriate, equipment that meets the latest emissions standards, would further minimize greenhouse gas emissions since staff believes that the use of newer equipment will increase efficiency and reduce GHG emissions and be compatible with low-carbon fuel mandates (e.g., bio-diesel and ethanol) that will likely be part of the ARB regulations to reduce GHG from construction vehicles and equipment. For all these reasons, staff would likely conclude that the short-term emission of greenhouse gases during construction would be sufficiently reduced and would not be significant. Staff will work with the applicant to quantify the construction GHG emissions.

The ISEGS project, as a solar project with a nightly shutdown will operate less than 60 percent of capacity and is therefore not subject to the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard. However, ISEGS would easily be consistent with the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard.

PROPOSED CONDITIONS OF CERTIFICATION

Staff recommends the following condition of certification to address the greenhouse gas impacts associated with the construction and operation of the ISEGS project.

STAFF CONDITION

GHG-1 Until the California Global Warming Solutions Act of 2006 (AB 32) is implemented, the project owner shall either participate in a GHG registry approved by the Compliance Project Manager (CPM) or report on an annual basis to the CPM the quantity of greenhouse gases (GHG) emitted as a direct result of facility electricity production.

The project owner shall maintain a record of fuels types and carbon content used on-site for the purpose of power production. These fuels shall include but are not limited to each fuel type burned in: (1) combustion turbines, (2) boilers, heat recovery steam generators or auxiliary boiler, (4) internal combustion engines, (4) flares, (5) for the purpose of startup, shutdown, operation or emission controls, and/or (6) vehicles and equipment used to prepare fuel or maintain generation components.

The project owner may perform annual source tests of CO_2 and CH_4 emissions from the exhaust stacks while firing the facility's primary fuel, using the following test methods or other test methods as approved by the CPM. The project owner shall produce fuel-based emission factors in units of pounds CO_2-equivalent per million British thermal units (mmMMBtu) of fuel burned from the annual source tests. If a secondary fuel is approved for the facility, the project owner may also perform these source tests while firing the secondary fuel.

Pollutant	Test Method
CO_2	EPA Method 3A
CH_4	EPA Method 18 (VOC measured as CH_4)

As an alternative to performing annual source tests, the project owner may use the Intergovernmental Panel on Climate Change (IPCC) Methodologies for Estimating Greenhouse Gas Emissions (MEGGE). If MEGGE is chosen, the project owner shall calculate the CO_2, CH_4 and N_2O emissions using the appropriate fuel-based carbon content coefficient (for CO_2) and the appropriate fuel-based emission factors (for CH_4 and N_2O).

The project owner shall convert the N_2O and CH_4 emissions into CO_2 equivalent emissions using the current IPCC Global Warming Potentials (GWP). The project owner shall maintain a record of all SF_6 that is used for replenishing on-site transformers. At the end of each reporting period, the project owner shall total the mass of SF_6 used and convert that to a CO_2 equivalent emission using the IPCC GWP for SF_6. The project owner shall maintain a record of all PFCs and HFCs that are used for replenishing on-site

refrigeration and chillers directly related to electricity production. At the end of each reporting period, the project owner shall total the mass of PFCs and HFCs used and convert that to a CO_2 equivalent emission using the IPCC GWP.

On an annual basis, the project owner shall report the CO_2 and CO_2 equivalent emissions from the described emissions of CO_2, N_2O, CH_4, SF_6, PFCs, and HFCs.

Verification: The project annual greenhouse gas emissions shall be reported, as a CO_2 equivalent, by the project owner to a climate action registry approved by the CPM, or to the CPM as part of the fourth Quarterly or the annual Air Quality Report, until such time that GHG reporting requirements are adopted and in force for the project as part of the California Global Warming Solutions Act of 2006.

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APPENDIX AIR-2 - FACILITY ANNUAL EMISSIONS

APPLICANT PROPOSED FACILITY EMISSIONS:

ASSUMPTIONS

- The boilers would be operated at approximately one hour each day.
- The boilers hourly emissions are those listed in the AFC Table 5.1-17.
- The tractors would travel approximately 30,000 miles annually in ISEGS 1 and 2, and approximately 60,000 miles annually in ISEGS 3.
- The gasoline powered trucks would travel approximately 10,000 miles annually for each ISEGS 1, 2 and 3 facilities.
- The tractors and truck emissions are those listed in Data Response Set 1A, dated January 14, 2008.
- The portion of PM2.5 in the fugitive PM10 emissions is approximately 30 percent.
- All combustion related particulate matter emissions are PM2.5.
- The fire pump and emergency engines are operated at approximately 52 hours annually.
- The fire pump and emergency engines' emissions are those listed in the AFC Table 5.1-17.

Facility daily emissions

NOx = 40lbs/d+[2(1778lbs/yr)+3557lbs/yr+3(14lbs/yr)]/360day/yr = 60 lbs/day

VOC= 2.2 +[2(1198) + 2395 + 3(14)]/360 = 15.5 lbs/day

SOx = 10.3 + Neg. = 10.3 lbs/day

CO = 67.7 + [2(12,730) + 25,460 + 3(145)]/360 = 209 lbs/day

PM10 = 27.4 +[2(69) + 137 + 3(1)]/360 + [2(6,810)+13,260+3(620)]/360
= 109 lbs/day

PM2.5 = 27.4 + [2(69) + 137 + 3(1)]/360 + .3*[2(6,810)+13,260+3(620)]/360
= 52.5 lbs/day.

Facility annual emissions

NOx = [60lbs/d(360d/yr) + (41.75lbs/hr+7lbs/hr)52hr/yr]/2000lbs/ton = 12 tpy

VOC = [15.5(360) + (1.7+0.8)52]/2000 = 2.86 tpy

SOx = [10.3(360) + Neg.]/2000 = 1.85 tpy

CO = [209(360) + (6.8+1)52]/2000 = 37.8 tpy

PM10 = [109(360) + (0.6+0.1)52)]/2000 = 19.6 tpy

PM2.5 = [52.5(360) + (0.6+0.1)52]/2000 = 9.5 tpy

Facility mitigated emissions

Staff recommended mitigation measures

- Gasoline powered, or natural gas powered, trucks (equivalent to a Ford F150) pulling mirror washing trailers.
- Electrical powered vehicles for maintenance crew.
- Internal combustion engines used to power the fire pumps and emergency generators would meet Tier III federal emission standards.
- Tier III standards for fire pump engines (240 hp) are 7.8 g/hp for NOx and VOC, 2.6 g/hp for CO and 0.4 g/hp for PM10.
- Tier II standards for emergency engines (3,750 hp) are 4.8 g/hp for NOx and VOC, 2.6 g/hp for CO and 0.15 g/hp for PM10.

Annual emissions of gasoline powered trucks (replacing the tractors)

NOx = 0.00136 lbs/mile (120,000miles/yr) = 163 lbs/yr

VOC = 0.0014 (120,000) = 168 lbs/yr

SOx = Neg.

CO = 0.01447 (120,000) = 1,736 lbs/yr

$PM10_{combustion}$ = 0.00008 (120,000) = 9.6 lbs/yr

$PM10_{fugitive}$ = 0.062 (120,000) = 7,440 lbs/yr

Annual emissions of maintenance crew electric vehicles (replacing trucks as personnel transport):

$PM10_{fugitive}$ = 0.062lbs/mile (30,000 miles/yr) = 1,860 lbs/yr

Fire pump engine (3 engines) emissions:

NOx and VOC = 3 eng [(240hp*7.8g.hp)/453.6g/lbs](52hr/yr) = 645 lbs/yr

CO = 3[(240*2.6)/453.6](52) = 213 lbs/yr

PM10 = 3[(240*0.4)/453.6](52) = 33.2 lbs/yr

Emergency generator (3 engines) emissions

NOx and VOC = 3 eng [(3,750hp*4.8g.hp)/453.6g/lbs](26hr/yr) = 3,120 lbs/yr

CO = 3[(3,750*2.6)/453.6](26) = 1,703 lbs/yr

PM10 = 3[(3,750*0.4)/453.6](26) = 96.2 lbs/yr

<u>The facility annual emission</u>s

NOx and VOC = 163 + 168 + 645 + 3,120 lbs/yr = 4,096 lbs/yr or 2.04 tpy

CO = 1,736 + 213 + 1,703 = 3,644 lbs/yr or 1.82 tpy

PM10 = 9.6 + 7,440 + 1,860 + 33.2 + 96.2 = 9,440 lbs/yr or 4.72 tpy

PM2.5 = 9.6 + 0.3(7,440 + 1,860) +33.2 + 96.2 = 2,928 lbs/yr or 1.46 tpy

BIOLOGICAL RESOURCES

Misa Milliron and Susan Sanders

SUMMARY OF CONCLUSIONS

The Ivanpah Solar Electric Generating System (ISEGS) project would have major impacts to the biological resources of the Ivanpah Valley, significantly affecting many sensitive plant and wildlife species and eliminating a broad expanse of relatively undisturbed Mojave Desert habitat. Approximately 4,065 acres of occupied desert tortoise habitat would be permanently lost and a minimum of 25 desert tortoises would need to be moved to a location yet to be determined. These actions would require state and federal endangered species "take" authorization. In addition to direct loss of habitat, the project would fragment and degrade adjacent habitat, and could promote the spread of invasive non-native plants and desert tortoise predators such as ravens.

Special-status wildlife species such as burrowing owl, loggerhead shrike, Crissal thrasher, golden eagle, and American badger would lose breeding and/or foraging habitat. Ten special-status plant species would be directly impacted by construction of ISEGS, and staff considers impacts to four of these (Rusby's desert-mallow, cave evening-primrose, Mojave milkweed, and desert pincushion) to be significant because the project would eliminate a substantial portion of known occurrences in the state. In the case of the California endemic Rusby's desert-mallow, the project would eliminate 11 percent of the known population in the world. The project would also affect approximately 2,000 ephemeral drainages on the ISEGS site, resulting in impacts to 198 acres of waters of the state. Staff considers the 4,065-acre ISEGS project would be a substantial contributor to the cumulatively significant loss of Ivanpah Valley's biological resources, including the threatened desert tortoise and other special-status species.

Impact avoidance and minimization measures described in staff's analysis and included in the conditions of certification would help reduce impacts to sensitive biological resources. However, these measures alone cannot offset project-related losses to less-than-significant levels without compensatory mitigation, nor can they assure compliance with state and federal laws such as the federal and state endangered species acts, state streambed alteration agreement regulations, and sections 401 and 404 of the Clean Water Act.

The applicant has not yet provided specific information on how to compensate for loss of habitat for desert tortoise, for loss of rare plants and other sensitive species, or for impacts to state waters. However, the Application for Certification (BSE 2007a) and the Biological Assessment (CH2M Hill 2008) indicated compensation for loss of desert tortoise habitat would occur through an assessed financial contribution based on the final construction footprint at a 1:1 ratio, consistent with the Bureau of Land Management's (BLM's) guidance and policies in the Northern and Eastern Mojave Planning Area. Presumably the applicant's proposed 1:1 mitigation would involve acquisition and protection/enhancement of approximately 4,065 acres. The applicant has not specified the mechanism by which compensatory mitigation might occur, nor the location(s), or characteristics of potential acquisition lands.

Staff has concluded that applicant's proposed mitigation, acquisition, and enhancement of approximately 4,065 acres would be insufficient to avoid significant direct, indirect, and cumulative impacts to biological resources of the Ivanpah Valley, and fails to meet the California Department of Fish and Game's full mitigation standard for desert tortoise. Staff also believes this proposed mitigation will be inadequate to compensate for cumulatively significant impacts to other special-status plant and animals inhabiting the project site and to offset permanent loss of waters of the state.

Staff proposes development of a compensatory mitigation approach that includes appropriate levels of suitable habitat acquisition and enhancement in order to ensure those lands are managed and maintained for the covered species in perpetuity. Efforts are also ongoing to analyze the opportunity for other agency-sponsored actions that would benefit desert tortoise and Mojave Desert plant and animal communities in the Ivanpah Valley. In addition to land acquisitions and actions to mitigate impacts to desert tortoise, the compensatory mitigation package must also include measures that would mitigate impacts to special-status plants and wildlife and to waters of the state. Staff will work closely and cooperatively with the Bureau of Land Management (BLM), the California Department of Fish and Game (CDFG), the U. S. Fish and Wildlife Service (USFWS), and the applicant to develop a compensatory mitigation approach, and to establish conditions of certification that would reduce impacts of the ISEGS project to less-than-significant levels.

INTRODUCTION

This section of the Preliminary Staff Assessment provides the California Energy Commission (Energy Commission) staff's preliminary analysis of potential impacts to biological resources from the construction and operation of the Ivanpah Solar Electric Generating System (ISEGS) project. Information provided in this document addresses potential impacts to special-status species and areas of critical biological concern. This analysis also describes the biological resources at the project site and at the locations of ancillary facilities. This document explains the need for mitigation, evaluates the adequacy of mitigation proposed by the applicant, and specifies additional mitigation measures to reduce impacts to less-than-significant levels. It also describes compliance with applicable laws, ordinances, regulations, and standards (LORS), and recommends conditions of certification.

This analysis is based, in part, upon information provided in the Application for Certification (AFC) for ISEGS (BSE 2007a); responses to staff data requests; site visits or field work conducted on April 20, 2007, January 4, 2008, and May 23, 2008; data response staff workshops; and discussions with experts and various agency, non-profit organization, and applicant representatives.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The applicant will need to abide by the laws, ordinances, regulations, and standards (LORS) during project construction and operation, as listed in **Biological Resources Table 1**.

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

Applicable Law	Description
Federal	
Federal Endangered Species Act (Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq.)	Designates and provides for protection of threatened and endangered plant and animal species, and their critical habitat.
Migratory Bird Treaty (Title 16, United States Code, sections 703 through 711)	Makes it unlawful to take or possess any migratory nongame bird (or any part of such migratory nongame bird) as designated in the Migratory Bird Treaty Act.
Clean Water Act (Title 33, United States Code, sections 1251 through 1376, and Code of Federal Regulations, part 30, section 330.5(a)(26))	Requires the permitting and monitoring of all discharges to surface water bodies. Section 404 requires a permit from the U.S. Army Corps of Engineers (USACE) for a discharge from dredged or fill materials into waters of the U.S., including wetlands. Section 401 requires a permit from a regional water quality control board (RWQCB) for the discharge of pollutants. By federal law, every applicant for a federal permit or license for an activity that may result in a discharge into a California water body, including wetlands, must request state certification that the proposed activity will not violate state and federal water quality standards.
Bald and Golden Eagle Protection Act (Title 16, United States Code section 668)	This law provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
California Desert Protection Act of 1994	An Act of Congress which established 69 wilderness areas, the Mojave National Preserve, expanded Joshua Tree and Death Valley National Monuments and redefined them as National Parks. Lands transferred to the National Park Service were formerly administered by the BLM and included significant portions of grazing allotments, wild horse and burro Herd Management Areas, and Herd Areas.
California Desert Conservation Area Plan	The California Desert Conservation Area (CDCA) comprises one of two national conservation areas established by Congress at the time of the passage of the Federal Land and Policy Management Act (FLPMA). The FLPMA outlines how the BLM will manage public lands. Congress specifically provided guidance for the management of the CDCA and directed the development of the 1980 CDCA Plan.

Northern and Eastern Mojave (NEMO) Coordinated Management Plan	As an amendment to the CDCA Plan, the BLM produced the Northern and Eastern Mojave (NEMO) Coordinated Management Plan (BLM 2002). This document consists of proposed management actions and alternatives for public lands in the NEMO Planning Area. This area encompasses 3.3 million acres and is located in the Mojave Desert in southeastern California adjacent to Nevada. The area borders Nevada on the east, Fort Irwin and the West Mojave (WEMO) Planning Area on the west, and I-40 and the Northern and Eastern Colorado (NECO) Planning Area on the south. The ISEGS site is located in the southeastern portion of the NEMO Planning Area Boundary.
State	
California Endangered Species Act of 1984 (Fish and Game Code, sections 2050 through 2098)	Protects California's rare, threatened, and endangered species.
California Code of Regulations (Title 14, sections 670.2 and 670.5)	Lists the plants and animals of California that are declared rare, threatened, or endangered.
Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515)	Designates certain species as fully protected and prohibits the take of such species or their habitat unless for scientific purposes (see also California Code of Regulations Title 14, section 670.7).
Nest or Eggs (Fish and Game Code section 3503)	Protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird.
Migratory Birds (Fish and Game Code section 3513)	Protects California's migratory birds by making it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame birds.
Significant Natural Areas (Fish and Game Code section 1930 et seq.)	Designates certain areas such as refuges, natural sloughs, riparian areas, and vernal pools as significant wildlife habitat.
California Environmental Quality Act (CEQA), CEQA Guidelines Section 15380	CEQA defines rare species more broadly than the definitions for species listed under the state and federal Endangered Species Acts. Under section 15830, species not protected through state or federal listing but nonetheless demonstrable as "endangered" or "rare" under CEQA should also receive consideration in environmental analyses. Included in this category are many plants considered rare by the California Native Plant Society (CNPS) and some animals on the CDFG's Special Animals List.

Streambed Alteration Agreement (Fish and Game Code sections 1600 et seq.)	Regulates activities that may divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake in California designated by CDFG in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit. Impacts to vegetation and wildlife resulting from disturbances to waterways are also reviewed and regulated during the permitting process.
California Native Plant Protection Act of 1977 (Fish and Game Code section 1900 et seq.)	Designates state rare, threatened, and endangered plants.
California Desert Native Plants Act of 1981 (Food and Agricultural Code section 80001 et seq. and California Fish and Game Code sections 1925-1926)	Protects non-listed California desert native plants from unlawful harvesting on both public and private lands in Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego counties. Unless issued a valid permit, wood receipt, tag, and seal by the commissioner or sheriff, harvesting, transporting, selling, or possessing specific desert plants is prohibited. In the Ivanpah area, such plants include cacti, yuccas, and catclaw acacia (*Acacia greggii*).
Local	
San Bernardino County General Plan: Conservation/Open Space Element of the County General Plan (County of San Bernardino, 2007)	Includes objectives to preserve water quality and open space to benefit biological resources, and specific policies and goals for protecting areas of sensitive plant, soils and wildlife habitat and for assuring compatibility between natural areas and development. Although ISEGS is not located on lands under county jurisdiction, the general plan provides objectives which are consistent with some of the LORS listed above.

SETTING

REGIONAL SETTING

The proposed ISEGS would be located in Southern California's Mojave Desert, approximately 3 miles southwest of the Nevada border, to the west of Ivanpah Dry Lake. The project would be located in San Bernardino County, California, on federal (public) land managed by the BLM. The proposed project area is situated on a bajada (alluvial fan with many washes) that extends eastward from the surrounding Clark Mountains to Ivanpah Dry Lake. The Primm Valley Golf Club is immediately east of the proposed project area. Primm, Nevada is the nearest town, located just over the state line and approximately 5 miles east along Interstate 15 (I-15), which lies east of the proposed ISEGS (approximately 0.8 mile at its closest point). Immediately west and less than 3 miles south of the project are units of the Mojave National Preserve. Approximately 4.5 miles and 15 miles northeast along I-15 are a retail/casino center with residential facilities and the town of Jean, respectively. The outskirts of greater Las Vegas lie approximately 32 miles north-northeast of the proposed ISEGS.

Project Area and Description

The project area consists of the proposed ISEGS solar fields and all associated buildings and linear facilities. The proposed ISEGS site lies approximately 0.8 mile east of the I-15 Yates Well Road exit. It is approximately 0.5 mile west of the Primm Valley Golf Club, and Colosseum Road passes through the site. Elevations range from approximately 3,150 to 2,850 feet above mean sea level (BSE 2007a). The topography slopes gradually down to the east and southeast toward Ivanpah Dry Lake. Approximately 2,000 ephemeral washes, which form part of the regional bajada, occur throughout the project area. The northernmost phase of the project site is immediately flanked by two hills: a limestone hill to the west and a metamorphic hill to the east.

The applicant proposes to develop the ISEGS project in three phases which are designed to generate a total of 400 megawatts (MW) of electricity. The first two phases of the project, Ivanpah 1 and 2, are designed to provide 100 MW of electricity and the third phase, Ivanpah 3, is designed to provide 200 MW. The 100-MW phases, Ivanpah 1 and 2, would each occupy approximately 914 acres and 921 acres respectively; the 200-MW phase, Ivanpah 3, would require occupy approximately 1,843 acres. All three phases would be developed on contiguous property, sharing an administration building, an operation and maintenance building and a substation. In addition, the administration building/warehouse, a substation, and detention ponds would require approximately 66 acres. An additional area of approximately 234 acres is needed for construction activities. ISEGS total project footprint amounts to approximately 4,065 acres (approximately 6.4 square miles).

Solar Power Plant Process and Equipment

The Ivanpah 1 and 2 plants would each consist of approximately 110,000 heliostats (mirrors), double mounted on 55,000 poles, in a single array around a centralized solar power tower. Ivanpah 3 would consist of approximately 208,000 heliostats, double mounted on 104,000 poles, in five separate arrays. Each of the five arrays would be centralized around a separate solar power tower.

The seven solar power towers would all be 459 feet tall, with an additional 10-foot-tall lightening rod that would extend above the top of the tower. The solar power tower would receive solar heat from the heliostats then convert the heat into steam by heating water in the solar boilers. In the secondary stage, the steam would be converted into electricity utilizing a Rankine-cycle reheat, steam turbine, electric generator which would be housed in the power block facility of each plant.

Each of the three solar-thermal plants would include the following equipment and facilities:

- A power block facility that would house the natural gas-fired start-up boiler, air emission control system for the combustion of natural gas in the start-up boiler, steam turbine generator, an air-cooled condenser, waste water treatment equipment, and auxiliary equipment (feed water heaters, a de-aerator, an emergency diesel generator and a diesel fire pump);
- A raw water tank with a 250,000 gallon capacity of which only a portion would be used for the plant;

- Onsite access and maintenance roads (either dirt, gravel or paved);
- Storm water retention basins and diversion channels; and
- Perimeter fencing.

Natural Gas Pipeline

The solar heat used in the boiler (steam) process would be supplemented by burning natural gas to heat a “partial load, steam boiler” when solar conditions are insufficient. Each plant within the project includes a small package, natural gas-fired start-up boiler to provide additional heat for plant start-up and during temporary cloud cover. Natural gas would be obtained by installing an underground distribution pipeline from the existing Kern River Gas Transmission (KRGT) pipeline located approximately 0.5 mile north of the Ivanpah 3 site. New metering stations would be constructed to measure and record gas volumes, regulate pressure, and remove any liquids or solid particles.

Water Supply and Discharge

Raw groundwater would be drawn from one of two wells which would be constructed at the northwest corner of Ivanpah 1, just outside the perimeter fence. Each of the three power blocks would be connected to the groundwater wells by underground water pipelines. The applicant estimates project water consumption to be no more than 100 acre-feet per year for all three solar plants combined, which would primarily be used to provide water for washing heliostats (mirrors) and to replace boiler feed water blow-down. Groundwater would go through a treatment system for use as boiler make-up water and to wash the heliostats. The only wastewater expected to be generated by the system would be treated and used for landscape irrigation.

Waste Management

All operational wastes produced at ISEGS would be properly collected, treated (if necessary), and disposed of in a closed system. Wastes include process and sanitary wastewater, nonhazardous waste and hazardous waste, both liquid and solid. A sewage package treatment plant would be located at the administration building/operations and maintenance area, located between Ivanpah 1 and 2. This primary wastewater collection system would collect process wastewater from all equipment, including the boilers and water treatment equipment. Additionally, each solar plant would include a small onsite wastewater plant located in the power block that would treat wastewater from domestic waste streams such as showers and toilets. Sewage sludge would be removed from the site by a sanitary service provider. All wastewater would be recycled in the system, except for a small stream that would be treated and used for landscape irrigation. If necessary, a small filter/purification system would be used to provide potable water at the administration building. Any reject streams from water treatment (for example from the reverse osmosis system, if used) would be trucked offsite for treatment or disposal. Additionally, there are two concrete-lined holding basins, approximately 40 feet by 60 feet in size, which are part of each power block facility and can serve for boiler commissioning and emergency outfalls from any of the processes.

Drainage, Erosion, and Sediment Control

The draft Preliminary Drainage, Erosion, and Sediment Control Plan (CH2M Hill 2008a) submitted in August 2008 provides a conceptual plan for conveying sheet flow of stormwater after construction of the solar fields. Existing small- to moderate-sized ephemeral washes will remain intact at locations capable of being traversed by installation equipment; large ephemeral washes that are subject to damaging heliostats or power block equipment will be routed through detention ponds and/or diversion channels either through or along the outer perimeter of each solar field.

Detention ponds sized for the site's 100-year, 24-hour storm event would be placed upstream in each facility drainage area. Stormwater received in excess of the detention ponds would be directed to long broad crested weirs armored with native stone. At pond locations with exceptionally large concentrated off-site stormwater runoff a portion of the excessive flow would be directed to bypass channels for redirection and velocity control prior to release within the site as sheet flow.

Stormwater would be channeled around the power blocks on their north and south sides with small berms, between 3 and 6.5 feet high. Relatively small rock filters and local diversion berms through the solar fields would discourage water from concentrating to maintain sheet flow and prevent scouring. In addition, each power block would have two concrete holding basins, each approximately 240 square feet in size that can serve for boiler commissioning and emergency outfalls from any of the processes. The basins would also be used for discharge of uncontaminated water used to pressure test and clean the pipelines.

The project owner anticipates submitting a revised Drainage, Erosion, and Sediment Control Plan once the final site layout, site drainage, and erosion control design has been completed.

Transmission System Interconnection and Upgrades

The Ivanpah project would be interconnected to the Southern California Edison (SCE) grid by three new 115-kV transmission generation tie lines (gen-tie line), a new substation that includes 220 kV/115-kV switch-racks and upgrades to SCE's 115-kV line passing through the project site between the proposed Ivanpah 1 and 2.

In order to accommodate the full load expected to be generated by ISEGS and other planned electricity generation projects the California Independent Systems Operator (California ISO) has determined that approximately 36 miles of transmission line would need to be upgraded. SCE proposes to upgrade the existing transmission system to safely and reliably accommodate the full load from ISEGS and other projects. The upgrade would include constructing a new double-circuit 220-kV transmission line between the existing Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California, a distance of approximately 36 miles. The Eldorado-Ivanpah portion of the existing Eldorado–Baker–Coolwater-Dunn Siding-Mountain Pass 115-kV transmission line would be removed and replaced with the proposed 220-kV transmission line. The rest of the 115-kV line would remain unchanged west of the new Ivanpah Substation. Additional upgrades may be required as mitigation prior to final approval of interconnection to California ISO and Non-California ISO controlled facilities.

Telecommunications Facilities

The proposed Ivanpah substation would also require new telecommunication infrastructure to be installed to provide protective relay circuit, a Supervisory Control and Data Acquisition circuit together with data and telephone services. The telecommunication path from Ivanpah Substation to the local carrier facility interface at Mountain Pass area consists of approximately 8 miles of fiber optic cable to be installed overhead on existing poles, and through new underground conduits to be constructed in the substation and telecom carrier interface point. This fiber optic route would consist of two segments. The first segment would be from Ivanpah Substation to Mountain Pass Substation using the existing Nipton 33-kV distribution line poles built along the transmission line corridor that crosses between Ivanpah 1 and 2. The second segment would be from Mountain Pass Substation to the telecommunications facility approximately 1.5 miles away at an interface point to be designated by the local telecommunication carrier. The fiber cable would be installed on the existing 12-kV distribution line poles.

Vehicle Trails

Vehicle trails run through the proposed project site. To allow continued use and access the applicant would reroute three public trails and one trail that serves as an access to a mining claim. Colosseum Road would be rerouted between Ivanpah 1 and 2. The other trails that would be rerouted are: 1) trail 699226, which passes through the northern third of Ivanpah 3 and would be rerouted along the northern border of Ivanpah 3; 2) trail 699198, which passes between Ivanpah 2 and 3 and would be rerouted between those two proposed plants; and 3) an unnumbered trail on the east side of Ivanpah 3m which would be relocated outside the project site so that it would provide continued access to the limestone outcrop.

Construction Schedule, Workforce, Access, and Laydown Areas

Construction of ISEGS, from site preparation and grading to commercial operation, is expected to be completed within 48 months of initiation. The phasing is planned so that Ivanpah 1 (southern plant) would be constructed first, followed by Ivanpah 2 (middle plant), then Ivanpah 3 (northern plant), though the order of construction may change. Construction of each plant would begin about 12 months following the start of the prior plant. Construction of the shared facilities would occur with the first solar plant.

An average and peak workforce of approximately 474 and 959, respectively, of construction craft people, supervisory, support, and construction management personnel is anticipated to be onsite during construction. Typically, construction would be scheduled to occur between 5:00 a.m. and 7:00 p.m. on weekdays and Saturdays. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities (e.g., pouring concrete at night during hot weather and working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities would continue 24 hours per day, 7 days per week.

Construction access would be from Colosseum Road to the plant entrance road. Colosseum Road is an existing dirt road and would be asphalted from the Primm Valley

Golf Club to the project site. The project would re-route a portion of Colosseum Road around the southern end of the Ivanpah 2 plant. In addition, paved access roads would be created to access the power blocks of the three Ivanpah plants.

Operations/Maintenance Activities

ISEGS is designed for an operating life of 50 years and is expected to operate 7 days a week, 14 hours per day, with 90 full-time employees. Some portion of the project's solar heliostats would be washed on a nightly basis, so individual heliostats would be washed about once every two weeks using high quality deionized water and minimal amounts (approximately 2.5 gallon/heliostat) (CH2M Hill 2008).

Water consumption is expected to be minimal (estimated at less than 100 acre-feet per year for all three solar plants) and would mainly be used to provide water for washing heliostats and to replace boiler feedwater blowdown.

The ISEGS site would require routine inspections and maintenance within and outside the fenced plant site. Activities potentially occurring outside the fenced site for repair of structures and machinery may require some surface disturbance (CH2M Hill 2008). The applicant has provided a description of the classes of maintenance activities that may occur during operation of ISEGS (CH2M Hill 2008), but has not yet provided information as to what these activities might be and where they might occur.

Revegetation/Site Rehabilitation Plan

The project owner has developed an outline (CH2M Hill 2008b) describing the revegetation and reclamation activities that would occur immediately after construction (within temporary laydown and staging areas), during operations, and upon site closure. The final revegetation and reclamation plan has not yet been submitted by the project owner, but will address soil and native plant salvage during clearing, grading, and construction, plant propagation, preliminary landscape design, and site rehabilitation upon closure and decommissioning.

Vegetation and Wildlife

Plant Communities

The ISEGS site is located on and surrounded by undisturbed, natural land, with the exception of the Primm Valley Golf Club and I-15 to the east and a transmission line and associated unpaved roads. Vegetation on the site and in the immediate project area consists of primarily Mojave creosote bush scrub, with Mojave yucca – Nevada ephedra scrub, and Mojave wash scrub also represented. Plant communities at the ISEGS site are characterized by an unusually high diversity and density of native succulents and relatively low levels of noxious weeds.

The dominant plant community on the site, Mojave creosote bush scrub, is common in the Mojave Desert and is comprised of drought-adapted native shrubs. A census of all individuals of California barrel cactus (*Ferocactus cylindraceus* var. *lecontei*) and clustered barrel cactus (*Echinocactus polycephalus* var. *polycephalus*) recorded 2,869 individuals of California barrel cactus and 3,501 individuals of clustered barrel cactus within the project area. Densities were estimated at one to two mature barrel cacti per

acre for the site overall (BSE 2007a, p. 5.2-105, CH2M Hill 2008c). The applicant documented densities of 15 mature barrel cacti per acre in some localized areas. This density is unusual because it occurs on a bajada rather than on rocky slopes where high barrel cactus densities would be expected (BSE 2007a, p. 5.2-28).

Annual plants are also characteristic of Mojave creosote bush scrub but were notably absent during the applicant's initial field surveys in 2007 due to low rainfall (BSE 2007a, p. 5.2-18). Follow-up field surveys were conducted in 2008 to characterize annual plant cover. In the project area, creosote bush (*Larrea tridentata)* is dominant in Mojave creosote bush scrub, and the following are commonly associated species: burrobush (*Ambrosia dumosa*), clustered barrel cactus, Nevada ephedra (*Ephedra nevadensis)*, California barrel, cheesebush (*Hymenoclea salsola*), and Mojave yucca (*Yucca shidigera*) (BSE 2007a, p. 5.2-9). Additional plant communities and habitats within the project footprint include disturbed land associated with roads and transmission lines, Mojave wash scrub (contains acacia as described below), and numerous ephemeral washes also that occur on the site (BSE 2007a, pp. 5.2B-4 and 5.2-27). Additional vegetation types within a one-mile radius of the project footprint include Mojave yucca – Nevada ephedra scrub and limestone pavement plain (BSE 2007a, p. 5.2-79). Plant communities of each of the three sites are described below.

Ivanpah 1

Ivanpah 1, the southernmost site, consists almost entirely of the Larrea-Ambrosia subtype of creosote bush scrub and occurs mainly in a form characterized by a low density and diversity of shrubs and cacti and a very low density of Mojave yucca. Here, the dominant shrubs of the larrea-ambrosia subtype are mainly less than 3 feet in height, with many less than 1 foot in height, and relatively widely spaced. Creosote bush and burrobush are the most common shrubs, with cheesebush, pima ratany (*Krameria erecta*), Nevada ephedra, Mojave Desert California buckwheat (*Eriogonum fasciculatum* ssp. *polifolium*), silver cholla (*Opuntia echinocarpa*), buckhorn cholla (*Opuntia acanthocarpa* var. *coloradensis*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and pencil cholla (*Opuntia ramosissima*) all present in much lower abundance. Barrel cacti of both species (i.e., California barrel cactus and clustered barrel cactus) and Mojave yucca are present in low to very low numbers. The topography of the Ivanpah 1 site is relatively flat, although it is broken by a number of small- to medium-sized ephemeral washes dominated by cheesebush.

Ivanpah 2

Vegetation of Ivanpah 2 consists predominantly of the larrea-ambrosia subtype of Mojave creosote bush scrub. This vegetation subtype varies in shrub and cactus density and species diversity from areas that are moderate in density and diversity at the upper elevation west end to areas that are low in density and diversity at the lower elevation east end. Creosote bush and burrobush are the dominant shrubs and are typically 1 to 4 feet in height. Associated species include: cheesebush, pima ratany, Nevada ephedra, Mojave Desert California buckwheat, silver cholla, buckhorn cholla, beavertail cactus, and pencil cactus. The density of barrel cacti, including California barrel cactus and clustered barrel cactus, and Mojave yucca, is highest in the northern third of the site, moderately high in the western half of the site, and lowest in the southern half, especially to the east.

The topography is relatively flat overall and dissected by many small- to medium-sized ephemeral washes with active channels usually less than 5 feet wide that flow from west to east in the northern half of Ivanpah 2 and trend from southwest to northeast and east in the southern half of Ivanpah 2. The vegetation of most of these is composed mainly of shrub species typical of larrea-lambrosia scrub. Cheesebush washes are in higher densities than in adjacent areas. North of Colosseum Road, in the southern half of Ivanpah 2, is a large drainage complex up to 75 feet wide in some areas, although the active channels are much narrower. This large wash system supports Mojave wash scrub, although in a form distinguished mainly by the presence of catclaw acacia (*Acacia greggii*). This form has lower shrub species diversity than the Mojave wash scrub observed in Ivanpah 3.

Ivanpah 3

Ivanpah 3 is the northernmost and largest of the three proposed sites and supports more complex plant communities than Ivanpah I and 2. The larrea-ambrosia scrub subtype of Mojave creosote bush scrub is the most common vegetation type and occurs throughout Ivanpah 3, covering about 75 to 80 percent of the site. The larrea mixed scrub subtype of Mojave creosote bush scrub occurs north and south of the limestone hill, along the southwest margin, and also immediately adjacent to the northern boundary of Ivanpah 3. In the western and northern parts of Ivanpah 3, larrea mixed scrub patches alternate with patches of larrea-ambrosia scrub. Some of the larger drainage features, which are concentrated in the northern and western sections of Ivanpah 3, contain well-developed Mojave wash scrub. Within Ivanpah 3, the larrea-ambrosia scrub subtype varies from the low density-low diversity form to the high density-high diversity form. The patterns are complex but, in general, vegetation with lower densities and diversity of shrubs and cacti, and lower densities of Mojave yucca, is more widespread in the southeastern section of Ivanpah 3.

The elevation gradient within Ivanpah 3 trends very gradually downward from approximately 3,400 feet at the western margin to about 2,985 feet at the southeastern corner. The topography of Ivanpah 3 is more strongly undulating than that of Ivanpah 1 and 2 due to the presence of many small to large ephemeral wash drainage features that trend generally in a west-to-east direction. Mojave wash scrub is well-developed in some of the larger ephemeral wash drainage features in the northern and western sections of Ivanpah 3. These drainage features are typically 30 to 75 feet wide bank-to-bank, although the active channels occupy only a small portion of the entire feature.

Mojave wash scrub within Ivanpah 3 varies in density and diversity of shrubs. The dominant shrubs are drought-deciduous and are typically 3 to 10 feet in height. The best-developed stands include many large individuals of catclaw acacia, some scattered large desert-willow (*Chilopsis linearis*), and a variety of wash-associated smaller shrubs, including: cheesebush, desert almond (*Prunus fasciculata*), black-banded rabbitbrush (*Chrysothamnus paniculatus*), bladder sage (*Salazaria mexicana*), Cooper's boxthorn (*Lycium cooperi*), and Anderson's boxthorn (*Lycium andersonii*).

Noxious Weeds

Noxious weeds are species of non-native plants included on the weed lists of the California Department of Food and Agriculture (CDFA 2007), the California Invasive Plant Council, or those weeds of special concern identified by BLM. Noxious weeds were relatively low in abundance and diversity throughout the ISEGS project area. Eight species of invasive weeds were detected during the 2007/2008 floristic surveys (CH2ML 2008c), as described below.

- **Sahara mustard, or African mustard**, (*Brassica tournefortii*) was found at two locations, in Ivanpah 3 and in the utility corridor. This species is of high concern; Cal-IPC has declared this plant highly invasive (Cal-IPC 2006) and recommends that it should be eradicated whenever encountered.
- **Red brome** (*Bromus madritensis* ssp. *rubens*) is widespread in the project area, occurring at 961 widely scattered locations, mostly at disturbed sites. It is an introduced Eurasian grass adapted to microhabitats that can be frequently found at the base of desert shrubs. It can also form carpet cover in pockets of fine grained soils in rough terrain off the bajada. It is widespread and abundant in the Mojave Desert and has been found in the ISEGS site. Seeds from this species can disperse readily and across large distances. Cal-IPC has declared this plant highly invasive (Cal-IPC 2006). Because of its widespread distribution, red brome is not considered feasible for general control.
- **Cheat grass** (*Bromus tectorum*) was found at nine widely scattered locations in the ISEGS site. It is among the most widely distributed invasive plant species in the western U.S. Closely related to red brome, it is adapted to colder steppe and woodland habitats. Cal-IPC has declared this plant highly invasive (Cal-IPC 2006). Because of its widespread distribution, cheat grass is not considered feasible for general control.
- **Mediterranean grass** (*Schismus* spp.) was observed patchily distributed throughout the project site. Cal-IPC has determined that this plant has a limited invasiveness rating in California (Cal-IPC 2006). BLM and other agencies recognize that because of the widespread distribution of Mediterranean grass, this species is not considered feasible to control.
- **Russian thistle** (*Salsola* sp.) was recorded along the Colosseum Road access route. Although all invasive plants share the trait of being adapted to disturbed habitat, Russian thistle or tumbleweed (*Salsola tragus*) particularly tends to be restricted to roadway shoulders and other sites where the soil has been recently disturbed. This species was not observed at the project site, but is a common invader on disturbed sites. After summer rains in 2008, widespread areas on the northern margin of Ivanpah Playa were covered with a thick growth of tumbleweed. Cal-IPC has determined that this plant has a limited invasiveness rating in California (Cal-IPC 2006). There is a high potential that Russian thistle could become established in the construction area and this species should be eradicated if observed.
- **London rocket** (*Sisymbrium irio*) is widespread throughout the warm deserts of North America. It was identified near the project site along Colosseum Road in the

southern half of Ivanpah 2. Cal-IPC has declared this plant moderately invasive (Cal-IPC 2006).

- **Mediterranean tamarisk or saltcedar** (*Tamarix ramosissima*) has been observed near the project site; however, it is a riparian plant and is therefore restricted to habitats where there is perennial saturation such as springs and seeps, or runoff from poorly maintained water pipelines or well pumps. Cal-IPC has declared this plant highly invasive (Cal-IPC 2006).
- **Filaree or storksbill** (*Erodium cicutarium*) is a widespread annual species common in disturbed habitats, and was detected at the ISEGS site. It can form dense, transient populations when conditions are suitable. It has a limited overall rating by Cal-IPC, generally because the ecological impacts of the species are minor. Because of its widespread distribution, eradication of filaree is not considered feasible.

Ephemeral Drainages and Waters of the State

The project area is located in the Ivanpah hydrologic unit of the South Lahontan Watershed, which includes approximately 278,486 acres in the Ivanpah and Pahrump Valleys of California and Nevada (BSE 2007a). All drainage from the surrounding mountains and alluvial fans collect in closed basins in the Ivanpah Valley. Streams, washes, and playas are dry most of the year, with surface water only present in response to storm events. Ivanpah Dry Lake is located approximately 2 miles east and down slope of the project area. The extensive dry lake bed covers approximately 35 square miles and is located in California adjacent to the California/Nevada border. Two mapped springs, Whisky Spring and Ivanpah Spring, are located approximately 1.6 miles west of the proposed project site in the foothills of the Clark Mountains.

The project area is located on a broad bajada that extends from the base of the Clark Mountains to the western shoreline of Ivanpah Lake, with numerous ephemeral washes occurring throughout the broad, coalescing, alluvial fans that convey storm water runoff from the mountains towards Ivanpah Dry Lake. These washes range in size from small (1 to 4 feet wide), weakly expressed erosional features to large, broad over 85 feet wide. A total of 1,973 ephemeral washes were mapped in the project area (CH2M Hill 2008d). These washes encompass 198.72 acres, with a cumulative length of 291 miles of channels (CH2M Hill 2008d, Table 3.1-2, p 3-5). Approximately 1,400 of the ephemeral washes are small and are common and widespread throughout the entire project area. The larger washes are most abundant in the northern section of Ivanpah 3 as well as the east and west sides of Ivanpah 2. The larger washes tend to dissipate into smaller, more braided channels as they progress downslope. The majority of the drainages terminate prior to reaching Ivanpah Dry Lake with defined erosion features diminishing and becoming broad surface flow only. All of the ephemeral washes identified in the study area typically flow only in response to storm events. No wetlands or riparian habitat occurs within the ISEGS project area. The ephemeral drainages on the site are considered waters of the state; their status as waters of the United States has not yet been determined (Pankratz 2008).

The active flow channels of the smaller washes are generally devoid of vegetation and typically have a sandy-gravel substrate, although some washes also contained cobble

and scattered larger rocks. Most of the larger channels typically contained scattered vegetation including creosote bush and cheesebush especially in braided channels that contain slightly elevated areas intermixed with the active flow channels. Mojave wash scrub is limited to the larger washes (typically over 15 feet) with sandy gravel substrate and well-defined banks. Vegetation associated with these features includes catclaw, cheesebush, Mojave Desert California buckwheat, desert willow, black-banded rabbitbrush, bladder-sage, desert almond (*Prunus fasciculata*), Virgin River encelia (*Encelia virginensis*), Anderson's and Cooper's, sand-wash groundsel (*Senecio flaccidus* var. *monoensis*), wire lettuce (*Stephanomeria pauciflora*), and blue sage (*Salvia dorrii*).

Wildlife

The diverse plant communities and landscape features in and around the ISEGS site support a correspondingly high diversity of wildlife. Reptiles detected during the 2007/2008 surveys include desert tortoise, side-blotched lizard (*Uta stansburiana*), desert iguana (*Dipsosaurus dorsalis*), long-nosed leopard lizard (Gambelia wislizenii), western whiptail (*Cnemidophorus tigris*), zebra-tailed lizard (*Callisaurus draconoides*), common collared lizard (*Crotaphytus collaris*), and sidewinder (*Crotalus cerastes*). The banded Gila monster (*Heloderma suspectum cinctum*) was not detected during the surveys, but this large, seldom-seen lizard may occur in the project vicinity.

The diverse landscape features, vegetation, forage, and prey availability at the ISEGS project area is likely to attract a variety of mammal species such as Audubon's cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), whitetail antelope squirrel (*Ammospermophilus leucurus*), desert kit fox (*Vulpes macrotis*), and coyote (*Canis latrans*). Given the proximity of the Clark Mountains, it is likely that mule deer (*Odocoileus hemionus hemionus*) and desert bighorn sheep (*Ovis canadensis nelsoni*) move down into the upper elevations of the valley, including the ISEGS project area, to forage (CH2M Hill 2008). It is also likely that portions of Ivanpah Valley provide movement corridors for mule deer and this bighorn sheep subspecies (CH2M Hill 2008).

The ISEGS project area provides forage, cover, roosting, and nesting habitat for a variety of bird species. Resident and migratory birds occur at the ISEGS site during the winter, migratory, and breeding seasons, including birds such as Say's phoebe (*Sayornis saya*), black-throated sparrow (*Amphispiza bilineata*), white-crowned sparrow (*Zonotrichia leucophrys*), sage sparrow (*Amphispiza belli*), blue-gray gnatcatcher (*Polioptila caerulea*), cactus wren (*Campylorhynchus brunneicapillus*), verdin (*Auriparus flaviceps*), western kingbird (*Tyrannus verticalis*), sage thrasher (*Oreoscoptes montanus*), house finch (*Carpodacus mexicanus*), lesser nighthawk (*Chordeiles acutipennis*), common ground-dove (Columbina passerine), mourning dove (*Zenaida macroura*), Gambel's quail (*Callipepla gambelii*), American kestrel (*Falco sparverius*), burrowing owl (*Athene cunicularia*), and red-tailed hawk (*Buteo jamaicensis*).

Special-Status Species

Biological Resources Table 2 lists special-status species that are known to occur or could potentially occur in the project area and vicinity. Many of these special-status plants and animals are unlikely to occur at the ISEGS site due to lack of suitable habitat.

However, quite a few were detected during the 2007/2008 surveys or otherwise known to occur at or near the site and those are indicated by **bold-face type**.

Biological Resources Table 2
Special-Status Species Known or Potentially Occurring in the ISEGS Area

PLANTS		
Common Name	***Scientific Name***	**Status State/Fed/CNPS/BLM**
Mormon needle grass	*Achnatherum aridum*	__/__/2.3
Clark Mountain agave	***Agave utahensis* var. *nevadensis***	**__/__/4.2**
Desert ageratina	*Ageratina herbacea*	__/__/2.3
Coyote gilia	*Aliciella triodon*	__/__/2.2
Small-flowered androstephium	***Androstephium breviflorum***	**__/__/2.3**
White bear poppy	*Arctomecon merriamii*	__/__/2.2
Mojave milkweed	***Asclepias nyctaginifolia***	**__/__/2.3**
Cima milk-vetch	*Astragalus cimae* var. *cimae*	__/__/1B.2
Providence Mountain milk-vetch	*Astragalus nutans*	__/__/4.2
Scaly cloak fern	*Astrolepis cochisensis* ssp. *cochisensis*	__/__/2.3
Black grama	*Bouteloua eriopoda*	__/__/4.2
Red grama	*Bouteloua trifida*	__/__/2.3
Alkali mariposa lily	*Calochortus striatus*	__/__/1B.2
Purple bird's-beak	*Cordylanthus parviflorus*	__/__/2.3
Desert pincushion	***Coryphantha chlorantha***	**__/__/2.2**
Viviparous foxtail cactus	***Coryphantha vivipara* var. *rosea***	**__/__/2.2**
Winged cryptantha	*Cryptantha holoptera*	__/__/4.3
Gilman's cymopterus	*Cymopterus gilmanii*	__/__/2.3
Utah vine milkweed	***Cynanchum utahense***	**__/__/4.3**
Nine-awned pappus grass	***Enneapogon desvauxii***	**__/__/2.3**
Naked-stemmed daisy	*Enceliopsis nudicaulis* ssp. *Nudicaulis*	__/__/4.3
Limestone daisy	*Erigeron uncialis* var. *uncialis*	__/__/1B.2
Forked buckwheat	*Eriogonum bifurcatum*	__/__/1B.2
Hairy erioneuron	*Erioneuron pilosum*	__/__/2.3
Clark Mountain spurge	*Euphorbia exstipulata* var. *exstipulata*	__/__/2.1
Wright's bedstraw	*Galium wrightii*	__/__/2.3
Pungent glossopetalon	*Glossopetalon pungens*	__/__/1B.2
Parish club-cholla	***Grusonia parishii***	**__/__/2.3**
Hairy-podded fine-leaf hymenopappus	*Hymenopappus filifolius* var. *eriopodus*	__/__/2.3
Jaeger's ivesia	*Ivesia jaegeri*	__/__/1B.3
Knotted rush	*Juncus nodosus*	__/__/2.3
Hillside wheat grass	*Leymus salinus* ssp. *Mojavensis*	__/__/2.3
Plains flax	*Linum puberulum*	__/__/2.3
Spearleaf	*Matelea parvifolia*	__/__/2.3
Rough menodora	*Menodora scabra*	__/__/2.3
Polished blazing star	*Mentzelia polita*	__/__/1B.2

PLANTS		
Common Name	***Scientific Name***	**Status State/Fed/CNPS/BLM**
Utah mortonia	***Mortonia utahensis***	**__/__/4.3**
Tough muhly	*Muhlenbergia arsenei*	__/__/2.3
Crowned muilla	*Muilla coronata*	__/__/4.2
False buffalo-grass	*Munroa squarrosa*	__/__/2.2
Short-joint beavertail	*Opuntia basilaris* var. *brachyclada*	__/__/1B.2
Curved-spine beavertail	*Opuntia curvospina*	__/__/2.2
Spiny cliff-brake	*Pellaea truncata*	__/__/2.3
White-margined beardtongue	*Penstemon albomarginatus*	__/__/1B.2
Rosy two-toned beardtongue	*Penstemon bicolor* ssp. *Roseus*	__/__/2.3
Limestone beardtongue	*Penstemon calcareous*	__/__/1B.3
Death Valley beardtongue	*Penstemon fruticiformis* var. *amargosae*	__/__/1B.3
Stephen's beardtongue	*Penstemon stephensii*	__/__/1B.3
Thompson's beardtongue	*Penstemon thompsoniae*	__/__/2.3
Utah beardtongue	*Penstemon utahensis*	__/__/2.3
Aven Nelson's phacelia	*Phacelia anelsonii*	__/__/2.3
Barneby's phacelia	*Phacelia barnebyana*	__/__/2.3
Sky-blue phacelia	*Phacelia coerulea*	__/__/2.3
Parish's phacelia	*Phacelia parishii*	__/__/1B.1
Jaeger's phacelia	*Phacelia perityloides* var. *jaegeri*	__/__/1B.3
Chambers' physaria	*Physaria chambersii*	__/__/2.3
Small-flowered rice grass	*Piptatherum micranthum*	__/__/2.3
Desert portulaca	***Portulaca halimoides***	**__/__/4.3**
Abert's sanvitalia	*Sanvitalia abertii*	__/__/2.2
Many-flowered schkuhria	*Schkuhria multiflora* var. *multiflora*	__/__/2.3
Johnson's bee-hive cactus	*Sclerocactus johnsonii*	__/__/2.2
Mojave spike-moss	*Selaginella leucobryoides*	__/__/4.3
Rusby's desert-mallow	***Sphaeralcea rusbyi* var. *eremicola***	**__/__/1B.2/S**

WILDLIFE		
Common Name	***Scientific Name***	**Status State/Fed/BLM**
Reptiles		
Desert tortoise	***Gopherus agassizii***	**FT/ST/__**
Banded gila monster	*Heloderma suspectum cinctum*	__/SC/S
Birds		
Burrowing owl	***Athene cunicularia***	**CSC/FSC/__**
Golden eagle	***Aquila chrysaetos***	**CSC, FP/FSC/S**
Vaux's swift	***Chaetura vauxi***	**__/FSC/__**
Gray-headed junco	*Junco hyemalis caniceps*	WL/FSC/__
Loggerhead shrike	***Lanius ludovicianus***	**CSC/FSC/__**
Hepatic tanager	*Piranga flava*	WL/FSC/__
Summer tanager	*Piranga rubra*	CSC/__/__

WILDLIFE		
Common Name	***Scientific Name***	**Status State/Fed/BLM**
Brewer's sparrow	***Spizella breweri***	**__/BCC/__**
Bendire's thrasher	*Toxostoma bendirei*	CSC/BCC/S
Crissal thrasher	***Toxostoma crissale***	**CSC/BCC/__**
Le Conte's thrasher	***Toxostoma lecontei***	**WL/BSS/S**
Virginia's warbler	*Vermivora virginiae*	WL/BCC/__
Gray vireo	*Vireo vicinior*	CSC/BCC/S
Mammals		
Townsend's big-eared bat	*Corynorhinus townsendii*	CSC/__/S
Pallid bat	*Antrozous pallidus*	CSC/__/S
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	__/__/S
American badger	***Taxidea taxus***	**CSC/__**

Bold-face-type species names are those observed on or near the proposed project site during the 2007/08 field surveys.

Sources: CNDDB 2007 (Ivanpah Lake, State Line Pass, Mesquite Lake, Clark Mountain, Mescal Range, Mineral Hill, Nipton, and Desert USGS Quads); Plants CNPS 2007; Animals: CDFG Special Animals List;

Status Codes:

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

State CSC = California Species of Special Concern. Species of concern to CDFG because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.
SE - State listed as endangered
ST = State listed as threatened
WL = State watch list

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

BLM: Sensitive: Bureau of Land Management
. BLM Manual §6840 defines sensitive species as"…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that Federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." <www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf>

Special-Status Plant Species

No state or federally listed plant species occur within the ISEGS project area, but ten plant species listed by the California Native Plant Society (CNPS) as CNPS List 1B or CNPS List 2 occur on the site. One of these, Rusby's mallow, is also a BLM sensitive species. Information on the natural history, distribution, and status of these 10 species on the project area is provided below. The status information is based on the results of floristic surveys conducted in 2007/2008 (CH2M Hill 2008c). In addition to the floristic surveys, staff searched databases and files of the California Natural Diversity Database (CNDDB), CNPS, and the Consortium of California Herbaria (2008) data, including information not yet entered into the CNDDB and CNPS databases.

Biological Resources Table 3 describes the status of the special-status plants found on the site in terms of Element Occurrences (EOs) rather than numbers of individual plants. An EO is defined by the CNDDB as individuals of a particular species occurring within one-quarter mile of each other. Due to incomplete data, contributors to the CNDDB sometimes do not note the number of individuals when reporting CNDDB EOs and herbaria records, and the population size in terms of individual plants cannot be ascertained. To provide a common metric for comparison with the CNDDB and herbarium data, **Biological Resources Table 3** expresses the occurrences of special-status plant species found on the ISEGS site during the 2007 and 2008 surveys in terms of EOs.

Biological Resources Table 3
CNDDB Rank Percent and Percentage of Statewide Known Occurrences for Special-Status Plant Species in the ISEGS Project Area

Name Scientific (Common)	CNDDB Rank (Global/State)	CNDDB occurrences* & Herbarium Records**	Project Site Occurrences	Project Site % of Known Occurrences in California
Androstephium breviflorum (small-flowered androstephium)	G5 S1.3	21* + 5** =26	3	3/(26+3) = 10%
Asclepias nyctaginifolia (Mojave milkweed)	G4G5 S1.3	4* + 2** =6	22	22/(6+22) = 79%
Coryphantha chlorantha (desert pincushion)	G2G3 S2.2	9* + 2** =11	13	13/(11+13) = 54%
Cynanchum utahense (Utah vine milkweed)	G4 S3.3	2* + 42** =44	9	9/(44+9) = 17%
Enneapogon desvauxii (nine-awned pappus grass)	G5 S2	7* + 8** =15	6	6/(15+6) = 29%
Grusonia parishii (Parish's club-cholla)	G3G4 S2.3	10* + 3** =13	5	5/(13+5) =28%
Mortonia utahensis (Utah mortonia)	G4G5 S3.3	11*+ 29**=40	1	1/(40+1) = 2%
Oenothera cavernae (cave evening-primrose)	G2G3 S1	4* (includes the one occurrence on the project site)	1* (an EO)	1/4 = 25%
Portulaca halimoides (desert portulaca)	G5 S3.2	16**	1	1/(16+1) = 6%
Sphaeralcea rusbyi var. *eremicola* (Rusby's desert-mallow)	G4T1 S1.3	19* + 5** =24	3	3/(24+3) = 11%

*—Number of CNDDB element occurrences
**—Number of occurrences derived from herbarium records
State Rank:
S1—Less than 6 EO, or less than 1,000 individuals, or less than 2,000 acres;
S2—Same as "G2";
S3—Same as "G3".
State Rank Extension:
0.2—threatened;

0.3—no current threats known

Global Rank is a reflection of the overall condition of an element throughout its global range:

G2—Same as “S2”;

G3—Same as “S3”;

G4—Apparently secure, this rank is clearly lower than G3, but factors exist to cause some concern; i.e., there is some threat, or somewhat narrow habitat;

G5—Population or stand demonstrably secure to ineradicable due to being commonly found in the world.

Subspecies receive a T-rank attached to the G-rank. The G-rank refers to the whole species range, but the T-rank refers to the global condition of variety *eremicola* only.

Rusby’s Desert-Mallow (Sphaeralcea rusbyi var. eremicola)

Rusby’s desert-mallow is a California endemic perennial herb found only in Inyo and San Bernardino Counties in the Death Valley Region and Eastern Mojave Desert in the Clark Mountain Range. It occurs in the Clark Mountain Range at Ivanpah Springs, on desert slopes and gravelly sandy washes and often in carbonate and limestone substrate. This plant is the only BLM-sensitive plant species detected on site. The CNDDB indicates 19 California element occurrences all of which are presumed extant. Herbaria records noted five additional occurrences. This species was not detected during the 2007 surveys, but in 2008 15 individuals were mapped in 12 locations in Mojave creosote bush scrub within Ivanpah 1, 2, and 3, the construction logistics area, and the utility corridor.

Cave Evening-Primrose (Oenothera cavernae)

Cave evening-primrose is an herbaceous annual, though may behave as a biennial or perennial in some situations. It is found in rocky soils in the eastern Mojave Desert, and in California is known only from only four occurrences near the California/Nevada border in San Bernardino County. It also occurs in Arizona, Nevada, and Utah, however it was first observed in California in 2008. Approximately 80 flowering and fruiting individuals were seen at the north end of the Ivanpah Valley, at the base of the eastern Clark Mountain Range, just north of the transmission line corridor, about 3.5 miles east of Keany Pass, in limestone gravels at about 4,020 feet elevation, on April 29, 2008. One occurrence with a single individual was found on the project site.

Mojave Milkweed (Asclepias nyctaginifolia)

In California, Mojave milkweed is known only from a few locations in the eastern Mojave Desert in San Bernardino County. This perennial plant also occurs in Arizona, New Mexico, and Nevada. The habitat of Mojave milkweed in California includes washes and dry slopes from about 3,000 to 5,100 feet in Mojavean desert scrub and pinyon and juniper woodland (CNPS 2008). CNDDB shows four historic Element Occurrence records which are all presumed extant. Herbarium records noted 2 additional occurrences. In 2008, 202 individuals of Mojave milkweed were mapped in 59 locations mainly in small washes in Ivanpah 1, 2 and 3. Within the project area Mojave milkweed typically grows in small- to medium-sized washes with sandy to gravelly substrates.

Desert Pincushion (Coryphantha chlorantha)

Desert pincushion is a stem succulent found in the Mojave Desert in San Bernardino and Inyo counties, and also occurs in Arizona, Nevada, and Utah. In California its habitat is gravelly or rocky carbonate substrates. In California, desert pincushion is known from the Mojave Desert, in San Bernardino and Inyo counties (CNDDB 2008); it also occurs in Nevada, Arizona and Utah. Desert pincushion’s distribution in California

is apparently restricted to a few mountain ranges in the eastern Mojave Desert, in eastern San Bernardino County and southeastern Inyo County. CNDDB shows 9 historic element occurrence records which are all presumed extant. Herbarium records noted 2 additional occurrences. Desert pincushion is widely scattered throughout the project area. In 2008, 477 individuals of this species were mapped in 177 locations during protocol-level surveys, within Ivanpah 1, 2 and 3, the construction logistics area, and the utility corridor. In 2007, an additional 122 individuals were found in 114 locations. The combined total for 2007 and 2008 is 599 individuals in 291 locations. Most individuals were found in Mojave creosote bush scrub.

Small-Flowered Androstephium (Androstephium breviflorum)

Small-flowered androstephium is a bulbiferous herb found mainly in San Bernardino County, though it has been recorded in adjacent Riverside County and possibly Inyo County. This species also occurs in Arizona, Nevada, and Utah. It is found in dry, loose sandy to rocky soils and on sand dunes and alluvial fans. The CNDDB Element Occurrence records are all presumed extant. There are 5 occurrences noted from herbarium records and 3 occurrences on site. This species was not detected in 2007, but in 2008 a total of 12 individuals were mapped in four locations on the ISEGS project site, within Ivanpah 1 and 2, in Mojave creosote bush scrub.

Utah Vine Milkweed (Cynanchum utahense)

Utah vine milkweed is a perennial herb found in Imperial, Riverside, San Bernardino, and San Diego Counties. This species also occurs in Arizona, Nevada, and Utah. It occurs in sandy and gravelly soils, often in washes climbing up through shrubs. The CNDDB electronic files do not track CNPS List 4 species, but staff found two Element Occurrences in the CNDDB paper files. Herbarium records contained approximately 42 additional occurrences. In 2008, 991 individuals were found in 146 locations, mainly in Ivanpah 1 and 2. In 2007, three individuals were mapped in three locations, all within Ivanpah 1. Most individuals were found in small washes in Mojave creosote bush scrub. The total for 2007 and 2008 is 994 individuals in 149 locations.

Nine-Awned Pappus Grass (Enneapogon desvauxii)

Nine-awned pappus grass is a widespread species of the southwestern U.S., Mexico and South America, but in California this species is known only from the eastern Mojave Desert, in San Bernardino County (CNDDB 2008). Habitat of nine-awned pappus grass in California consists of rocky slopes, crevices, calcareous soils, in desert woodland. In the Ivanpah Valley, this species grows within the Ivanpah Valley alluvial fan, on the often north-facing sides of medium-sized to large washes, and on cobble mounds within and outside of washes that include some calcareous rocks, from 2,900 to 3,400 feet, in Mojave creosote bush scrub. In 2008, dead individuals of nine-awned pappus grass were very abundant, and were widely scattered throughout the ISEGS project area. No live individuals were observed during protocol-level surveys in 2008. In 2008, the skeletal remains of 8,145 dead individuals of this species were mapped in 182 locations during field surveys, within Ivanpah 1, 2, and 3, the construction logistics area, and the utility corridor. Most locations included ten or more individuals, with a range of 1-300. In 2007, no individuals of this species were detected within the ISEGS project area.

Parish's Club-Cholla (Grusonia parishii)

Parish's club-cholla is a stem succulent known from the Mojave and Colorado deserts in San Bernardino, Riverside, and Imperial counties, and from Nevada, Arizona, and possibly Texas. The habitat of Parish's club-cholla within the project area consists of sandy to somewhat gravelly uplands in the larrea-ambrosia sub-type of Mojave creosote bush scrub. The CNDDB documents 10 historic Element Occurrence records which are presumed extant and herbarium records noted 3 additional occurrences.

Parish's club-cholla is abundant within the ISEGS project area, where it is discontinuously distributed, with most locations found in Ivanpah 1 and 3, and the construction logistics area. This species grows in clones consisting of spreading mats that may form separate patches over time. One individual was defined as all mats growing together, of which none are separated by more than 10 feet. Using this definition, many individuals consisted of five to ten or more mats in close proximity. In 2008, 196 individuals of Parish's club-cholla were mapped at 47 locations within Ivanpah 1, the construction logistics area, and the utility corridor. In 2007, 143 clones of this species were mapped within 96 locations in Ivanpah 1 and 3, and the construction logistics area. For 2008 and 2007 combined, 339 individuals were mapped in 143 locations.

Utah Mortonia (Mortonia utahensis)

Utah mortonia is an evergreen shrub known in California only from the eastern Mojave Desert in San Bernardino County and the Death Valley region in Inyo County. This species also occurs in Arizona, New Mexico, Nevada, Texas, and Utah. The habitat of Utah mortonia consists of limestone slopes and canyon bottoms from 2,700 to 6,300 feet elevation. The CNDDB noted 11 estimated Element Occurrences in their files, and herbarium records noted 29 additional occurrences.

During surveys for the ISEGS project in 2007, Utah mortonia was observed to be fairly common on the limestone hills of the northeastern extension of the Clark Mountain Range, within the one-mile buffer; however, no plants of this species were found within the project area in 2007. In 2008, the boundaries of the utility corridor were revised slightly, and one individual was found in a single location, at the northern end of the utility corridor, within Mojave yucca – Nevada ephedra scrub.

Desert portulaca (Portulaca halimoides)

Desert portulaca is a late summer/early fall blooming annual found in Riverside and San Bernardino Counties, and possibly San Diego County. This species also occurs in Nevada, Arizona, Utah, Colorado, New Mexico, Oklahoma, Texas, and Baja California. Habitat of desert portulaca consists of sandy washes and flats, from about 3,000 to 3,600 feet in elevation. Herbarium records noted 16 different occurrences, not including the one collected from the project site.

At the ISEGS project area, no individuals of desert portulaca were detected during field surveys conducted in April, May, and June 2007, or in April 2008. However, desert portulaca was observed within the ISEGS project area in October 2007, following rains in August 2007. Quantitative data on the distribution and abundance of desert portulaca

within the ISEGS project area are not available, but one individual was detected at the site.

Special-Status Wildlife Species - Birds

Western Burrowing Owl (Athene cunicularia hypugaea)

Western burrowing owls inhabit arid lands throughout much of the western United States and southern interior of western Canada (Haug et al. 1993). In the Mojave Desert region, and in many other areas, this species has declined because of habitat modification, poisoning of its prey, and introduced nest predators. The burrowing owl is diurnal and usually non-migratory in this portion of its range.

Burrowing owls are unique among the North American owls in that they nest and roost in abandoned burrows, especially those created by California ground squirrels, San Joaquin kit fox, desert tortoise, and other wildlife. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats. They often return to burrows used in previous years, especially if they were successful at reproducing there in previous years (Gervais et al. 2008). The southern California breeding season (defined as from pair bonding to fledging) generally occurs from February to August with peak breeding activity from April through July (Haug et al. 1993).

In the Mojave Desert, burrowing owls generally occur at low densities in scattered populations, but they can be found in much higher densities near agricultural lands where rodent and insect prey tend to be more abundant (Gervais et al. 2008). Burrowing Owls tend to be opportunistic feeders. Large arthropods, mainly beetles and grasshoppers, comprise a large portion of their diet. Small mammals, especially mice and voles (*Microtus*, *Peromyscus*, and *Mus* spp.), are also important food items. Other prey animals include reptiles and amphibians, young cottontail rabbits, bats, and birds, such as sparrows and horned larks. Consumption of insects increases during the breeding season (Haug et al. 1993).

This species was detected on the ISEGS site during the 2008 surveys, but the size and status of this population is not known. The ISEGS site provides suitable foraging and breeding habitat for this species.

Golden Eagle (Aquila chrysaetos)

Throughout most of the western United States golden eagles are mostly year-round residents, breeding from late January through August with peak activity in March through July (Kochert et al. 2002). Migratory patterns are usually fairly local in California where adults are relatively sedentary, but dispersing juveniles sometimes migrate south in the fall. This species is generally considered to be more common in southern California than in the northern part of the state (USFS 2008).

Habitats for this species typically include rolling foothills, mountain areas, and deserts. Golden eagles need open terrain for hunting and prefer grasslands, deserts, savanna, and early successional stages of forest and shrub habitats. Golden eagles primarily prey on lagomorphs and rodents but will also take other mammals, birds, reptiles, and some carrion (Kochert et al. 2002). This species prefers to nest in rugged, open habitats

with canyons and escarpments, with overhanging ledges and cliffs and large trees used as cover. Golden eagles were detected on the ISEGS project site, but are unlikely to nest there because of the absence of suitable nesting habitat. However, the Clark Mountains, just north of the project area, provide suitable nesting habitat for this species, and the ISEGS site provides foraging habitat.

Loggerhead Shrike (Lanius ludovicianus)

Loggerhead shrikes are uncommon residents throughout most of the southern portion of their range, including southern California. In southern California they are generally much more common in interior desert regions than along the coast (Humple 2008). In the Mojave Desert this species appears to be most numerous in flat or gently sloping deserts and desert/scrub edges, especially along the eastern slopes of mountainous areas (Humpel 2008). Loggerhead shrikes initiate their breeding season in February and may continue with raising a second brood as late as July; they often re-nest if their first nest fails or to raise a second brood (Yosef 1996).

This species can be found within lowland, open habitat types, including creosote scrub and other desert habitats, sage scrub, non-native grasslands, chaparral, riparian, croplands, and areas characterized by open scattered trees and shrubs. Fences, posts, or other potential perches are typically present. In general, loggerhead shrikes prey upon large insects, small birds, amphibians, reptiles, and small rodents over open ground within areas of short vegetation, usually impaling prey on thorns, wire barbs, or sharp twigs to cache for later feeding (Yosef 1996). Loggerhead shrikes were detected on the ISEGS site and are year-round residents, using the site for nesting, foraging, and cover.

Le Conte's Thrasher (Toxostoma lecontei)

This species inhabits some of the hottest and driest habitats in the arid southwest, including the Mojave Desert where they occur year-round. Preferred habitats include sparse desert scrub, alkali desert scrub, and desert succulent scrub habitats with open desert washes. They seek gentle to rolling slopes bisected by dry desert washes, conditions found on alluvial fans that are found in the project area. The Le Conte's thrasher population densities are among the lowest of passerine (perching) birds, estimated at less than five birds per square kilometer in optimal habitats (Fitton 2008). This low population density decreases the probability of their detection during field surveys. This species requires areas with an accumulated leaf litter under most plants as cover for its preferred arthropod prey; they also feed on seeds, insects, small lizards, and other small vertebrates. LeConte's thrashers were detected during the surveys. They are year-round residents at the ISEGS site and use the site for nesting, foraging, and cover.

Crissal Thrasher (Toxostoma crissale)

Crissal thrashers are non-migratory residents ranging from southern Nevada and southeastern California to western Texas and central Mexico, and they are known to occur in the Mojave Desert in the vicinity of the Clark Mountains (Fitton 2008). This species prefers habitats characterized by dense, low scrubby vegetation, such as desert and foothill scrub and riparian brush including higher elevation arroyos of the Mojave Desert, normally near the upper limit of desert scrub vegetation as it transitions into

pinyon-juniper woodland. The nest of this species typically consists of an open cup of twigs, lined with finer vegetation, and placed in the middle of a dense shrub. Loss of habitat to clearing for agriculture or urban and suburban development threatens some populations. Crissal thrashers were detected during the surveys and are likely to be year-round residents at the ISEGS site, using the site for nesting, foraging, and cover.

Vaux's Swift (Chaetura vauxi)

Most Vaux's swifts observed in the Mojave Desert are passing through, and this species is not known to breed in San Bernardino County or elsewhere in the Mojave Desert (Hunter 2008). Very few nests have been found so their breeding range has been inferred from sightings of birds flying over potential nesting areas during their nesting season, in June and July. Vaux's swifts prefer to nest in the hollows formed naturally inside of large old conifer trees, especially snags, which are entirely lacking from the project area. This species was detected in the project area, but was likely a migrant rather than a resident. The ISEGS project area does not provide nesting habitat for Vaux's swift.

Brewer's Sparrow (Spizella breweri)

This species is a fairly common summer resident and breeder east of the Cascade-Sierra Nevada crest in mountains and higher valleys of the Mojave Desert. In summer, Brewer's sparrow often finds cover in sagebrush in extensive stands with moderate canopy unbroken by trees, while similar shrub habitats, such as bitterbrush, are used to a lesser extent. This species breeds in treeless shrub habitats with moderate canopy, especially in sagebrush. In winter, this species is common in open desert scrub and cropland habitats of the southern Mojave and Colorado deserts, usually in areas with some herbaceous understory. Brewer's sparrows were detected during the surveys and are likely to be year-round residents at the ISEGS site, using the site for nesting, foraging, and cover.

Special-Status Wildlife Species - Mammals

American Badger (Taxidea taxus)

American badgers were once fairly widespread throughout open grassland habitats of California. They are now uncommon, permanent residents throughout most of the state, with the exception of the northern North Coast area. Known to occur in the Mojave Desert, they are most abundant in the drier open stages of most shrub, forest, and herbaceous habitats with friable soils. Badgers are generally associated with treeless regions, prairies, parklands, and cold desert areas. Cultivated lands have been reported to provide little usable habitat for this species. They feed mainly on small mammals, especially ground squirrels, pocket gophers, rats, mice, and chipmunks. This species captures some of its prey above ground foraging on birds, eggs, reptiles, invertebrates, and carrion. Its diet will shift seasonally and yearly depending upon prey availability. This species is somewhat tolerant of human activities. The ISEGS project site provides suitable foraging habitat and denning sites for American badger, and it was detected during the 2007 surveys.

Nelson's Bighorn Sheep (Ovis canadensis nelsoni)

The Nelson's bighorn sheep includes bighorns from the Transverse Ranges through most of the desert mountain ranges of California and adjacent Nevada and northern Arizona to Utah. This species is widely distributed from the White Mountains in Mono County south to the Chocolate Mountains in Imperial County, and is known to occur in the Clark Mountains (CH2M Hill 2008). Bighorn sheep are typically found on open, rocky, steep areas used for escape cover with available water and herbaceous vegetation for forage. Bighorn sheep are agile in steep, rocky terrain, allowing them to Basic to the biology of bighorn sheep is their agility on steep rocky terrain, an adaptation used to escape predators such as coyotes, eagles, and cougars (Wehausen 1992).

Bighorn sheep graze on grasses and browse shrubs, particularly in fall and winter, and seek minerals at natural salt licks. Bighorn sheep have a large rumen, relative to body size, which allows digestion of grasses, even in a dry state (Hanly 1982). This gives them flexibility to select diets that optimize nutrient content from available forage. Consequently, bighorn sheep feed on a large variety of plant species and diet composition varies seasonally and among locations. While diet quality in the Mojave Desert varies greatly among years, it is most predictably high in late winter and spring (Wehausen 1992), and this period coincides with the peak of lambing. Desert bighorn have a long lambing season that can begin in December and end in June in the Mojave Desert, and a small percentage of births commonly occur in summer as well (Wehausen 1992).

Radio telemetry studies of bighorn sheep in various southwestern deserts, including the Mojave Desert of California, have found considerable movement of these sheep between mountain ranges (Bleich et al. 1990). Consequently, intermountain areas of the desert floor that bighorn traverse between mountain ranges can be as important to the long term viability of populations as are the mountain ranges themselves (Schwartz et al. 1986, Bleich et al. 1990).

Surface water is another element of desert bighorn habitat considered to be important to population health. Male and female bighorn sheep inhabiting desert ecosystems can survive without consuming surface water (Krausman et al. 1985), and males appear to drink infrequently in many situations; however, there are no known large populations of bighorn sheep in the desert region that lack access to surface water. It is common for males and females to segregate and occupy different habitats outside the breeding season (Bleich et al. 1997). Females tend to choose particularly steep, safe areas for bearing and initial rearing of lambs. Areas of steep limestone are commonly preferred lambing areas if available. Males frequently occupy much less precipitous habitat during the lamb-rearing season (Bleich et al. 1997).

The CNDDB records indicate that this species was documented in the vicinity if the ISEGS project in 1986, when approximately 150 sheep were recorded approximately 2.9 miles west and northwest of the project area in the Clark Mountains (BSE 2007a). Jaeger's (1994) studies of bighorn sheep in the Kingston and Clark Mountain ranges provide some more recent information on the demography, habitat use, behavior and movement patterns of the Clark Mountain population of Nelson's bighorn sheep. Jaeger (1994) estimated 58 ewes in the Clark Mountain population in 1991 and 1992, and

calculated the ewe to ram ratio to be approximately 96:100 (Jaeger 1994). Jaeger (1994) found that from 1991 through 1993 the ewe population in the Clark Mountain Range declined due to poor recruitment of lambs combined with mountain lion predation on adults. Jaeger (1994) also studied seasonal movements of big horn sheep, and determined that radio-collared ewes in the Clark Mountain Range moved seasonally between Clark Mountain and the State Line Hills to the northeast (Jaeger 1994).

No studies are available that would confirm the presence of Nelson's big-horn sheep in the project area. Given the proximity of the Clark Mountains, it is likely that bighorn sheep move down into the upper elevations of the Ivanpah Valley, including the ISEGS project area, to forage (CH2M Hill 2008 p. 3-7). It is also likely that areas of the Ivanpah Valley provide important movement corridors for deer and bighorn sheep (CH2M Hill 2008 p. 3-7). CDFG has noted that wildlife corridors are present through and adjacent to the ISEGS site, and have expressed concern that the project could adversely affect bighorn sheep (CDFG 2008).

Special-Status Bat Species

Pallid bat (*Antrozous pallidus*) and Townsend's big-eared bat (*Corynorhinus townsendii*) are special-status bat species that have been reported in the project vicinity (Brown 2008, CNDDB 2008). The pallid bat is a locally common species of low elevations in California, occurring throughout the state from Shasta to Kern counties except in the high Sierra. It occupies a wide variety of habitats is occupied, including grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. The species is most common in open, dry habitats with rocky areas for roosting and is a yearlong resident in most of the range. Pallid bats use caves, crevices, and mines for day roosts.

Townsend's big-eared bat is found throughout California in all but subalpine and alpine habitats, and may be found at any season throughout its range. Once considered common, Townsend's big-eared bat now is considered uncommon in California. It is most abundant in mesic habitats, and uses caves, mines, tunnels, buildings, or other human made structures for roosting. The Townsend's big-eared bat captures their prey in flight using echolocation, or by gleaning from foliage, with small moths being the principal food of this species. Extremely sensitive to disturbance of roosting sites, a single visit may result in the abandonment of a maternity roost.

Pallid and Townsend's big-eared bats could use the project area for foraging and might use nearby mine shafts for roosting. The AFC (BSE 2007a) correctly states that no mines exist on site, but staff observed a mine shaft in the limestone hill immediately west of Ivanpah 3. While no direct impacts to the mine would occur from the project, BLM staff assessed the level of bat activity at the mine shaft by conducting a visual night survey on June 23, 2008. At least five bats were observed from the limestone hill, and one individual flew into and out of the mine shaft (Grant 2008). Species identification was not possible with this type of survey. Although standard acoustic surveys would be able to distinguish most species, they would not be successful in detecting Townsend's big-eared bat (Brown 2008).

Special-Status Wildlife Species - Reptiles

Banded Gila Monster (*Heloderma suspectum cinctum****)***

The banded Gila monster is considered rare in California (Lovich and Beaman 2007) with only 26 credible records of the species documented in California within the past 153 years. This large and distinct looking lizard is difficult to observe even in areas where they have been recently recorded. As a result, little is known about this species' distribution, population status, and life history in California.

Most of the historical observations in California occurred in mountainous areas of moderate elevations with rocky, incised topography, in large and relatively high ranges as well as riparian areas (Lovich and Beaman 2007). Despite the widespread localities of potential habitat throughout the California desert, the few documented observations suggest the California populations appear to be confined to the eastern portion of the California desert (Lovich and Beaman 2007), and the current distribution is apparently a function of summer rainfall. As reported by Lovich and Beaman (2007), all California Gila monster observations occurred east of the 116° longitude in areas that received at least 25 percent of their annual precipitation during the summer months. Throughout their range, Gila monsters appear to be most active during or following summer rain events. Gila monsters have been recorded in the adjacent Mojave National Preserve and the Clark Mountains (Lovich and Beaman 2007). The closest confirmed observation of a Gila monster to the project area is likely an animal collected within the Mojave National Preserve in 1962 on the eastern slope of the Clark Mountains near Ivanpah Springs (Persons and Nowak 2007). Another incidental observation from the area includes finding Gila monster remains beneath a red-tail hawk nest near Primm, Nevada (CH2M Hill 2008g).

Like most areas of the desert, rain fall within the Ivanpah Valley is variable but mean annual precipitation is approximately 4 to 7 inches. The distribution of rainfall is also bi-modal with winter peak precipitation typically in February and summer peak rain falls in August. Runoff from the steep surrounding mountains is rapid and flash floods are common events as most of the storm water in the Ivanpah Valley drains across the alluvial fan to Ivanpah and Roach Dry Lakes. Although the Mojave is the driest of the North American deserts, the east Mojave does receive a large percentage of its annual precipitation from summer "monsoon" rains. As reported in Hereford et al. (2001) the relative abundance of cacti, many yuccas, agaves, and agave-like plants tend to be greater where warm-season rainfall is abundant. This is true of the ISEGS project area where cacti are extremely abundant. Although the project area does not receive near the amount of the rainfall as the Sonoran Desert where Gila monsters are more prevalent, the Ivanpah Valley does mimic the climatic conditions that appear to be favorable to Gila monster presence (CH2M Hill 2008g).

Gila monsters have the potential to occur in the ISEGS project area, particularly near the metamorphic hill, immediately adjacent to the southeastern boundary of Ivanpah 3 (CH2M Hill 2008g). They could also occur at the northeastern corner of Ivanpah 2 as well as the utility interconnections south of the base of the Clark Mountains (CH2M Hill 2008g). Gila monsters may venture from those rockier areas adjacent to the project

area where they would likely take refuge in small crevices and caves to forage within the spreading arroyo on which the proposed project is located (CH2M Hill 2008g).

Desert Tortoise

The desert tortoise's range includes the Mojave Desert region of Nevada, southern California, and the southwest corner of Utah and the Sonoran Desert region of Arizona and northern Mexico. The desert tortoise range is divided into Mojave and Sonoran populations. The Ivanpah Valley supports the Mojave population, which is primarily found in creosote bush-dominated valleys with adequate annual forbs for forage.

Desert tortoises have been known to live up to 70 years or more but the typical adult likely lives 25 to 35 years (in USFWS 1994). Like many long-lived species, the tortoise has a relatively slow rate of reproduction, and achieves breeding status at 15 to 20 years of age. Egg-laying occurs primarily from April to July (Rostral et al. 1994; USFWS 1994); the female typically lays 2-14 eggs (average 5-6) eggs in an earthen chamber excavated near the mouth of a burrow or under a bush (Woodbury and Hardy 1948; USFWS 1994). The eggs typically hatch 90 to 120 days later, between August and October.

Desert tortoise activity is seasonally variable, and in California peak adult and juvenile activity typically coincides with the greatest annual forage availability during the early spring and summer. However, tortoises will emerge from their burrows at any time of year when the weather is suitable. Hatchling desert tortoises typically become active earlier than adults do and their greatest activity period can be expected between late winter and spring. During active periods, tortoises feed on a wide variety of herbaceous plants, including cactus, grasses, and annual flowers (USFWS 1994).

Annual home ranges have been estimated between 10 and 450 acres and are age, sex, seasonal, and resource density dependent (USFWS 1994). Although adult males can be aggressive toward each other during the breeding season, there can be a great deal of overlap in individual home ranges (USFWS 1994). More than 1.5 square miles of habitat may be required to meet the life history needs of a tortoise and individuals have been known to travel as much or more than 7 miles at a time (BLM 2001). In drought years, tortoises can be expected to wander farther in search of forage. During their active period, desert tortoises retreat to shallow burrows and aboveground shade to escape the heat of the day, and will also retire to burrows at nighttime. Desert tortoises are primarily dormant in winter in underground burrows and sometimes congregate in communal dens.

Desert tortoise populations have declined throughout their range because of loss and degradation of habitat caused by urbanization, agricultural development, military training, recreational use, mining, and livestock grazing. The loss of individual desert tortoises to increased predation by common ravens, collection by humans for pets or consumption, collisions with vehicles on paved and unpaved roads, and mortality resulting from diseases also contributed to declines.

The proposed ISEGS project would be constructed within the Northeastern Mojave Recovery Unit, one of six designated evolutionarily significant units within the range of

the desert tortoise (USFWS 1994). When the 1994 recovery plan was issued, some of the highest known tortoise densities were in southern Ivanpah Valley, with 200 to 250 adults per square mile (USFWS 1994). These 1990s densities were less than estimates for the southern Ivanpah Valley in the 1970s; a decline has been attributed to raven predation (USFWS 1994). Densities for the northern Ivanpah Valley in the 1990s were typically less than 50 adults per square mile (USFWS 1994). According to the 1994 recovery plan, tortoise densities in the Ivanpah Valley Desert Wildlife Management Areas were estimated between 5 and 250 adult tortoises per square mile and the area was given a threat level of 3 out of 5 (5 = extremely high) (USFWS 1994). The Desert Tortoise Recovery Planning Assessment Committee (DTRPAC) recommended revising the threat level for the Ivanpah Valley Desert Wildlife Management Areas to a 4 to reflect 2003 conditions (DTRPAC 2004). Desert tortoises are distributed throughout Ivanpah Valley with the exception of the dry lakes and developed areas. According to the Northern and Eastern Mojave Planning Area EIR (BLM 2002), the non-lakebed portion of Ivanpah Valley area is considered excellent quality tortoise habitat with some of the highest population densities in the East Mojave.

The ISEGS project area provides high quality habitat for this species, with low levels of disturbance and high plant species diversity (CDFG 2008a). The desert tortoise population in this part of the Ivanpah Valley is also unique because it is the highest elevation at which this species is known to reside in the state (CDFG 2008a). The 2007/2008 protocol desert tortoise surveys found 25 live desert tortoises, 97 desert tortoise carcasses, 214 burrows, and 50 other tortoise sign (BSE 2007a). Tortoise sign and density was greatest in Ivanpah 1 at the southern boundary of the project site and was less dense as the survey moved towards the Clark Mountains and Ivanpah 3.

Desert tortoises also occur along the ISEGS linear facilities (BSE 2007a). Surveys of the fiber optic route by EPG, Inc. (2008) (cited in BSE 2007a) confirmed that the entire route is within desert tortoise habitat. Protocol level surveys were not conducted. However, in surveying the fiber optic route EPG found three tortoise burrows and a tortoise shell.

Sensitive Habitats

Critical Habitat Designation and Desert Tortoise Recovery Plan

The USFWS desert tortoise recovery plan is the key strategy for recovery and delisting of this species (USFWS 1994). As part of the recovery strategy, the USFWS designated critical habitat for the desert tortoise in portions of California, Nevada, Arizona, and Utah (USFWS 1994). Critical habitat is a term defined by the federal Endangered Species Act that refers to areas designated by the USFWS that are essential for the conservation of threatened or endangered species and may require special management and protection (USFWS 2005). The proposed project is not within designated critical habitat for any species, but is located approximately five miles north of the Ivanpah Critical Habitat Unit for desert tortoise, just north of the I-15 and Route 164 interchange.

The recovery plan (USFWS 1994) recommends implementation of reserve level protection of desert tortoise populations and habitat within Desert Wildlife Management Areas (DWMAs), while maintaining and protecting other sensitive species and

ecosystem functions. DWMAs were developed to provide “reserve level” protection for the tortoise (USFWS 1994). Critical habitat was designated to identify areas containing key biological and physical attributes that are essential to the desert tortoise’s survival and conservation, such as space, food, water, nutrition, cover, shelter, and reproductive sites. As part of the actions needed to accomplish the recovery of this species, land management goals within all DWMAs include restriction of human activities that adversely affect desert tortoises (USFWS 1994).

The 1994 and draft 2008 Desert Tortoise Recovery Plans (USFWS 1994, 2008) emphasize aggressive management within “tortoise conservation areas” a term that encompasses critical habitat Desert Wildlife Management Areas, Areas of Critical Environmental Concern, and other conservation areas or easements managed for desert tortoises. While the recovery plans suggest that land managers focus the most aggressive recovery efforts toward tortoise conservation areas, they also emphasize that land managers should strive to limit the loss of desert tortoise habitat outside conservation areas as much as possible (USFWS 2008). The recovery plans recognize that activities occurring on lands beyond the boundaries of existing tortoise conservation areas can affect tortoise populations and the effectiveness of conservation actions occurring within the conservation area boundaries. While recovery efforts may be prioritized within existing desert tortoise conservation areas, populations, habitats, and actions outside of these areas may also contribute to, or hamper, recovery of the species.

CDFG Sensitive Natural Communities

In addition to special-status species, a search of CDFG’s California Natural Diversity Database (CNDDB) revealed the presence of a sensitive natural plant community in the project vicinity: mesquite bosque, a type of desert riparian forest dominated by mesquite (*Prosopis pubescens*). While there are several ephemeral washes of considerable size on the site, their associated vegetation is Mojave wash scrub, a common vegetation type. The nearest occurrence of mesquite bosque was recorded encircling Mesquite Lake, which is approximately five and a half miles north of the northern end of the project site (CNDDB 2008).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Methods and Threshold for Determining Significance

The determination of whether a project has a significant effect on biological resources is based on the best scientific and factual data that staff could review for the project. The significance of the activity is in large part dependent on the setting and the existing laws, ordinances, regulations, and standards (LORS) for the particular site. For example, disturbance during construction on a “brownfield” (i.e., developed) site may not be significant, but this same activity on a “greenfield” (i.e., undeveloped) site may be significant because of the greater likelihood of sensitive biological resources in the area. Significance of impacts is generally determined by compliance with applicable LORS; however, because of the diversity of biological resource impacts, guidelines adopted by resource agencies may also be used.

Significant biological resource impacts would occur if special-status species, such as state- or federal-listed species, state fully protected species, candidates for state or federal listing and/or Species of Special Concern, are likely to be impacted from the construction and/or operation of the proposed project. Interruption of species migration; reduction of native fish, wildlife and plant habitat; causing a fish or wildlife population to drop below self-sustaining levels; and disturbance of wetlands, marshes, riparian areas or other wildlife habitat would also be considered significant impacts. Harassment of a protected species, even if it does not result in the loss of habitat or reduction in population numbers, would still be considered a significant impact. Substantial degradation of the quality of the environment or environmental effects that are individually limited, but cumulatively considerable, would also be considered significant.

Direct and Indirect Impacts and Mitigation

The California Environmental Quality Act (CEQA) Guidelines define direct impacts as those impacts that result from the project and occur at the same time and place. Indirect impacts are caused by the project, but can occur later in time or farther removed in distance while still reasonably foreseeable and related to the project. The potential impacts discussed in this analysis are those most likely to be associated with construction and operation of the ISEGS project.

Impact analyses typically characterize effects to plant communities as temporary or permanent, with a permanent impact referring to areas that are paved or otherwise precluded from restoration to a pre-project state. In the Mojave Desert ecosystem the definition of permanent impacts needs to reflect the slow recovery rates of its plant communities. Natural recovery rates from disturbance in these systems depend on the nature and severity of the impact. For example, creosote bushes can resprout a full canopy within five years after damage from heavy vehicle traffic (Gibson et al. 2004), but more severe damage involving vegetation removal and soil disturbance can take from 50 to 300 years; complete ecosystem recovery may require over 3,000 years (Lovich and Bainbridge 1999). In this analysis, an impact is considered temporary only if there is evidence to indicate that pre-disturbance levels of biomass, cover, density, community structure, and soil characteristics could be achieved within five years. Unless otherwise indicated, the acreages provided below for impacts are considered permanent.

Biological Resources Table 4 summarizes the impacts to biological resources resulting from ISEGS construction and operation.

Biological Resources Table 4
Summary of Impact/Mitigation

Biological Resource	Impact/Mitigation
Mojave Desert Plant Communities & Wildlife Habitat	**Impacts:** Permanent loss of 4,065+ acres of Mojave creosote scrub and other native plant communities, including approximately 6,400 barrel cactus; permanent loss of cover, foraging, breeding habitat for wildlife; habitat fragmentation and loss of connectivity for terrestrial wildlife; disturbance/dust to nearby vegetation and wildlife; increased predation due to increased raven/predator presence; spread of non-native invasive weeds. **Mitigation**: Off-site habitat acquisition and enhancement (**BIO-17**); implement Best Management Practices **(BIO-11)**
Waters of the State	**Impacts:** Loss of approximately 2,000 ephemeral drainages totaling 198 acres of waters of the state (and possibly waters of the U.S; as of November 2008 the USCOE had not completed a jurisdictional determination); **Mitigation**: Acquisition and enhancement of off-site waters (**BIO-17**); implement terms and conditions of state and federal permits **(BIO-18)**
Special-Status Plants	
Rusby's desert-mallow *Sphaeralcea rusbyi var. eremicola*	**Impacts**: Loss of 3 occurrences (5 individuals), 11 percent of known occurrences in the world; indirect impacts to nearby populations from introduction of weeds, increased dust. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Cave evening-primrose *Oenothera cavernae*	**Impact:** Loss of one of four known occurrences (25 percent) in California; indirect impacts to nearby populations from introduction of weeds, increased dust. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Mojave milkweed *Asclepias nyctaginifolia*	**Impact:** Loss of 22 occurrences (202 individuals), 79 percent of known occurrences in California. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Desert pincushion *Coryphantha chlorantha*	**Impact**: Loss of 13 occurrences (599 individuals), 54 percent of known occurrences in California; indirect impacts to nearby populations from introduction of weeds, increased dust. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).

Biological Resource	Impact/Mitigation
Small-flowered androstephium *Androstephium breviflorum*	**Impact**: Loss of 3 occurrences (12 individuals) 10 percent of the known occurrences in California; indirect impacts to nearby populations from introduction of weeds, increased dust. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Utah vine milkweed *Cynanchum utahense*	**Impact**: Loss of 9 occurrences (994 individuals), 17 percent of the known occurrences in California; indirect impacts to nearby populations from introduction of weeds, increased dust. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Nine-awned pappus grass *Enneapogon desvauxii*	**Impact**: Loss of 6 occurrences (8,145 individuals), 29 percent known occurrences in California; indirect impacts to nearby populations from introduction of weeds, increased dust; possible range reduction due to impacts at this species California distributional limits. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Parish's club-cholla *Grusonia parishii*	**Impact**: Loss of 5 occurrences (339 individuals), 28 percent of known occurrences in California; indirect impacts to nearby populations from introduction of weeds, increased dust; loss of populations which are the boundary of this species' range; **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Utah mortonia *Mortonia utahensis*	**Impact**: Potential loss of 1 occurrence (1 individual) at north end of site where transmission line ties into the solar plant. Loss would eliminate 2 percent of known occurrences in California. **Mitigation**: Flag and avoid during transmission line construction and implement other Best Management Practices (**BIO-11**); implement weed management plan (**BIO-13**).
Desert portulaca *Portulaca halimoides*	**Impact**: Loss of 1 occurrence, 6 percent of known occurrences in California; indirect impacts to nearby populations from introduction of weeds, increased dust. **Mitigation**: Protect and enhance offsite populations or some other form of compensatory mitigation (**BIO-17**); implement weed management plan (**BIO-13**); implement Best Management Practices (**BIO-11**).
Special-Status Wildlife	

Biological Resource	Impact/Mitigation
Desert tortoise *Gopherus agassizii*	**Impact:** Loss of 4,065+ acres of occupied habitat; translocation of an estimated minimum of 25 desert tortoise, resulting in reduced survivorship and reproduction for translocated individuals; fragmentation and loss of connectivity with surrounding habitat; increased risk from ravens and other predators; increased road kill hazard from construction and operations traffic; cumulative impacts to Ivanpah Valley population. **Mitigation**: Off-site habitat acquisition, endowment, and enhancement (**BIO-17**); conduct desert tortoise clearance surveys and establish exclusionary fencing (**BIO-8**); develop and implement desert tortoise translocation plan (**BIO-9**); implement avoidance measures and Best Management Practices (**BIO-11**); implement raven and weed management plant (**BIO-12** and **BIO-13**)
Banded Gila monster *Heloderma suspectum cinctum*	**Impact:** Presence in project area unconfirmed; if present, potential for direct impacts, habitat loss; **Mitigation**: Compensatory mitigation for desert tortoise may also offset impacts to Gila monsters (**BIO-17**); implement Best Management Practices to avoid direct impacts (**BIO-11**).
Burrowing owl *Athene cunicularia*	**Impact**: Potential loss of nest, eggs, or young; loss of breeding and foraging habitat; disturbance of nesting activities; **Mitigation**: Implement burrowing owl impact avoidance and mitigation measures (**BIO 16**); off-site habitat acquisition and enhancement (**BIO-17**)
Golden eagle *Aquila chrysaetos*	**Impact**: Loss of foraging habitat. **Mitigation**: Off-site habitat acquisition and enhancement (**BIO-17**); implement Best Management Practices (**BIO-11**)
Loggerhead shrike *Lanius ludovicianus*	**Impact**: Potential loss of nest, eggs, or young; loss of breeding and foraging habitat; disturbance of nesting activities. **Mitigation**: Conduct pre-construction nesting surveys, implement avoidance measures (**BIO-15**); off-site habitat acquisition and enhancement (**BIO-17**)
Brewer's sparrow *Spizella breweri*	**Impact**: Potential loss of nest, eggs, or young; loss of breeding and foraging habitat; disturbance of nesting activities. **Mitigation**: Conduct pre-construction nesting surveys, implement avoidance measures (**BIO-15**); off-site habitat acquisition and enhancement (**BIO-17**)
Crissal thrasher *Toxostoma crissale*	**Impact**: Potential loss of nest, eggs, or young; loss of breeding and foraging habitat; disturbance of nesting activities. **Mitigation**: Conduct pre-construction nesting surveys, implement avoidance measures (**BIO-15**); off-site habitat acquisition and enhancement (**BIO-17**)
Le Conte's thrasher *Toxostoma lecontei*	**Impact**: Potential loss of nest, eggs, or young; loss of breeding and foraging habitat; disturbance of nesting activities. **Mitigation**: Conduct pre-construction nesting surveys, implement avoidance measures (**BIO-15**); off-site habitat acquisition and enhancement (**BIO-17**)

Biological Resource	Impact/Mitigation
Nelson's bighorn sheep *Ovis canadensis nelsoni*	**Impact:** Potential loss of seasonal foraging habitat and impacts to movement corridors; **Mitigation**: Implement avoidance measures and Best Management Practices (**BIO-11**); determine if compensatory mitigation for desert tortoise (**BIO-17**) may offset impacts to bighorn sheep, or develop alternative habitat acquisition and/or enhancements
American badger *Taxidea taxus*	**Impact:** Loss and fragmentation of habitat, loss of foraging grounds, crushing or entombing of animals during construction **Mitigation**: Conduct pre-construction surveys and implement avoidance measures (**BIO-11**); off-site habitat acquisition and enhancement (**BIO-17**)

Construction Impacts and Mitigation

Construction of the ISEGS Sites and Associated Buildings and Roads

Approximately 4,065 acres (approximately 6.4 square miles) of Mojave creosote bush scrub and other native plant communities within the ISEGS project area would be eliminated by vegetation clearing, grading, and construction of the solar facilities. Ivanpah 1 and 2 would each occupy approximately 914 acres and 921 acres respectively, and Ivanpah 3 would occupy approximately 1,843 acres. An additional 300 acres would be used as laydown and temporary work space for utility installation. In addition, the administration building/warehouse, a substation, and detention ponds would occupy approximately 66 acres. An additional area of approximately 234 acres is needed for construction activities. As discussed in more detail in the cumulative impact subsection, this permanent loss contributes to the significant cumulative loss of native Mojave Desert plant and animal communities.

Linear Facilities and Drainage Impacts

Two new wells would be drilled outside of the boundary fencing, to the east of Ivanpah 2. During trenching of the water supply pipeline, a 50-foot-wide right-of-way would be used to store the excavated soil and provide access for equipment and vehicles and space for fitting the pipeline prior to installation and backfill via backhoe. The construction disturbance area for the water supply line outside the project boundary encompasses approximately 2 acres (BSE 2007a).

The proposed gas pipeline alignment is 5.3 miles long, with all but approximately one-half mile of the gas line located within the project boundary. The primary method of construction involves trenching, and a right-of-way 50 feet wide may be disturbed. The construction disturbance area for the natural gas pipeline outside the project boundary is estimated to be approximately 2.7 acres (BSE 2007a).

Impacts to biological resources due to upgrades to 36 miles of transmission line have not yet been fully assessed. The upgrade would include constructing a new double-circuit 220-kV transmission line between the existing Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California. Additional upgrades may be required as mitigation prior to final approval of interconnection to California Independent System Operator (ISO) and Non-California ISO controlled facilities.

Impacts due to installation of the 8-mile fiber optic line have not yet been fully assessed. The fiber optic line would use existing distribution lines and would involve use of a bucket truck that would remain in the dirt service road. Stringing the fiber optic cable would require a 40-foot by 60-foot area every 10,000 to 20,000 feet. Activities that could not be done from the existing dirt service road would be handled by vehicles driving over vegetation (CH2M Hill 2008)

Potential impacts to biological resources due to changes in drainage patterns have not yet been fully assessed. The July 2008 Preliminary Draft Drainage, Erosion, and Sediment Control Plan (CH2M Hill 2008a) provides a conceptual drainage plan with the goal of construction of the solar fields while still maintaining sheet flow where possible. The applicant is currently revising its preliminary stormwater calculations and draft conceptual plan. Potential downslope impacts due to drainage alterations, if any, will be addressed when that revised report is released.

Impacts to Special-Status Plants

The ISEGS project will impact 10 plant species listed as California Native Plant Society (CNPS) List 1B or 2 species. Plants on the CNPS Lists 1A, 1B, or 2 meet the requirements of section 15380 of the California Environmental Quality Act (CEQA), meaning they fulfill the requirements for state listing as threatened or endangered despite their currently unlisted status. Staff considers loss of 4 of these 10 species — Rusby's desert-mallow, cave evening-primrose, Mojave milkweed, and desert pincushion — as significant under CEQA guidelines because the project site contains the majority of known occurrences (or supports one of the few occurrences) in the state or in the world (see **Biological Resources Table 3**).

Rare plant populations adjacent to the ISEGS project site could also be indirectly affected by construction due to increases in wind-blown dust. Disturbance of the soil's surface caused by construction traffic and other activities would result in increased wind erosion of the soil. Aeolian (wind-borne) transport of dust and sand can result in the degradation of soil and vegetation over a wide area (Okin et al., 2001). Aeolian transport and dust, sand, and litter are the primary mechanisms of degradation, killing plants by burial and abrasion, interrupting natural processes of nutrient accumulation, and allowing the loss of soil resources.

Non-native forbs may be introduced or existing weeds spread due to construction and operation of ISEGS. Many invasive non-native species are adapted to and promoted by soil disturbance, and seeds are commonly transported on vehicles and by wind and water. Exotics can out-compete native species because of minimal water requirements, high germination potential and high seed production (Beatley 1966) and can become locally dominant, representing a serious threat to native desert ecosystems (Abella et al. 2008). The ISEGS project could adversely affect rare plant populations near the project area by the increase and spread of non-native plant species.

Implementation of Conditions of Certification **BIO-11** (Impact Avoidance and Best Management Practices), **BIO-14** (Revegetation and Reclamation), and **BIO-17** (Compensatory Mitigation Plan) could potentially avoid, minimize and compensate for

significant impacts to special-status plant species on the ISEGS site. **BIO-11** requires dust abatement measures during construction, and will reduce indirect impacts to nearby populations or special-status plant species. **BIO-14** will address preconstruction salvage and relocation of succulent vegetation from the site to either an onsite or nearby nursery facility for study and propagation of seed sources to reclaim the disturbed area. **BIO-17** could involve acquisition and protection of off-site populations some of the special status plant species impacted by the project.

Staff cannot yet conclude if these measures will reduce impacts to less-than-significant levels because two of these conditions (**BIO-14** and **BIO-17**) have not yet been fully developed. Staff will work closely and cooperatively with the applicant and with the California Department of Fish and Game to develop **BIO-14** and **BIO-17** and will incorporate policy guidance from the California Native Plant Society in creating these plans.

Impacts/Mitigation to Wildlife - Overview

Vegetation clearing and grading associated with ISEGS construction will directly affect wildlife by removal and crushing of shrubs and herbaceous vegetation, resulting in loss and fragmentation of cover, breeding and foraging habitat. Construction and operation of ISEGS also result in wildlife being crushed, entombed in dens or burrows, and colliding with vehicles and power line conductors or towers. In addition, wildlife could experience increased predation levels from ravens and other predators attracted to the project site and could be disturbed by increased levels of noise and activity. These potentially significant impacts can be reduced with avoidance and minimization measures described in Conditions of Certification **BIO-1 through -7** and in other conditions of certification. Impacts and mitigation measures for special-status wildlife species are discussed below.

Migratory/Special-Status Bird Species

Mojave creosote bush scrub at the power plant site provides foraging, cover, and/or breeding habitat for migratory birds, including a number of special-status bird species confirmed to be present at the site (golden eagle, burrowing owl, loggerhead shrike, Crissal thrasher, LeConte's thrasher, and Brewer's sparrow). Power plant construction would eliminate nesting habitat and result in direct and cumulative impacts to these species due to habitat loss or injury/fatality of individuals. Potential cumulative impacts to these species are discussed in more detail later in this section.

The loss of active bird nests or young is regulated by the federal Migratory Bird Treaty Act and Fish and Game Code section 3503. These impacts would be considered significant. The applicant has proposed mitigation measures to avoid and minimize impacts to nesting birds that have been incorporated into staff's Conditions of Certification **BIO-11** (Impact Avoidance and Best Management Practices), **BIO-15** (Pre-construction Nest Surveys) and **BIO-16** (Burrowing Owl Avoidance and Impact Minimization Measures). Implementation of staff's recommended conditions of certification will avoid direct impacts to nests, eggs, or young of migratory birds, and will minimize the impacts of construction disturbance to nesting birds to less-than-significant levels.

Loss of nesting and foraging habitat for these special-status bird species will adversely affect populations of these species within the Ivanpah Valley. As discussed in the cumulative impact subsection, staff considers the ISEGS project to be a substantial contributor to the cumulatively significant loss of Ivanpah Valley's biological resources, including these special-status bird species. Condition of Certification BIO-17, the compensatory mitigation plan, could offset the significant loss of habitat for these species.

Impacts to Special-Status Mammals

American Badger (Taxidea taxus)

American badgers were detected on the ISEGS site, and the site includes suitable foraging and denning habitat for this species. The American badger is protected under Title 14, California Code of Regulations (sections 670.2 and 670.5), and potential impacts to individuals of this species must be mitigated to less-than-significant levels. Construction of the ISEGS project could kill or injure American badgers by crushing with heavy equipment, or could entomb them within a den. Construction activities could also result in disturbance or harassment of individuals. Condition of Certification **BIO-11** requires that concurrent with the desert tortoise clearance survey, a qualified biologist will perform a preconstruction survey for badger dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads.

The ISEGS project will permanently remove approximately 4,065 acres of foraging and denning habitat for American badgers and will fragment and reduce the value of foraging and denning habitat adjacent to the project site. This habitat loss and degradation could adversely affect American badger populations within the Ivanpah Valley. As discussed in the cumulative impact subsection, staff considers the ISEGS project to be a substantial contributor to the cumulatively significant loss of Ivanpah Valley's biological resources, including American badgers. Staff's proposed Condition of Certification **BIO-17**, the compensatory mitigation plan, could offset the significant loss of habitat for this species.

Nelson's Bighorn Sheep (Ovis canadensis nelsoni)

Nelson's bighorn sheep are known to occur in the nearby Clark Mountains, and could use the ISEGS project site as foraging habitat and possibly as a migratory corridor (CDFG 2008). The project could reduce the availability of seasonal forage for Nelson's bighorn sheep and interfere with their activities if they move between mountain ranges through the Ivanpah Valley. The proposed ISEGS project boundaries and security fencing were shifted approximately 130 to 340 feet away from adjacent hills to provide a wildlife corridor (BSE 2007a p. 5.2-54). The applicant acknowledges that Nelson's big horn sheep could occur in the project area (CH2M Hill 2008a). However, the AFC (BSE 2007a) does not provide sufficient project-specific information on use of the site by Nelson's big-horn sheep to identify areas that might provide foraging habitat and movement corridors, to assess potential impacts, or to develop appropriate mitigation measures. It may be possible to offset potential project impacts to Nelson's bighorn sheep with implementation of Condition of Certification **BIO-17**, the compensatory mitigation plan, if the plan included enhancement measures that would benefit bighorn

sheep (for example, habitat improvements to springs important to this species, or changes to grazing practices that would improve foraging habitat).

The CDFG (CDFG 2008) and others (DOW 2008) expressed concerns regarding potential impacts of the ISEGS wells and groundwater pumping on springs used by bighorn sheep. The proposed project includes the installation of two groundwater wells east of Ivanpah 2. Water consumption for all three phases of all three projects is estimated at less than 100 acre-feet/year for the 50-year life of the project (BSE 2007a p. 5.5-17). This level of pumping, combined with all other projects, is not expected to significantly affect overall groundwater recharge in the Ivanpah Valley (BSE 2007a p. 5.15-20) and is unlikely to affect springs and big horn sheep that use these water sources.

Impacts to Special-Status Reptiles

Banded Gila Monster (Heloderma suspectum cinctum)

Gila monsters were not detected during the 2007/2008 surveys, but this species is difficult to detect and cannot be assumed to be absent based on the absence of observations. If Gila monsters are present in the ISEGS project area they may be harmed during clearing, grading and trenching activities or may become entrapped within open trenches and pipes. Construction activities could also result in direct mortality, injury, or harassment of individuals as a result of encounters with vehicles or heavy equipment. Condition of Certification **BIO-11** requires that concurrent with the desert tortoise clearance survey, a biologist perform a preconstruction survey for Gila monsters in the project area, and implement appropriate impact avoidance and minimization measures if detected.

Construction of the ISEGS project will eliminate 4,065 acres that might provide cover, foraging, and breeding habitat for Gila monsters. Condition of Certification **BIO-17**, the compensatory mitigation plan, could offset the significant loss of habitat for this species.

Desert Tortoise (Gopherus agassizii)

Direct Impacts

During construction of the ISEGS project desert tortoises may be harmed during clearing, grading, and trenching activities or may become entrapped within open trenches and pipes. Construction activities could also result in direct mortality, injury, or harassment of individuals as a result of encounters with vehicles or heavy equipment. Other direct effects could include individual tortoises being crushed or entombed in their burrows, collection or vandalism, disruption of tortoise behavior during construction or operation of facilities, disturbance by noise or vibrations from the heavy equipment, and injury or mortality from encounters with workers’ or visitors' pets. Desert tortoises may also be attracted to the construction area by application of water to control dust, placing them at higher risk of injury or mortality. Increased human activity and vehicle travel would occur from the construction and improvement of access roads, which could disturb, injure, or kill individual tortoises. Also, tortoises may take shelter under parked vehicles and be killed, injured, or harassed when the vehicle is moved.

The applicant has recommended impact avoidance and minimization measures to reduce these significant, direct impacts to desert tortoise, including installation of exclusion fencing to keep desert tortoise out of construction areas, reducing construction traffic and speed limits to reduce the incidence of road kills and worker training programs. Staff has incorporated these recommendations into conditions of certification. These include Conditions of Certification **BIO-1** through **BIO-6**, which apply to protection of desert tortoise and other biological resources in and near the ISEGS project area, and Conditions of Certification **BIO-8** through **11**, which are specific to desert tortoise.

Staff's proposed Condition of Certification **BIO-8** would involve installation of security and desert tortoise exclusionary fencing around the entire project site and along access roads, and **BIO-9** recommends the development and implementation of a desert tortoise translocation plan to move the tortoises currently living in the ISEGS project area to a safe location. Staff's proposed **BIO-10** requires verification that all desert tortoise avoidance, minimization, and compensation measures have been implemented. Staff's proposed **BIO-11** recommends a variety of additional impact avoidance and minimization measures to reduce the risk of injury and death to desert tortoise as well as other sensitive species.

Implementation of staff's proposed Conditions of Certification **BIO-8** and **BIO-9** could themselves result in direct effects such as mortality, injury, or harassment of desert tortoises due to equipment operation, fence installation activities, removal of tortoise burrows, and tortoise translocation. Installation of exclusionary fencing at the perimeter of the project area would also fragment habitat for desert tortoise and home ranges of individual tortoises.

Capturing, handling, and relocating desert tortoises from the proposed site after the installation of the fencing could result in harassment and possibly death or injury. Tortoises may die or become injured by capture and relocation if these methods are performed improperly, particularly during extreme temperatures, or if they void their bladders. Averill-Murray (2001) determined that tortoises that voided their bladders during handling had significantly lower overall survival rates (0.81-0.88) than those that did not void (0.96). If multiple desert tortoises are handled by biologists without the use of appropriate protective measures, pathogens may be spread among the tortoises. For those tortoise near but not within the ISEGS site, removal of habitat within a tortoise's home range or segregating individuals from their home range with a fence would likely result in displacement stress that could result in loss of health, exposure, increased risk of predation, increased intraspecific competition, and death. Mortality for translocated desert has been estimated at approximately 15 percent (Sullivan 2008) and recent experiences with the Fort Irwin translocation operation suggest that even higher mortality rates are possible. Tortoises moved outside their home ranges would likely attempt to return to the area from which they were moved, therefore making it difficult to remove them from the potential adverse effects associated with project construction.

Staff's proposed **BIO-9**, the Desert Tortoise Translocation Plan, has not yet been drafted, nor has an appropriate translocation site been identified. To fully assess impacts to translocated desert tortoise, staff needs additional information as to the location of the translocation and specific methods that will be employed. The USFWS

has nearly completed development of updated Best Management Practices (BMPs) for handling and translocation of desert tortoise which will address some of these potential impacts (Croft 2008). These BMPs will be integrated with staff's conditions of certification when they are finalized. Staff will continue to work closely and cooperatively with BLM, USFWS, CDFG, and the applicant to develop a Desert Tortoise Translocation Plan that will safely transfer out of harm's way the desert tortoise currently occupying the ISEGS project site.

One of the most significant direct effects of the ISEGS project on desert tortoise is loss of approximately 4,065 acres of occupied habitat and fragmentation and disturbance to adjacent habitat. Condition of Certification **BIO-17**, the compensatory mitigation plan, could potentially offset the significant loss of habitat for this species. The applicant proposed compensation for loss of desert tortoise habitat through land acquisitions or an assessed financial contribution based on the final construction footprint at a 1:1 ratio (BSE 2007a, CH2M Hill 2008). This proposed mitigation is consistent with the BLM's guidance and policies for lands within the Northern and Eastern Mojave Planning Area that are not designated as Desert Wildlife Management Areas (BLM 2002). Presumably the applicant's proposed 1:1 mitigation would involve acquisition, protection and enhancement of approximately 4,065 acres. The applicant has not specified the mechanism by which compensatory mitigation might occur, nor the location(s) or characteristics of potential acquisition lands.

Staff has concluded that the applicant's proposed mitigation would be insufficient to avoid significant direct, indirect, and cumulative impacts to desert tortoise, and fails to meet the state's full mitigation standard. Staff proposes development of a compensatory mitigation approach that includes appropriate levels of habitat acquisition and enhancement, as well as funding for other agency-sponsored actions that would benefit desert tortoise and other sensitive species in the Ivanpah Valley. Compensatory mitigation would need to include adequate levels of acquisition and enhancement of desert tortoise habitat, as well as other enhancement actions that would fully mitigate impacts to desert tortoise. Staff will work closely and cooperatively with BLM, USFWS, CDFG, and the applicant to develop a mitigation and enhancement plan that would offset the significant habitat loss and indirect impacts associated with construction and operation of the ISEGS project.

Indirect Effects

The indirect effects of the ISEGS project include loss of forage, nesting sites, and cover sites, the potential replacement of native with non-native plant species, loss of dispersal areas and connectivity to other areas, contracted home ranges, and increased risk of predation by predators attracted to the area by increased human activity. Each of these impacts is discussed in more detail below.

Ravens and Other Predators

Human activities in the ISEGS project area potentially provide food or other attractants in the form of trash, litter, or water, which draw unnaturally high numbers of tortoise predators such as the common raven, kit fox, and coyote. Common raven populations in some areas of the Mojave Desert have increased 1,500 percent from 1968 to 1988 in response to expanding human use of the desert (Boarman 2002). Since ravens were

scarce in this area prior to 1940, the current level of raven predation on juvenile desert tortoises is considered to be an unnatural occurrence (BLM 1990).

In addition to ravens, feral dogs have emerged as significant predators of the tortoise. Dogs may range several miles into the desert and have been found digging up and killing desert tortoises (USFWS 1994; Evans 2001). Dogs brought to the project site with visitors may harass, injure, or kill desert tortoises, particularly if allowed off leash to roam freely in occupied desert tortoise habitat. The worker environmental awareness training (**BIO-6**) and restrictions on pets being brought to the site required of all personnel (**BIO-11**) would reduce the potential for these impacts.

Construction and operation of the ISEGS project would increase raven presence in the project area. Ravens depend on human encroachment to expand into areas where they were previously absent or in low abundance. Ravens habituate to human activities and are subsidized by the food and water, as well as roosting and nesting resources that are introduced or augmented by human encroachment. The Ivanpah Valley currently includes several unauthorized public and open community dumps (BLM 2001), and the casinos at Primm (4.5 miles from ISEGS) and the Primm Valley Golf Club (0.5 miles from ISEGS) provide food, water features, and roosting/nesting substrates (buildings, signs, lamps, and utility poles) that otherwise would be unavailable. This development adjacent to the proposed ISEGS provides year-round water and trash subsidies for the raven as well as nesting opportunities.

Small mammal, fox, coyote, rabbit, lizard, snake, and tortoise road kill along I-15, Nipton Road, Yates Well Road, Colosseum Road, and other local roads provides an additional attractant and subsidy for opportunistic predators/scavengers such as ravens. Road kills would mount with increased ISEGS construction and operations traffic, further exacerbating the raven/predator attractions and increasing desert tortoise predation levels.

The ISEGS area is already subject to elevated raven predation pressure and any cumulative loss of juvenile tortoise due to the further addition of raven subsidies could have a long-term effect on the Ivanpah tortoise population by reducing the recruitment of juvenile tortoises into the adult life stages (Boarman 2003). The effects of this shortage may not be apparent for years because tortoises do not typically reach sexual maturity until approximately 15 to 20 years of age.

To reduce the impacts of increased raven presence at the ISEGS project site, the applicant has prepared a draft Raven Management Plan (CH2M Hill 2008f) and has recommended other avoidance and minimization measures. Staff has incorporated these recommendations with proposed Conditions of Certification **BIO-11** and **BIO-12,** which will minimize the effects of increased predation on the Ivanpah Valley population of desert tortoise. The USFWS is currently developing a raven management plan that will address some of these potential impacts on a regional basis (Croft 2008) and which will implement recommendations in the USFWS *Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2008). This USFWS regional raven management plan will be integrated with staff's conditions of certification if that plan is completed in time.

Increased Risk from Roads/Traffic

Vehicle traffic would increase as a result of construction and improvement of access roads, increasing the risk of injuring or killing desert tortoise. During the month-long time period in which the ISEGS workforce is at its largest, an estimate of the average daily traffic would include 39 transport buses and 192 personal vehicles (BSE 2007a). Likewise during this time period, the average total of construction truck traffic would be approximately 145 vehicles per day. For all other periods during construction (and to a much greater extent during operations and maintenance activities) daily average vehicle activity would be far less.

The potential for increased traffic-related tortoise mortality is greatest along paved roads where vehicle frequency and speed is greatest though tortoises on dirt roads may also be affected depending on vehicle frequency and speed. Census data indicate that desert tortoise numbers decline as vehicle use increases (Bury et al. 1977) and that tortoise sign increases with increased distance from roads (Nicholson 1978). Additional unauthorized impacts that may occur from casual use of the access roads in the project area include unauthorized trail creation.

To minimize the risks of increased traffic fatality and other hazards associated with roads at the ISEGS project site, the applicant has proposed a variety of minimization measures which staff has incorporated into Condition of Certification **BIO-11**. These measures include confining vehicular traffic to and from the project site to existing routes of travel, prohibiting cross country vehicle and equipment use outside designated work areas, and imposing a speed limit of 20 miles per hour on Colosseum Road and other dirt access routes within desert tortoise habitat.

Dust

Disturbance of the soil's surface caused by construction traffic and other activities would result in increased wind erosion of the soil. Aeolian transport of dust and sand can result in the degradation of soil and vegetation over a widening area (Okin et al. 2001). Dust can have deleterious physiological effects on plants and may affect their productivity and nutritional qualities. The destruction of plants and soil crusts by windblown sand and dust exacerbates the erodibility of the soil and accelerates the loss of nutrients (Okin et al. 2001). Soil erosion from construction activities and vehicle activity, which affects vegetation and soil properties, could have an adverse effect on both tortoise foraging and burrowing potential. The impacts of increased dust and other construction impacts can be minimized with implementation of Condition of Certification **BIO-11**, and with conditions of certification described in staff's **Soil & Water** analysis.

Impacts to Waters of the State/United States

Clearing, grading, and construction will impact all ephemeral washes on the ISEGS project site, resulting in temporary or permanent impacts to 198 acres of waters of the State. Under California State law, waters of the State refers to any surface water or groundwater within the boundaries of the state (California Water Code § 13050(e)). The washes are considered waters of the state (BSE 2007a).

The federal jurisdictional status of the washes has yet to be established, so it is not known if the project will impact waters of the United States. Under the federal Clean

Water Act, waters of the United States refers to surface waters, rivers, lakes, estuaries, coastal waters, and wetlands; not all surface waters are legally "waters of the United States." The U.S. Army Corps of Engineers (USACOE) estimates that a final determination of jurisdictional status will be made by January or February 2009 (Pankrantz 2008).

If impacts to waters of the state cannot be minimized or avoided, mitigation will be required to offset the loss of these resources (CDFG 2008, Dellavalle 2008). This mitigation could potentially be incorporated into the compensatory mitigation plan that will be developed, as described in staff's proposed Condition of Certification **BIO-17**.

Spread of Noxious Weeds

Construction activities and soil disturbance could introduce new noxious weeds to the ISEGS site and linear facilities, and could further spread weeds already present in the project vicinity. The spread of invasive plants is a major threat to biological resources in the Mojave Desert because non-native plants can displace native plants, increase the thread of wildfire, and supplant wildlife foods that are important to desert tortoise and other herbivorous species. The weeds of highest concern in the general area include Sahara mustard and salt cedar (CH2M Hill 2008). Red brome and other ubiquitous weeds are also present; however, because of the widespread nature of these weeds, control is considered impracticable.

To avoid and minimize the spread of existing weeds and the introduction of new ones, an active weed management strategy and control methods must be implemented. The applicant has provided a detailed Weed Management Plan (CH2M Hill 2008e) to avoid and minimize the adverse effects of noxious weeds. Staff concurs with the recommendations in the applicant's weed management plan, and has incorporated it into staff's proposed Condition of Certification **BIO-13**. The Weed Management Plan includes a discussion of weed eradication and control methods, preventative measures to be implemented during construction (for example, limiting the size of disturbance, establishing wash stations for construction vehicles, using only weed-free products for erosion control) and long-term reporting requirements.

Noise

Noise from construction activities could temporarily discourage wildlife from foraging and nesting immediately adjacent to the project area. Many bird species rely on vocalization during the breeding season to attract a mate within their territory. Noise levels from certain construction, operations, and demolition activities could reduce the reproductive success of nesting birds. The expected loudest composite noise levels are approximately 89 dBA at 50 feet from the activity, which results in noise levels of approximately 77 and 61 dBA at distances of 200 and 400 feet from the activity, respectively (BSE 2007a). The construction period is relatively short, about 20 months per phase, and wildlife usually becomes habituated to ongoing general construction noise. Weisenberger et al. (1996) found that bighorn sheep responded to aircraft over-flights with increased heart rates and altered behavior; however, animal response decreased with increased exposure. In general, nearly all equipment will be specified to have near-field maximum noise levels that do not exceed 90 dBA at 3 feet from the activity (or 85 dBA at 3 feet where available as a vendor standard) to limit the noise

exposure of plant personnel to acceptable levels. As a result of these design features, the temporary nature of these activities, and the adherence to noise reducing mitigation measures, the noise levels at the project fence line are not expected to have any significant impact on nearby wildlife resources.

Operation Impacts and Mitigation

Potential operation impacts include impacts to birds due to collision with structures, risk of burns to birds that fly into the reflected sunlight between the heliostats and the power towers, and effects of disturbance and lighting. Operational impacts to desert tortoise impacts and other special-status species from increased road traffic, noise, and disturbance, and impacts to vegetation and rare plants from dust and spread of noxious weeds, was addressed above in the subsection on special-status species.

Lighting, Collisions and Electrocution

Birds are known to collide with communications towers, transmission lines and other elevated structures. The ISEGS project design will result in the construction of 8 power towers 312 feet in height, 5 power towers 459 feet in height, and 3 boiler stacks 131 feet in height. Numerous other project-related structures lower in height will also be constructed. The heliostat array at each of the ISEGS sites would be arranged around a single centralized solar power tower 459 feet high, which would include FAA required lighting and a lightening pole that would extend above the top of the towers approximately 5 to 10 feet. Lighting plays a significant role in collision risk because lights can attract nocturnal migrant songbirds, and major bird kill events have been reported at lighted communications towers (Manville 2001) with most kills from towers higher than 300 to 500 feet (Kerlinger 2004). Many of the avian fatalities at communications towers and other tall structures have been associated with steady-burning, red incandescent L-810 lights used at communications towers seem to attract birds (Gehring et al. 2006). Longcore et al. (2008) concluded that use of strobe or flashing lights on towers resulted in less bird aggregation, and, by extension, lower bird mortality, than use of steady-burning lights. Bright night lighting close to the ground at the ISEGS project site could also disturb wildlife that occurs adjacent to the project site (e.g., nesting birds, foraging mammals, and flying insects).

To minimize this risk of collision and disturbance to wildlife from lights, staff recommends implementation of staff's proposed Condition of Certification **BIO-11**, which includes specifications that the lighting atop the towers use flashing strobe lights rather than steady burning, and recommendations for lighting to be shielded downward and turned off when not needed.

Diurnal birds could also collide with tall structures, and could also be at risk of injury and fatality from burns if they flew into the reflected sunlight between the heliostats and the power towers. Staff has concluded that the risk of such impacts is low. Bird fatality studies at the Solar One facility near Daggett, San Bernardino County found that bird mortality observed on the site was associated with the large evaporation ponds at this solar plant rather than collisions or burns (McCrary 1986). Furthermore, most diurnal bird collisions with tall structures are associated with guyed towers in poor visibility conditions such as fog or inclement weather (Manville 2001). The ISEGS project does

not include evaporation ponds or guyed structures, and rarely is subject to weather that reduces visibility.

Large raptors like golden eagles can be electrocuted by transmission lines when a bird's wings simultaneously contact two conductors of different phases, or a conductor and a ground. This happens most frequently when a bird attempts to perch on a structure with insufficient clearance between these elements. The presence of distribution lines 69 kV or less represents more of a danger to raptors than transmission lines greater than 69 kV, because the spacing between elements in distribution lines is much less than that of transmission lines (APLIC, 1996). The proposed transmission lines would be 115 kV. To minimize risk of electrocution, the applicant has proposed a "raptor-friendly" construction design for the transmission line with conductor wire spacing greater than the wingspans of large birds to help prevent electrocution as described in Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 (APLIC 2006). With the proposed mitigation addressed in Condition of Certification **BIO-11**, staff concludes that the proposed transmission lines would not pose a significant threat to birds.

Noise

Operational noise, anticipated to be less than 30 dBA, will be more consistent and at a much lower level than during construction. The power plant will operate an average of about 10 hours a day, 7 days a week throughout the year, with the exception of a scheduled shutdown in late December for maintenance (BSE 2007a). The solar field and power generation equipment will be started up each morning after sunrise and insolation build-up, and shut down in the evening when insolation drops below the level required for generating power. In addition, the solar nature of the facility limits its primary operations and noise generating activities to the daylight hours when ambient levels (such as from I-15, which is located 0.8 mile southeast of proposed Ivanpah 1) are typically highest. Therefore, with the implementation of noise-reducing measures described in the AFC (BSE 2007a), the impact on operational noise on surrounding wildlife is expected to be less-than significant. These measures include requiring construction equipment to maintain maximum noise levels at 90 dBA of less three feet from the construction activity.

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 (Cal. Code Regs, tit. 14, section 15130). Cumulative impacts must be addressed if the incremental effect of a project, combined with the effects of other projects is "cumulatively considerable" (14 Cal Code Regs §15130(a)). Such incremental effects are to be "viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects" (14 Cal Code Regs §15164(b)(1)).

This cumulative impact analysis makes a broad, regional evaluation of the impacts of past projects that threaten plant and animal communities within California's southern

deserts, and also discusses in a general fashion future foreseeable threats. This overview of regional impacts is followed by a more detailed discussion of the effects of past, present, and future projects to biological resources of the Ivanpah Valley, in particular to its desert tortoise population.

Regional Overview

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

Against this backdrop of past projects within California's deserts, proposed wind and solar energy projects have the potential to further reduce and degrade native plant and animal populations, in particular sensitive species such as desert tortoise. BLM has received solar and wind applications for use of BLM land for approximately one million acres of the California Desert Conservation Area (see the **Cumulative Impacts** section). Nearby in the Nevada desert applications have been submitted for solar power facility right-of-ways on over 133,000 acres of desert landscape (USFWS 2008). In the context of this large scale habitat loss, the ISEGS project will contribute to the cumulative significant loss and degradation of habitat for desert plants and wildlife, including desert tortoise, within southern California's deserts.

Ivanpah Valley Past and Present Projects

The Ivanpah Valley has followed trends similar to the rest of the California desert in terms of habitat loss and degradation. **Biological Resources Table 5** lists the past and present projects within the Ivanpah Valley. The map ID numbers in this table correspond to the numbers shown on **Cumulative Impacts Figure 3.**

Biological Resources Table 5
Past and Present Projects in the Ivanpah Valley

Map ID	Project Name/Ownership	Project Description
1	Bighorn Electric Generating Station/ Reliant Energy Wholesale Generation, LLC	Operating natural gas power plant, uses dry cooling system
2	Primm Casinos: Buffalo Bill's, Primm Valley, Whiskey Pete's/ Terrible's Primm Valley Casino Resorts (MGM Mirage)	Two existing Resort and Casinos and one existing Hotel and Casino; undergoing renovation
3	Primm Valley Golf Course/ Terrible's Primm Valley Casino Resorts (MGM Mirage)	Existing golf course located south of the California/Nevada border along I-15, opened in 1997.
4	Primm Outlet Mall/ Fashion Outlets (MGM Mirage)	Existing shopping outlet with over 100 stores. Connected to the Primm Casinos by monorail.
5	Recreation Activities/ BLM	Approximately 12 permitted and organized events (championship racing, archery, kite buggying, land sailing) occur on the Dry Lake annually; approximately 5000 annual visitors/year
6	Molycorp/ Chevron-Texaco	Existing mining operation on Mountain Pass, acquired by Molycorp in 1950 and mined ever since.
7	Colosseum Mine/ Lac Minerals	Inactive mining facilities occupying 284 acres on a 3,316 acre private parcel.
8	Clark Mountain and Crescent Peak Allotment	Ongoing 10-year grazing lease
9	Molycorp Evaporation Pond/Molycorp	Active evaporation pond southeast of Ivanpah Dry Lake
10	AT&T Fiber-optic replacement of cables	Existing direct buried fiber-optic cable will be replaced from Nevada border to the Halloran Summit within existing right-of-way; expect completion in next few years.
11	Existing 115-kV transmission line from El Dorado substation/SCE	Existing line passing through ISEGS site
12	Molycorp (Now Chevron-Texaco) pipeline	Runs from Molycorp south of I-15, through the Mojave National Desert Preserve to the Evaporation Pond

Biological resources of the Ivanpah Valley has been adversely affected by the projects listed above, as well as construction and continued use of major highways such as I-15 and secondary roads, unimproved roads and trails, pipelines, the Union Pacific Railroad, casinos and retail businesses, recreational developments, and electrical transmission lines and substations. Development-related habitat loss continues around the Nevada communities of Jean and Primm as well as the California community of Nipton. These activities in the Ivanpah Valley have resulted in direct loss and fragmentation of habitat, introduction of non-native species, and increased disturbance to wildlife. Urbanization, grazing, vandalism, illegal dumping, mining, off-road recreation, and construction of utility corridors, facilities and roads have contributed to the cumulative degradation of biological resources in the region. In general, actions on private lands within and adjacent to desert communities in Nevada including Las Vegas, Jean and Primm, and Barstow in California, are expected to continue to increase in proportion to increases in the human populations and access in these areas. Planned future actions, such as those that may occur as a result of the development of the Ivanpah Valley Airport, completion of rail lines, and others would continue this trend. All of these past activities have contributed to the loss of Ivanpah Valley vegetation communities, wildlife habitat, and special-status species.

Ivanpah Valley Future Projects

The Ivanpah Valley has followed trends similar to the rest of the California desert in terms of habitat loss and degradation. **Biological Resources Table 6** lists the future foreseeable projects within the Ivanpah Valley. The map ID letters in this table correspond to the numbers shown in **Cumulative Impacts Figure 3.**

Biological Resources Table 6
Future Foreseeable Projects in the Ivanpah Valley

Map ID	Project Name/Owner or Proponent	Project Description/Status
A	GEN 3 Solar, Inc/OptiSolar	A 300 MW photovoltaic development on 4,160 acres/Status: Plan of Development Letter sent 7/08
B	Ivanpah Airport (Southern Nevada Supplemental Airport)/Clark County Dept. of Aviation	The Ivanpah Valley Airport project is planned on 9.4 square miles (~6,000 acres) along I-15; Draft EIS in progress, possible construction start date of 2010, operation in 2017
C	Victorville-Las Vegas High Speed Train/ DesertXpress Enterprises	High speed train would run from Victorville to Las Vegas/Status: Scoping report completed 7/06; project proponents anticipate train operational by 2012
D	Pipeline Restoration/ Mojave Pipeline	Pipeline restoration adjacent to ISEGS project, similar footprint to original pipeline/ Status: meetings in Jan/Feb 2008 to discuss right-of-way

Map ID	Project Name/Owner or Proponent	Project Description/Status
E	Joint Port of Entry/Caltrans, CA Dept Food & Ag	Highway construction planned between Barstow and the Nevada state line includes: 1) a proposed point-of-entry inspection station near the Nevada border with construction likely to start in 2009 and continue for 2 years; 2) a 12-mile-long northbound truck descending lane and pavement rehabilitation (expected to be completed in the summer of 2010); and 3) regrading of median slopes, has been completed
F	Temporary Batch plant/Caltrans	Construction occurring now on widening of I-15
G	Mixed-use Development/ MGM Mirage and Jeanco Realty Development, LLC	166 acres proposed for housing, commercial businesses, new hotel-casino; includes demolition of two casinos MGM Mirage currently owns in Jean/ Status: On hold
H	Clark Mountain and Crescent Peak Allotment/ BLM	10 Year Lease grazing lease/Status: ongoing
I	Ivanpah Energy Center/ Diamond Generating Corporation	Status: On hold
J	Wind energy power plant/PPM Energy	75 MW wind energy project on 2,330 acres/Status: applications received 10/02, 10/06
K	Wind energy power plant/Clipper Wind CACA 44236	50 MW wind energy project on 3,360 acres/Status: applications received 3/02, 5/06
L	I-15 Mountain Pass Truck Lane/Caltrans	Now under construction from 8/08 to 2010
N	Upgrade to existing 115-kV transmission line from El Dorado Substation (SCE)	Construct a new Ivanpah Substation sized to accommodate 230 / 115 kV facilities, removal approximately 36 miles of a portion of existing line, construct a double circuit 230 kV line/Status: Project filing date early 2009, projected on line 2013
O	Mixed Use -Recreation	Approximately 200 Casual Use permits are issued annually (cover between 1 to 6 individuals); Status anticipate approximately 12 permitted and organized events per year l
P	Karnama Fast Food New fast food restaurant in Primm	Fast food restaurant to be built adjacent to the Primm Outlet Mall/Status: in permitting, application received 2/07
Q	Primm Solar Generating Plant/ NextLight Renewable Power, LLC	250 MW solar trough project on approximately 2,500 acres/ Status: application submitted to Las Vegas BLM Field Office

Past and current actions have significantly reduced and degraded the plant communities and wildlife habitat within the Ivanpah Valley. While no precise estimate can be made of the future habitat loss associated with the proposed projects listed above, collectively these projects would remove and fragment tens of thousands of

acres of additional habitat. The ISEGS project, combined with the proposed 4,000-acre OptiSolar development immediately to the east, would eliminate a large swath of the better desert tortoise habitat found on the west side of I-15 within the Ivanpah Valley. All of these past, present, and future proposed activities contribute to the significant loss of Ivanpah Valley vegetation communities, wildlife habitat, and special-status species. Staff considers the 4,065-acre ISEGS project to be a substantial contributor to the cumulatively significant loss of Ivanpah Valley's native Mojave Desert plant and wildlife communities, including the threatened desert tortoise and other special-status species. This significant cumulative impact may be reduced to less than significant levels with appropriate levels of compensatory mitigation, as discussed in staff's proposed Condition of Certification **BIO-17**.

COMPLIANCE WITH LORS

The proposed project must comply with state and federal laws, ordinances, regulations, and standards that address state and federally listed species, as well as other sensitive species and their habitats. The ISEGS project is located on federal land under BLM's jurisdiction and is therefore subject to the provisions of BLM's California Desert Conservation Area (CDCA) Plan (Revised 1999). As an amendment to the CDCA Plan, BLM produced the Northern and Eastern Mojave (NEMO) Coordinated Management Plan (BLM 2002). This document consists of proposed management actions and alternatives for public lands in the NEMO Planning Area. The ISEGS project is located in the southeastern portion of the NEMO Planning Area Boundary.

The BLM has worked with the USFWS to develop a variety of land designations as tools to protect sensitive biological resources, including the desert tortoise. The siting of the ISEGS project is consistent with the management direction of these designations, as described below:

- **Desert Wildlife Management Areas** (DWMA) are general areas recommended by the Desert Tortoise Recovery Plan (USFWS 1994) within which recovery efforts for the desert tortoise would be concentrated. DWMAs had no specific legal boundaries in the 1994 Recovery Plan. The BLM formalized the general DWMAs from the 1994 Recovery Plan through its planning process and administers them as Areas of Critical Environmental Concern (see below). The ISEGS project does not fall within any DWMA.
- **Area of Critical Environmental Concern** (ACEC) are specific, legally defined, BLM designations where special management is needed to protect and prevent irreparable damage to important historical, cultural, scenic values, fish and wildlife, and natural resources or to protect life and safety from natural hazards. The ISEGS project is not included within any designated ACEC.
- **Critical Habitat** consists of specific areas defined by the USFWS as areas essential for the conservation of the listed species, which support physical and biological features essential for survival and that may require special management considerations or protection. Critical habitat for the desert tortoise was designated in 1994, largely based on proposed DWMAs in the draft Recovery Plan. The ISEGS project is approximately 5 miles from the nearest desert tortoise critical habitat.

BLM provides management direction for species such as desert tortoise within the NEMO, which include five geographical areas of tortoise habitat in the planning area. These areas include an Ivanpah Valley and a North Ivanpah Valley area (BLM 2002), with the ISEGS project located within the Ivanpah Valley habitat area. Current designations for both Ivanpah areas are as Category III desert tortoise habitat (BLM 2002). Category III management goals are to limit tortoise habitat and population declines to the extent possible by mitigating impacts.

PERMITS/CONSULTATIONS REQUIRED

Construction of the project will likely require the following permits to achieve consistency with state and federal LORS:

- 2081 Permit for California Endangered Species Act of 1984 (Fish and Game Code, §2050 through 2098) for impacts to the threatened desert tortoise. No 2081 permit application has yet been submitted.
- Streambed Alteration Agreement (SAA), Fish and Game Code §1600, from the California Department of Fish and Game for impacts to state waters. No application for a SAA has yet been submitted.
- Section 7 Consultation with U.S. Fish and Wildlife Service (Endangered Species Act of 1973) for take of the threatened desert tortoise. A Biological Assessment is currently being revised by BLM in preparation for submittal to the USFWS and initiation of formal consultation (Sullivan 2008).
- Section 404 (Clean Water Act of 1977 [33 USC §1344]) from the U.S. Army Corps of Engineers for impacts to the ISEGS ephemeral drainages to Ivanpah Dry Lake. The USACOE is currently determining the jurisdictional status of the drainages and anticipates a decision by January or February of 2009 (Pankratz 2008). If the USACOE establishes that the ephemeral drainages are jurisdictional waters of the United States, an individual permit (rather than a Nationwide Permit) is likely to be required because of the extent of the impacts to waters. The 404 permit application is likely to require compensatory mitigation for unavoidable impacts to 198 acres of waters.
- Section 401 of Clean Water Act from the Lahontan Regional Quality Control. RWQCB will require 401 Certification for discharges into the ephemeral washes that drain to Ivanpah Dry Lake. No application has yet been submitted to the RWQCB (Dellavalle 2008). As with the 404 permit, compensatory mitigation is likely to be required for unavoidable impacts to state waters

Staff will work with closely and cooperatively with these permitting agencies, BLM, and the applicant to develop the impact avoidance, minimization, and compensation measures that are likely to be conditions of the permits. These permit conditions will be integrated with the conditions of certification recommended by staff in the Final Staff Assessment.

FACILITY CLOSURE

In the future, ISEGS will experience either a planned closure or be unexpectedly (either temporarily or permanently) closed. When facility closure occurs, it must be done in such a way as to protect the environment and public health and safety. A closure plan would be prepared by the project owner prior to any planned closure (BSE 2007a). To address unanticipated facility closure, an "on-site contingency plan" would be developed by the project owner, and approved by the Energy Commission Compliance Project Manager (CPM). Facility closure requirements are discussed in more detail in the **General Conditions** section of this preliminary staff assessment. Facility closure mitigation measures would also be included in BRMIMP prepared by the project owner and described in staff's Condition of Certification **BIO-7.**

The facility closure plan should address habitat restoration measures to be implemented in the event of a planned or an unexpected permanent closure, and must also include a funding mechanism to ensure sufficient funds are available for decommissioning and habitat restoration. Planned or unexpected permanent facility closure should address the removal of the transmission conductors since birds are known to collide with transmission line ground wires.

Conditions of Certification **BIO-14** and **BIO-19** contain measures that need to be implemented to ensure that impacts to biological resources are addressed prior to the planned permanent or unexpected permanent closure of the project.

CONCLUSIONS

Construction of the Ivanpah Solar Electric Generating System (ISEGS) project would result in significant direct and indirect impacts to biological resources of the Ivanpah Valley. Approximately 4065 acres of occupied desert tortoise habitat would be permanently lost, and a minimum of 25 desert tortoises would need to be moved to a location yet to be determined. In addition to direct loss of habitat, the project would fragment and degrade adjacent habitat, and could promote the spread of invasive non-native plants and desert tortoise predators such as ravens. Special-status wildlife species such as burrowing owl, loggerhead shrike, Crissal thrasher, golden eagle, and American badger would lose breeding and/or foraging habitat. Ten special-status plant species would be directly impacted by construction of ISEGS, and staff considers impacts to four of these (Rusby's desert-mallow, cave evening-primrose, Mojave milkweed, and desert pincushion) to be significant because the project would eliminate a substantial portion of the known range in the state. In the case of the California endemic Rusby's desert-mallow, the project would eliminate 11 percent of the known population in the world. The project would also affect approximately 2,000 ephemeral drainages on the ISEGS site, resulting in impacts to 198 acres of waters of the state. Staff considers the 4,065-acre ISEGS project would be a substantial contributor to the cumulatively significant loss of Ivanpah Valley's biological resources, including the threatened desert tortoise and other special-status species.

Impact avoidance and minimization measures described in staff's analysis and included in the conditions of certification below would help reduce impacts to sensitive biological

resources. However, these measures alone cannot offset project-related losses to less-than-significant levels without compensatory mitigation, nor can they assure compliance with state and federal laws such as the federal and state endangered species acts and sections 401 and 404 of the Clean Water Act.

The applicant has proposed to compensate for loss of desert tortoise habitat through habitat acquisition or an assessed financial contribution based on the final construction footprint at a 1:1 ratio (BSE 2007a, CH2M Hill 2008). This proposed mitigation is consistent with the BLM's guidance and policies for lands within the Northern and Eastern Mojave Planning Area that are not designated as Desert Wildlife Management Areas (BLM 2002). Presumably the applicant's proposed 1:1 mitigation would involve acquisition, protection, and enhancement of approximately 4,065 acres. The applicant has not specified the mechanism by which compensatory mitigation might occur, nor the location(s) or characteristics of potential acquisition lands.

Staff has concluded that the applicant's proposed mitigation, acquisition and enhancement of approximately 4,065 acres would be insufficient to avoid significant direct, indirect, and cumulative impacts to biological resources of the Ivanpah Valley, and fails to meet the state's full mitigation standard for desert tortoise. Staff also believes this proposed mitigation will be inadequate to compensate for cumulatively significant impacts to other special-status plant and animals inhabiting the project site or to offset permanent loss of waters of the state.

Staff proposes development of a compensatory mitigation approach that includes appropriate levels of habitat acquisition and enhancement, as well as funding for other agency-sponsored actions that would benefit desert tortoise and Mojave Desert plant and animal communities in the Ivanpah Valley. In addition to land acquisitions and actions to enhance desert tortoise survivorship and reproduction, the compensatory mitigation package must also include measures that would mitigate impacts to special-status plants and wildlife and to waters of the state.

Staff needs additional information to make a full analysis of the impacts of the ISEGS project and to develop appropriate mitigation measures. The most critical information needed is a compensatory mitigation and enhancement plan; a Desert Tortoise Translocation Plan; a Revegetation and Reclamation Plan; a complete project description that incorporates a comprehensive drainage, erosion and sediment control plan, a description of linear facility impacts and proposed future maintenance activities; and establishment of a funding mechanism for the facilities closure plan. Staff will work closely and cooperatively with BLM, CDFG, USFWS, and the applicant to develop these plans and to establish conditions of certification that would reduce impacts of the ISEGS project to less-than-significant levels.

PROPOSED CONDITIONS OF CERTIFICATION

DESIGNATED BIOLOGIST SELECTION

BIO-1 The project owner shall assign a Designated Biologist to the project. The project owner shall submit the resume of the proposed Designated Biologist, with at least three references and contact information, to the Energy

Commission Compliance Project Manager (CPM) for approval in consultation with CDFG and USFWS.

The Designated Biologist must meet the following minimum qualifications:

- Bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field; and
- Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society; and
- At least one year of field experience with biological resources found in or near the project area.

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

Verification: The project owner shall submit the specified information at least 90 days prior to the start of any project-related site disturbance activities. No site or related facility activities shall commence until an approved Designated Biologist is available to be on site.

If a Designated Biologist needs to be replaced, the specified information of the proposed replacement must be submitted to the CPM at least ten working days prior to the termination or release of the preceding Designated Biologist. In an emergency, the project owner shall immediately notify the CPM to discuss the qualifications and approval of a short-term replacement while a permanent Designated Biologist is proposed to the CPM for consideration.

DESIGNATED BIOLOGIST DUTIES

BIO-2 The project owner shall ensure that the Designated Biologist performs the following during any site (or related facilities) mobilization, ground disturbance, grading, construction, operation, and closure activities. The Designated Biologist may be assisted by the approved Biological Monitor(s) but remains the contact for the project owner and CPM. The Designated Biologist Duties shall include the following:

a. Advise the project owner's Construction and Operation Managers on the implementation of the biological resources conditions of certification;

b. Consult on the preparation of the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) to be submitted by the project owner;

c. Be available to supervise, conduct and coordinate mitigation, monitoring, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as special-status species or their habitat;

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

e. Inspect active construction areas where animals may have become trapped prior to construction commencing each day. At the end of the day, inspect for the installation of structures that prevent entrapment or allow escape during periods of construction inactivity. Periodically inspect areas with high vehicle activity (e.g., parking lots) for animals in harm's way;

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

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

h. Maintain written records of the tasks specified above and those included in the BRMIMP. Summaries of these records shall be submitted in the Monthly Compliance Report and the Annual Compliance Report;

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

j. Maintain the ability to be in regular, direct communication with representatives of CDFG, USFWS, and BLM.

Verification: The Designated Biologist shall submit in the Monthly Compliance Report to the CPM copies of all written reports and summaries that document biological resources activities. If actions may affect biological resources during operation a Designated Biologist shall be available for monitoring and reporting. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report unless their duties cease, as approved by the CPM.

BIOLOGICAL MONITOR QUALIFICATIONS

BIO-3 The project owner's CPM-approved Designated Biologist shall submit the resume, at least three references, and contact information of the proposed Biological Monitors to the CPM for approval in consultation with CDFG, USFWS, and BLM. The resume shall demonstrate, to the satisfaction of the CPM, the appropriate education and experience to accomplish the assigned biological resource tasks.

Biological Monitors involved in any aspect of desert tortoise surveys or handling must have a minimum of 60 days field experience with this species. Biological Monitors must: (1) be familiar with the USFWS-approved handling protocol (Desert Tortoise Council 1994, revised 1999, or more current guidance approved by the USFWS Desert Tortoise Recovery Office); (2) demonstrate thorough, current knowledge of desert tortoise biology (behavior, natural history, ecology, physiology) and, (3) have sufficient field experience and training to safely and successfully conduct the following activities:

- handle and temporarily hold desert tortoises
- excavate burrows to locate desert tortoise or eggs
- relocate/translocate desert tortoises
- reconstruct desert tortoise burrows
- unearth and relocate desert tortoise eggs
- locate, identify, and record desert tortoise sign

Biological Monitor(s) training by the Designated Biologist shall include familiarity with the conditions of certification, BRMIMP, WEAP, and all permits.

Verification: The project owner shall submit the specified information to the CPM for approval at least 30 days prior to the start of any project-related site disturbance activities. The Designated Biologist shall submit a written statement to the CPM confirming that individual Biological Monitor(s) have been trained including the date when training was completed. If additional biological monitors are needed during construction the specified information shall be submitted to the CPM for approval at least ten days prior to their first day of monitoring activities.

Biological Monitors involved in any aspect of desert tortoise surveys or handling shall complete a USFWS Qualifications Form and submit it to the USFWS and CPM within 60 days prior to ground breaking for review and final approval.

BIOLOGICAL MONITOR DUTIES

BIO-4 The Designated Biologist shall ensure that the Biological Monitors perform the following during any site (or related facilities) mobilization, ground disturbance, grading, construction, operation, and closure activities. The Designated Biologist may be assisted by the approved Biological Monitor(s), but remains the contact for the project owner and CPM.

Biological Monitors shall be or any aspect of desert tortoise surveys or handling would provide oversight to ensure proper implementation of protective measures, record and report desert tortoise and sign observations in accordance with approved protocol, report incidents of noncompliance, and move desert tortoises from harm's way and place these animals in "safe areas" pre-selected by the Designated Biologist or maintain the desert tortoises in their immediate possession until the Designated Biologist assumes care of the animal. A Biological Monitor(s) must be present during any activities with the potential to result in the take of desert tortoise.

Verification: The Designated Biologist shall submit in the Monthly Compliance Report to the CPM copies of all written reports and summaries that document biological resources activities. If actions may affect biological resources during operation a Designated Biologist shall be available for monitoring and reporting. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report unless their duties cease, as approved by the CPM.

DESIGNATED BIOLOGIST AND BIOLOGICAL MONITOR AUTHORITY

BIO-5 The project owner's construction/operation manager shall act on the advice of the Designated Biologist and Biological Monitor(s) to ensure conformance with the biological resources conditions of certification.

If required by the Designated Biologist and Biological Monitor(s) the project owner's construction/operation manager shall halt all site mobilization, ground disturbance, grading, construction, and operation activities in areas specified by the Designated Biologist.

The Designated Biologist shall:

1. Require a halt to all activities in any area when determined that there would be an unauthorized adverse impact to biological resources if the activities continued;

2. Inform the project owner and the construction/operation manager when to resume activities; and

3. Notify the CPM if there is a halt of any activities and advise the CPM of any corrective actions that have been taken or will be instituted as a result of the work stoppage.

If the Designated Biologist is unavailable for direct consultation, the Biological Monitor shall act on behalf of the Designated Biologist.

Verification: The project owner shall ensure that the Designated Biologist or Biological Monitor notifies the CPM immediately (and no later than the morning following the incident, or Monday morning in the case of a weekend) of any non-compliance or a halt of any site mobilization, ground disturbance, grading, construction, and operation activities. The project owner shall notify the CPM of the circumstances and actions being taken to resolve the problem.

Whenever corrective action is taken by the project owner, a determination of success or failure will be made by the CPM within five working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

BIO-6 The project owner shall develop and implement an Ivanpah SEGS-specific Worker Environmental Awareness Program (WEAP) and shall secure approval for the WEAP from BLM, USFWS, CDFG, and the CPM. The WEAP shall be administered to all onsite personnel including surveyors, construction engineers, employees, contractors, contractor’s employees, supervisors, inspectors, subcontractors, and delivery personnel. The WEAP shall be implemented during site mobilization, ground disturbance, grading, construction, operation, and closure. The WEAP shall:

a. Be developed by or in consultation with the Designated Biologist and consist of an on-site or training center presentation in which supporting written material and electronic media is made available to all participants;

b. Discuss the locations and types of sensitive biological resources on the project site and adjacent areas, and explain the reasons for protecting these resources;

c. Place special emphasis on desert tortoise, including information on physical characteristics, distribution, behavior, ecology, sensitivity to human activities, legal protection, penalties for violations, reporting requirements, and protection measures.

d. Include a discussion of fire prevention measures to be implemented by workers during project activities.

e. Present the meaning of various temporary and permanent habitat protection measures;

f. Identify whom to contact if there are further comments and questions about the material discussed in the program; and

g. Include a training acknowledgment form to be signed by each worker indicating that they received training and shall abide by the guidelines.

The specific program can be administered by a competent individual(s) acceptable to the Designated Biologist.

Verification: At least 60 days prior to the start of any project-related site disturbance activities, the project owner shall provide to the CPM a copy of the draft WEAP and all supporting written materials and electronic media prepared or reviewed by the Designated Biologist and a resume of the person(s) administering the program.

The project owner shall provide in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date. At least ten days prior to site and related facilities mobilization, the project owner shall submit two copies of the CPM-approved final WEAP.

Training acknowledgement forms signed during construction shall be kept on file by the project owner for at least six months after the start of commercial operation.

During project operation, signed statements for operational personnel shall be kept on file for six months following the termination of an individual's employment.

BIOLOGICAL RESOURCES MITIGATION IMPLEMENTATION AND MONITORING PLAN (BRMIMP)

BIO-7 The project owner shall develop a BRMIMP and submit two copies of the proposed BRMIMP to the CPM (for review and approval) and shall implement the measures identified in the approved BRMIMP. The BRMIMP shall

incorporate avoidance and minimization measures described in final versions of the Desert Tortoise Translocation Plan, the Raven Management Plan, the Revegetation and Reclamation Plan, the Burrowing Owl Mitigation and Monitoring Plan, Closure Plan, and the Weed Management Plan.

The BRMIMP shall be prepared in consultation with the Designated Biologist and shall and shall include the following:

1. All biological resources mitigation, monitoring, and compliance measures proposed and agreed to by the project owner;

2. All biological resources conditions of certification identified as necessary to avoid or mitigate impacts;

3. All biological resource mitigation, monitoring and compliance measures required in federal agency terms and conditions, such as those provided in the USFWS Biological Opinion and the US Army Corps of Engineers 404 permit, if this permit is required;

4. All biological resources mitigation, monitoring and compliance measures required in other state agency terms and conditions, such as those provided in the permits or agreements with CDFG and RWQCB;

5. All sensitive biological resources to be impacted, avoided, or mitigated by project construction, operation, and closure;

6. All required mitigation measures for each sensitive biological resource;

7. A detailed description of measures that shall be taken to avoid or mitigate temporary disturbances from construction activities;

8. All locations on a map, at an approved scale, of sensitive biological resource areas subject to disturbance and areas requiring temporary protection and avoidance during construction;

9. Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities; include one set <u>prior</u> to any site or related facilities mobilization disturbance and one set <u>subsequent</u> to completion of project construction. Provide planned timing of aerial photography and a description of why times were chosen. Provide a final accounting of the before/after acreages and a determination of whether additional habitat compensation is necessary in the Construction Termination Report;

10. Duration for each type of monitoring and a description of monitoring methodologies and frequency;

11. Performance standards to be used to help decide if/when proposed mitigation is or is not successful;

12. All performance standards and remedial measures to be implemented if performance standards are not met;

13. A discussion of biological resources-related facility closure measures including a description of funding mechanism(s);

14. A process for proposing plan modifications to the CPM and appropriate agencies for review and approval; and

15. Copies of all biological resources-related permits obtained.

Verification: The project owner shall submit the BRMIMP to the CPM at least 60 days prior to start of any project-related site disturbance activities. The BRMIMP shall contain all of the required measures included in all biological Conditions of Certification. No ground disturbance may occur prior to the CPM's approval of the final BRMIMP.

The CPM, in consultation with other appropriate agencies, will determine the BRMIMP's acceptability within 45 days of receipt. If there are any permits that have not yet been received when the BRMIMP is first submitted, these permits shall be submitted to the CPM within five days of their receipt, and the BRMIMP shall be revised or supplemented to reflect the permit condition within at least ten days of their receipt by the project owner. Ten days prior to site and related facilities mobilization the revised BRMIMP shall be resubmitted to the CPM.

The project owner shall notify the CPM no less than five working days before implementing any modifications to the approved BRMIMP to obtain CPM approval.

Any changes to the approved BRMIMP must also be approved by the CPM in consultation with appropriate agencies to ensure no conflicts exist.

Implementation of BRMIMP measures (construction activities that were monitored, species observed) will be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the project's site mobilization, ground disturbance, grading, and construction phases, and which mitigation and monitoring items are still outstanding.

DESERT TORTOISE CLEARANCE SURVEYS AND FENCING

BIO-8 The project owner shall undertake appropriate measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to desert tortoise. Methods for clearance surveys, fence installation, tortoise handling, artificial burrow construction, egg handling and other procedures would be consistent with those described in the Guidelines for Handling Desert Tortoise during Construction Projects (Desert Tortoise Council 1994) or more current guidance provided by USFWS. These measures would include the following:

1. Within 24 hours prior to the initiation of construction of tortoise-exclusion fence, Biological Monitors would survey for desert tortoises and their burrows using techniques approved by the USFWS and CDFG. These surveys shall provide 100-percent coverage of all areas to be disturbed and an additional transect along both sides of the fence line. This fence line transect will cover an area approximately 90 feet wide centered on the fence alignment. Transects would be no greater than 30 feet apart. The fence alignment would be flagged prior to the biological survey. Two complete passes of complete coverage shall be conducted. All desert tortoise burrows, and burrows constructed by other species that might be used by desert tortoises, would be examined to determine occupancy of each burrow by desert tortoises and handled in accordance with USFWS - approved protocol.

2. Prior to the initiation of construction activities for each solar plant, the project owner shall enclose the boundary of the affected solar plant with permanent chain-link fencing for security purposes and permanent desert tortoise exclusionary fencing would be attached to the bottom of the chain link fencing.

    a. The exclusion fencing would be installed prior to the onset of clearing and grubbing. The fence installation would be supervised by the Designated Biologist and monitored by the Biological Monitors.

    b. The permanent tortoise exclusionary fencing shall consist of galvanized hard wire cloth l-cm mesh sunk 15 cm into the ground (USFWS 2008). The fencing would be buried approximately 6 inches below ground or bent at a right angle towards the outside of the solar plants and covered with dirt, rocks or gravel to discourage the tortoise from digging under the fence

    c. Security gates would provide minimal ground clearance to deter ingress by tortoises. The gates may be electronically activated to open and close immediately after the vehicle(s) have entered or exited. This would prevent the gates from being kept open for long periods of time, which may lead to a tortoise entering. Cattle grating would be installed at the gated entries to discourage tortoises from gaining entry

    d. The utility rights-of-way would be temporarily fenced on each side of the right-of-way. The temporary exclusionary fencing would consist of galvanized hard wire cloth or silt fencing.

    e. Any damage to the permanent fencing would be repaired immediately. Following installation, the permanent fencing would be inspected yearly and after major rainfall events.

3. Following construction of the security and attached tortoise exclusion fence, the fenced area would be cleared of tortoises by Biological Monitors under the supervision of the Designated Biologist. Two complete passes

with complete coverage shall be conducted as described above. If a desert tortoise is located on the second survey, a third survey would be conducted. Transects would be no wider than 30 feet. Each separate survey would be walked in a different direction to allow opposing angles of observation. Once the area surveyed is deemed free of desert tortoises the areas may be open to a vegetation salvage program, if BLM desires.

4. All potential desert tortoise burrows within the fenced area would be searched for presence. In some cases, a fiber optic scope may be needed to determine presence or absence within a deep burrow. Burrows inhabited by tortoises would be excavated by Biological Monitors using hand tools under the supervision of the Designated Biologist. To prevent reentry by a tortoise or other wildlife, all burrows would be collapsed once absence has been determined. Tortoises excavated from burrows would be relocated to unoccupied natural or artificial burrows immediately following excavation in an area approved by the Designated Biologist.

5. All potential desert tortoise burrows located would be excavated by hand by a Biological Monitor, tortoises removed, and collapsed or blocked to prevent occupation by desert tortoises. If excavated during May through July, the Biological Monitor would search for desert tortoise nests/eggs, which are typically located near the entrance to burrows. All desert tortoise handling and removal, and burrow excavations, including nests, would be conducted by a Biological Monitor in accordance with the Service-approved protocol (Desert Tortoise Council 1994, revised 1999). If the Desert Tortoise Council releases a revised protocol for handling of desert tortoises before initiation of project activities, the revised protocol would be implemented for the project.

6. Following the tortoise clearance and translocation and vegetation salvage, heavy equipment would be allowed to enter the project site to perform earth work such as clearing, grubbing, leveling, and trenching. A Biological Monitor would monitor initial clearing and grading activities to find and move tortoises missed during the initial tortoise clearance survey. Should a tortoise be discovered, it would be relocated to an area approved by the Designated Biologist. Any pre-activity tortoise surveys for other construction areas would be performed within 72 hours of ground disturbing activities.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented. Implementation of the measures will be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report identifying how measures have been completed.

DESERT TORTOISE TRANSLOCATION PLAN

BIO-9 The project owner shall develop and implement a Desert Tortoise Translocation Plan (Plan) that is consistent with current USFWS approved

guidelines, and meets the approval of USFWS, CDFG, BLM, and the Energy Commission staff. The Plan shall designate a translocation site as close as possible to the ISEGS, and which provides suitable conditions for long-term survival of the relocated desert tortoise. The Plan shall also incorporate the most recent Best Management Practices (BMPs), which are now under development by the USFWS Desert Tortoise Recovery Office.

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM and BLM with the final version of a Translocation Plan that has been reviewed and approved by USFWS, BLM, and CDFG. The CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved translocation must be made only after consultation the Energy Commission CPM, BLM, USFWS, and CDFG. The project owner shall notify the CPM no fewer than 5 working days before implementing any CPM-approved modifications to the Translocation Plan.

Within 30 days after initiation of translocation activities, the Designated Biologist shall provide to the CPM for review and approval, a written report identifying which items of the Translocation Plan have been completed, and a summary of all modifications to measures made during implementation of the Plan.

DESERT TORTOISE COMPLIANCE VERIFICATION

BIO-10 The project owner shall provide Energy Commission and BLM representatives with reasonable access to the project site and mitigation lands under the control of the project owner and shall otherwise fully cooperate with the Energy Commission's and BLM's efforts to verify the project owner's compliance with, or the effectiveness of, mitigation measures set forth in the conditions of certification. The project owner shall hold the Designated Biologist, the Energy Commission, and BLM harmless for any costs the project owner incurs in complying with the management measures, including stop work orders issued by the CPM, BLM, or the Designated Biologist. The Designated Biologist shall do all of the following:

1. Notify the CPM and BLM at least 14 calendar days before initiating ground-disturbing activities;

2. Immediately notify the CPM and BLM in writing if the project owner is not in compliance with any conditions of certification, including but not limited to any actual or anticipated failure to implement mitigation measures within the time periods specified in the conditions of certification;

3. Remain onsite daily while grubbing and grading are taking place to avoid or minimize take of listed species, to check for compliance with all impact avoidance and minimization measures, and to check all exclusion zones to ensure that signs, stakes, and fencing are intact and that human activities are restricted in these protective zones.

4. Maintain and check desert tortoise exclusion fences on a daily basis to ensure the integrity of the fence is maintained. The Designated Biologist

shall be present onsite to monitor construction and determine fence placement during fence installation.

5. Conduct compliance inspections at a minimum of once per month after clearing, grubbing, and grading are completed and submit a monthly compliance report to the CPM and BLM's Needles office;

6. No later than January 31 of every year the ISEGS facility remains in operation, provide the CPM and BLM an annual Listed Species Status Report, which shall include, at a minimum: 1) a general description of the status of the project site and construction activities, including actual or projected completion dates, if known; 2) a copy of the table in the BRMIMP with notes showing the current implementation status of each mitigation measure; and 3) an assessment of the effectiveness of each completed or partially completed mitigation measure in minimizing and compensating for project impacts;

7. Ensure that all observations of listed species and their sign during project activities are reported to the Designated Biologist for inclusion in the next monthly compliance report submitted to the CPM and BLM;

8. No later than 45 days after the first firing of fuel in the project's equipment, provide the CPM and BLM a Final Listed Species Mitigation Report that shall include, at a minimum: 1) a copy of the table in the BRMIMP with notes showing when each of the mitigation measures was implemented; 2) all available information about project-related incidental take of listed species; 3) information about other project impacts on the listed species; 4) construction dates; 5) an assessment of the effectiveness of conditions of certification in minimizing and compensating for project impacts; 6) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the listed species; and 7) any other pertinent information, including the level of take of the listed species associated with the project;

9. In the event of a sighting in an active construction area (e.g., with equipment, vehicles, or workers), injury, kill, or relocation of any listed species, notify the CPM, BLM, and USFWS immediately by phone and in no event later than noon on the business day following the event if it occurs outside normal business hours so that the agencies can determine what further actions, if any, are required to protect listed species;

10. Prepare written follow-up notification via FAX or electronic communication to these agencies within 2 calendar days of the incident and include the following information as relevant:

    a. If a desert tortoise is injured as a result of project related activities during construction, the Designated Biologist will immediately take it to a BLM-approved wildlife rehabilitation and/or veterinarian clinic. Any veterinarian bills for such injured animals will be paid by the project owner. Following phone notification as required above, the CPM, BLM,

and USFWS will determine the final disposition of the injured animal, if it recovers. Written notification shall include, at a minimum, the date, time, location, circumstances of the incident, and the name of the facility where the animal was taken.

b. If a desert tortoise is killed by project-related activities during construction, or if a desert tortoise is otherwise found dead, submit a written report with the same information as an injury report. These desert tortoises shall be salvaged according to guidelines described in *Salvaging Injured, Recently Dead, Ill, and Dying Wild, Free-Roaming Desert Tortoise* prepared by Kristin Berry, June 2001. The project owner shall pay to have these desert tortoises necropsied. The report will include the date and time of the finding or incident.

c. The CPM may issue the project owner a written stop work order to suspend any activity related to the construction or operation of the project for an appropriate period determined in consultation with BLM in order to prevent or remedy a violation of one or more conditions of certification (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. The project owner shall comply with the stop work order immediately upon receipt thereof.

Verification: No later than 2 calendar days following the above required notification of a sighting, kill, or relocation of a listed species, the project owner shall deliver to the CPM, BLM, CDFG, and USFWS via FAX or electronic communication the written report from the Designated Biologist describing all reported incidents of injury, kill, or relocation of a listed species, identifying who was notified, and explaining when the incidents occurred. In the case of a sighting in an active construction area, the project owner shall, at the same time, submit a map (e.g., using Geographic Information Systems) depicting both the limits of construction and sighting location to the CPM, BLM, and USFWS.

IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-11 Any time the project owner modifies or finalizes the project design they shall incorporate all feasible measures that avoid or minimize impacts to the local biological resources, including the following:

1. The boundaries of all areas to be disturbed shall be flagged before beginning construction activities, and all disturbances, project vehicles and equipment shall be confined to the flagged areas. Survey crew vehicles would remain on existing roads.

2. Design, install and maintain transmission line poles, access roads, pulling sites, and storage and parking areas to avoid identified sensitive resources, including rare plant populations adjacent to linear facilities.

3. Design, install, and maintain transmission lines and all electrical components in accordance with the Avian Power Line Interaction Committee's (APLIC) Suggested *Practices for Avian Protection on Power Lines: The State of the Art in 2006* to reduce the likelihood of electrocutions of large birds,

4. Design, install, and maintain transmission lines and all electrical components in accordance with the APLIC *Mitigating Bird Collisions with power lines: The State of the Art in 1994* to reduce the likelihood of bird collisions.

5. Prescribe a road surfacing and sealant as well as soil bonding and weighting agents to non-paved surfaces that are non-toxic to wildlife and plants.

6. Design, install, and maintain facility lighting to prevent side casting of light towards wildlife habitat. To minimize risk of avian collisions with the heliostat towers, use only flashing or strobe lights on these towers.

7. Concurrent with the desert tortoise clearance survey, Biological Monitors shall perform a preconstruction survey for badger dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads. If badger dens are found, each den will be classified as inactive, potentially active, or definitely active. Inactive dens will be excavated by hand and backfilled to prevent reuse by badgers. Potentially and definitely active dens will be monitored by the Biological Monitor for three consecutive nights using a tracking medium (such as diatomaceous earth or fire clay) at the entrance. If no tracks are observed in the tracking medium after 3 nights, the den will be excavated and backfilled by hand. If tracks are observed, the den will be progressively blocked with natural materials (rocks, dirt, sticks, and vegetation piled in front of the entrance) for the next 3 to 5 nights to discourage the badger from continued use. The den will then be excavated and backfilled by hand to ensure that no badgers are trapped in the den. This will be performed outside of the breeding season to ensure young are not affected.

8. If a Gila monster is encountered during clearance surveys or during construction, the Designated Biologist shall capture and maintain it in a cool (<85 degrees F) environment until it can be released to a safe, suitable area beyond the construction impact zone. The Designated Biologist shall coordinate with BLM and CDFG biologists in the transport and relocation of any Gila monsters encountered during project surveys, construction, or operation.

9. Any time a vehicle or construction equipment is parked in desert tortoise habitat outside the permanently fenced area, the ground under the vehicle shall be inspected for the presence of desert tortoise before it is moved. If a desert tortoise is observed, it will be left to move on its own. If

it does not move within 15 minutes, a Biological Monitor may remove and relocate the animal to a safe location.

10. At the end of each work day, the Designated Biologist would ensure that trenches, bores and other excavations outside the permanently fenced area that constitute wildlife pitfalls would either be immediately backfilled, sloped at a 3:1 ratio at the ends to provide wildlife escape ramps, covered, or fully enclosed with fencing to prevent any entrapment. All excavations outside the permanently fenced area would be inspected periodically throughout and at the end of each workday by the Designated Biologist or a Biological Monitor. Should a tortoise become entrapped, the Designated Biologist or Biological Monitor will remove and relocate the tortoise to a safe location.

11. Any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches aboveground and within desert tortoise habitat (i.e., outside the permanently fenced area) for one or more nights, would be inspected for tortoises before the material is moved, buried or capped. As an alternative, all such structures may be capped before being stored outside the fenced area, or placed on pipe racks. These materials would not need to be inspected or capped if they are stored within the permanently fenced area after the clearance surveys have been completed.

12. Water applied to construction areas and dirt roads for dust abatement shall use the minimal amount needed to meet safety and air quality standards in an effort to prevent the formation of puddles, which could attract desert tortoises and common ravens to construction sites.

13. All vehicles and equipment would be maintained in proper working condition to minimize the potential for fugitive emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Designated Biologist would be informed of any hazardous spills immediately as directed in the project Hazardous Materials Plan. Hazardous spills would be immediately cleaned up and the contaminated soil would be properly disposed of at a licensed facility.

14. All fuel, transmission or brake fluid leaks, or other hazardous waste leaks, spills or releases shall be reported immediately. The project proponent shall be responsible for spill material removal and disposal to an approved offsite landfill. Servicing of construction equipment would take place only at a designated area. All fuel or hazardous waste leaks, spills, or releases would be stopped or repaired immediately and cleaned up at the time of occurrence. Service/maintenance vehicles would carry a bucket and pads to absorb leaks or spills.

15. Dispose of all trash and food-related items in self-closing containers and remove from the project site at least once a week.

16. Workers shall not feed wildlife, or bring pets to the project site. Except for law enforcement personnel, no workers or visitors to the site shall bring firearms or weapons.

17. Vehicular traffic shall be confined to existing routes of travel to and from the project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited. The speed limit when traveling on Colosseum Road and other dirt access routes within desert tortoise habitat shall not exceed 20 miles per hour.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented. Implementation of the measures will be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report identifying how measures have been completed.

RAVEN MANAGEMENT PLAN

BIO-12 The project owner shall implement a Raven Management Plan that is consistent with the most current USFWS-approved raven management guidelines, and which meets the approval of USFWS, CDFG, BLM, and the Energy Commission staff. The draft Raven Management Plan submitted by the applicant (CH2M Hill 2008f) shall provide the basis for the final plan, subject to review and revisions from USFWS, CDFG, BLM, and the Energy Commission staff.

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM, USFWS, CDFG, and BLM with the final version of a Raven Management Plan that has been reviewed and approved by USFWS and CDFG. The CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Raven Management Plan must be made only after consultation the Energy Commission staff, BLM, USFWS, and CDFG. The project owner shall notify the CPM no less than 5 working days before implementing any CPM-approved modifications to the Raven Management Plan.

Within 30 days after completion of project construction, the project owner shall provide to the CPM for review and approval, a written report identifying which items of the Raven Management Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

WEED MANAGEMENT PLAN

BIO-13 The project owner shall implement a Weed Management Plan that meets the approval of BLM and the Energy Commission staff/CPM. The draft Weed Management Plan submitted by the applicant (CH2M Hill 2008e) shall provide the basis for the final plan, subject to review and revisions from USFWS, CDFG, BLM, and the Energy Commission staff/CPM. In addition to describing weed eradication and control methods, and a reporting plan for weed management during and after construction, the final Weed Management Plan

shall include at least the following Best Management Practices to prevent the spread and propagation of noxious weeds:

1. Limit the size of any vegetation and/or ground disturbance to the absolute minimum, and limit ingress and egress to defined routes.

2. Maintain vehicle wash and inspection stations and closely monitor the types of materials brought onto the site.

3. Reestablish vegetation quickly on disturbed sites.

4. Monitoring and rapid implementation of control measures to ensure early detection and eradication for weed invasions.

5. Use only weed-free straw or hay bales used for sediment barrier installations, and weed-free seed.

6. Reclamation and revegetation shall occur on all temporarily disturbed areas, including pipelines, transmission lines, and staging areas.

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM and BLM with the final version of a Weed Management Plan that has been reviewed and approved by BLM, USFWS, and CDFG. The CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Translocation must be made only after consultation with the Energy Commission staff, BLM, USFWS, and CDFG. The project owner shall notify the CPM no less than 5 working days before implementing any CPM-approved modifications to the Weed Management Plan.

Within 30 days after completion of project construction, the project owner shall provide to the CPM for review and approval, a written report identifying which items of the Weed Management Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

REVEGETATION AND RECLAMATION PLAN

BIO-14 The project owner shall develop and implement a Revegetation and Reclamation Plan in cooperation with BLM and the Energy Commission staff to guide site restoration and closure activities, including methods proposed for revegetation of disturbed areas immediately following construction. This plan must address preconstruction salvage and relocation of succulent vegetation from the site to either an onsite or nearby nursery facility for study and propagation of seed sources to reclaim the disturbed area. In the case of unexpected closure, the plan should assume restoration activities could possibly take place prior to the anticipated lifespan of the plant. The project owner has prepared an outline of the draft Revegetation and Reclamation Plan (CH2M Hill 2008b) which shall form the basis for the final plan. Specifically the closure and restoration plan must address the following:

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM and BLM with the final version of a Revegetation and Reclamation Plan that has been reviewed and approved by BLM, CDFG, and the Energy Commission staff. The CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Revegetation and Reclamation Plan must be made only after consultation the Energy Commission staff, BLM, and CDFG. The project owner shall notify the CPM no less than 5 working days before implementing any CPM-approved modifications to the Revegetation and Reclamation Plan.

Within 30 days after completion of project construction, the project owner shall provide to the CPM for review and approval, a written report identifying which items of the Revegetation and Reclamation Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

PRE-CONSTRUCTION NEST SURVEYS

BIO-15 Pre-construction nest surveys shall be conducted if construction activities will occur from February 1 through August 31. The Designated Biologist or Biological Monitor shall perform surveys in accordance with the following guidelines:

1. Surveys shall cover all potential nesting habitat in the project site or within 500 feet of the boundaries of the site and linear facilities;

2. At least two pre-construction surveys shall be conducted, separated by a minimum 10-day interval. One of the surveys needs to be conducted within the 14-day period preceding initiation of construction activity. Additional follow-up surveys may be required if periods of construction inactivity exceed three weeks, an interval during which birds may establish a nesting territory and initiate egg laying and incubation;

3. If active nests are detected during the survey, a buffer zone (protected area surrounding the nest, the size of which is to be determined by the Designated Biologist in consultation with CDFG) and monitoring plan shall be developed. Nest locations shall be mapped and submitted, along with a report stating the survey results, to the CPM; and

4. The Designated Biologist shall monitor the nest until he or she determines that nestlings have fledged and dispersed; activities that might, in the opinion of the Designated Biologist, disturb nesting activities, shall be prohibited within the buffer zone until such a determination is made.

Verification: At least 10 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM a letter-report describing the findings of the pre-construction nest surveys, including the time, date, and duration of the survey; identity and qualifications of the surveyor (s); and a list of species observed. If active nests are detected during the survey, the report shall include a map or aerial photo identifying the location of the nest and shall depict the boundaries of the no-disturbance buffer zone around the nest.

BURROWING OWL IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-16 The project owner shall implement the following measures for the burrowing owl:

1. Complete a pre-construction survey for burrowing owls for any areas subject to disturbance from construction no less than 30 days prior to the start of initial ground disturbance activities. If burrowing owls are present within 500 feet of the project site or linear facilities, then the CDFG burrowing owl guidelines (1995) shall be implemented;

2. Monitor burrowing owl pairs within 500 feet of any activities that exceed ambient noise and/or vibration levels;

3. Establish a 500-foot set back from any active burrow and construct additional noise/visual barriers (e.g., haystacks or plywood fencing) to shield the active burrow from construction activities. Post signs (in both English and Spanish) designating presence of sensitive area;

4. Passively relocate all owls occupying burrows that will be temporarily or permanently impacted by the project and implement the following CDFG take avoidance measures:

   a. Occupied burrows shall not be disturbed during the nesting season (February 1 – August 31) unless a qualified biologist can verify through non-invasive methods that egg laying/incubation has not begun or juveniles are foraging independently and able to fly;

   b. A qualified biologist must relocate owls, confirm that owls have left burrows prior to ground-disturbing activities, and monitor the burrows. Once evacuation is confirmed, the biologist should hand excavate burrows and then fill burrows to prevent reoccupation; and

   c. Relocation of owls shall be approved by and conducted in consultation with CDFG.

5. Submit a Burrowing Owl Mitigation and Monitoring Plan to CDFG for review and approval prior to relocation of owls (and incorporate it into the project's BRMIMP) as well as a construction termination report with results to CDFG and CPM 30 days after completing owl relocation and monitoring and at least 30 days prior to the start of commercial operation.

Verification: The project owner shall submit a report to CDFG, USFWS, and the CPM at least 30 days prior to the start of any project-related site disturbance activities that describes when surveys were completed, observations, mitigation measures, and the results of the mitigation. If burrowing owls are to be relocated, the project owner shall coordinate with and report to CDFG on the number of new burrows to be created, their locations, and how any created burrows/individuals and compensation land will be protected for the life of the project in a Burrowing Owl Mitigation and Monitoring Plan. Within 30 days after completion of owl relocation and monitoring, and the start of ground disturbance **or** at least 90 days prior to the sale of power, the project owner shall

provide to the CDFG and CPM a written construction termination report identifying how measures have been completed.

COMPENSATORY MITIGATION PLAN

BIO-17 To compensate for significant direct, indirect, and cumulative impacts to desert tortoise, loss of habitat for special-status plant and animal species, and impacts to waters of the state, the applicant shall implement a compensatory mitigation plan developed in cooperation with USFWS, CDFG, BLM, and the Energy Commission staff. This plan shall include appropriate levels of habitat acquisition and enhancement, as well as funding for other agency-sponsored actions that would benefit desert tortoise and Mojave Desert plant and animal communities in the Ivanpah Valley. In addition to land acquisitions and actions to enhance desert tortoise survivorship and reproduction, the compensatory mitigation plan package would also need to include measures that would mitigate impacts to other special-status plants and wildlife and to waters of the state to less than significant levels.

Verification: No later than 12 months following the publication of the Energy Commission Decision, the project owner will provide written verification to the CPM that the Compensatory Mitigation Plan has been completed. At the same time, the project owner will provide a certified check for the endowment and for initial protection and restoration activities, if required, to an approved third party and written verification to the CPM that the check has been provided. Within six months of the land purchase (as determined by the date on title), the project owner shall provide the CPM a management plan for the habitat compensation lands and associated funds for review and approval in consultation with CDFG.

Within 90 days after completion of project construction, the project owner shall provide the CPM aerial photographs taken after construction and an analysis of the amount of any habitat disturbance additional to that identified in this staff assessment. The CPM will notify the project owner of any additional funds required to compensate for any additional habitat disturbances at the adjusted market value at the time of construction to acquire and manage habitat.

STATE AND FEDERAL PERMITS

BIO–18 The project owner shall implement all terms and conditions described in the state and federal permits issued for this project, including a CDFG Lake and Streambed Alteration Agreement, CDFG Incidental Take Permit, 401 permit from Lahontan Regional Water Quality Control Board, a 404 permit from U.S. Army Corps of Engineers (if required), and shall incorporate these measures within the BRMIMP.

Verification: All terms and conditions described in the CDFG Streambed Alteration Agreement shall be included in the BRMIMP. Implementation of these terms and conditions will be described in the Monthly Compliance Reports and provided to the CPM. Within thirty 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report describing how permit conditions have been satisfied.

CLOSURE PLAN MEASURES

BIO-19 The project owner shall implement and incorporate into the facility closure plan measures to address the local biological resources related to facility closure. A funding mechanism shall be developed in consultation with the BLM and Energy Commission staff to ensure sufficient funds are available for revegetation, reclamation, and decommissioning. The facility closure plan shall address biological resources-related mitigation measures. In addition to these measures, the plan must include the following:

1. Removal of transmission conductors when they are no longer used and useful;

2. Removal of all above ground and subsurface power plant site facilities and related facilities;

3. Methods for restoring wildlife habitat and promoting the re-establishment of native plant and wildlife species;

4. Re-vegetation of the project site and other disturbed areas utilizing appropriate seed mixture;

5. Criteria that would trigger implementation of the plan (e.g., non-operational for one year or greater); and

6. A cost estimate to complete closure-related activities.

In addition, the project owner shall secure funding to ensure implementation of the plan and provide to the CPM written evidence of the dedicated funding mechanism(s).

Verification: At least 12 months prior to commencement of planned closure activities, the project owner shall address all biological resources-related issues associated with facility closure, and provide final measures, in a Biological Resources Element. The draft planned permanent or unplanned closure measures shall be submitted to the CPM for comment by staff, CDFG, and USFWS. After revision, final measures shall comprise the Biological Resources Element, which shall include the items listed above as well as written evidence of the dedicated funding mechanism(s) for these measures. The final Biological Resources Element shall become part of the facility closure plan, which is submitted to the CPM within 90 days of the permanent closure or another period of time agreed to by the CPM.

In the event of an unplanned permanent closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the on-site contingency plan (see **Compliance** conditions of certification).

Upon facility closure, the project owner shall implement measures in the Biological Resources Element and provide written status updates on all closure activities to the CPM at a frequency determined by the CPM.

REFERENCES

The tn: 00000 in the references below indicates the transaction number under which the item is catalogued in the Energy Commission's Docket Unit. The transaction number allows for quicker search and retrieval of individual items docketed for a case or used for ease of reference and retrieval of exhibits cited in briefs and used at Evidentiary Hearings.

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CULTURAL RESOURCES

Michael McGuirt and Sarah C. Murray

SUMMARY OF CONCLUSIONS

Staff tentatively concludes that the Ivanpah Solar Energy Generating System (ISEGS) project would have a significant direct impact on one historically significant built-environment resource, the Hoover Dam-to-San Bernardino transmission line. The adoption and implementation of Conditions of Certification **CUL-8** and **CUL-9** would reduce the potential impact of the proposed project on the resource to less than significant.

Conditions of Certification **CUL-1** through **CUL-7** and **CUL-10** take into account the extensive and thorough field investigations that Bright Source (applicant) undertook for the present analysis and underwrites the recommendation of staff that the applicant be given substantial relief from routine monitoring requirements. The adoption and implementation of Conditions of Certification **CUL-1** through **CUL-7** and **CUL-10** ensure that the applicant would be able to respond quickly and effectively in what staff concludes is the highly improbable event that archaeological sites are found on the surface of the project area or buried beneath it during construction-related ground disturbance.

The conclusions here are tentative due to outstanding reports on the inventory and the historical significance evaluation of ethnographic resources that are in the project area of analysis. Preliminary results that the applicant provides indicate that there may be no historically significant ethnographic resources in the project area of analysis, but staff cannot definitively conclude the analysis of such resources absent the final results of recent field efforts.

INTRODUCTION

This cultural resources assessment identifies the potential impacts of the ISEGS project to cultural resources. Cultural resources are defined under state law as buildings, sites, structures, objects, and historic districts. Three kinds of cultural resources are considered in this assessment: prehistoric, ethnographic, and historic.

Prehistoric archaeological resources are those materials relating to prehistoric human occupation and use of an area. These resources may include sites and deposits, structures, artifacts, rock art, trails, and other traces of Native American human behavior. In California, the prehistoric period began over 12,000 years ago and extended through the eighteenth century until 1769, when the first Europeans settled in California.

Ethnographic resources are those materials important to the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, or Asian immigrants. They may include traditional resource collecting areas, ceremonial sites, topographic features, cemeteries, shrines, or ethnic neighborhoods and structures.

Historic-period resources are those materials, archaeological and architectural, usually associated with Euro-American exploration and settlement of an area and the beginning of a written historical record. They may include archaeological deposits, sites, structures, traveled ways, artifacts, or other evidence of human activity. Under federal and state requirements, historical cultural resources must be greater than fifty years old to be considered of potential historic importance. A resource less than fifty years of age may be historically important if the resource is of exceptional importance.

For the ISEGS project, staff provides an overview of the environmental setting and history of the project area, an inventory of the cultural resources identified in the project vicinity, and an analysis of the potential impacts from the proposed project using criteria from the California Environmental Quality Act (CEQA). The primary concern is to ensure that all potential impacts are identified and that conditions are set forth that ensure that impacts are mitigated below the level of significance.

If cultural resources are identified, staff determines whether there may be a project-related impact to them. If the cultural resources cannot be avoided, staff determines whether any of the impacted resources are eligible for the California Register of Historical Resources (CRHR). If impacted resources are eligible for the register, staff recommends mitigation measures that ensure that impacts to the identified cultural resources are reduced to a less-than-significant level.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Projects licensed by the Energy Commission are reviewed to ensure compliance with all applicable laws. For the present analysis the applicable laws are primarily state laws. Although the Energy Commission has exclusive permitting authority over ISEGS, it typically ensures compliance with all applicable laws, ordinances, regulations, standards, plans, and policies.

CULTURAL RESOURCES TABLE 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
State	
Public Resources Code 5097.98 (b) and (e)	Requires a landowner on whose property Native American human remains are found to limit further development activity in the vicinity until he/she confers with the Native American Heritage Commission-identified Most Likely Descendents (MLDs) to consider treatment options. In the absence of MLDs or of a treatment acceptable to all parties, the landowner is required to reinter the remains elsewhere on the property in a location not subject to further disturbance.
California Health and Safety Code, Section 7050.5	This code makes it a misdemeanor to disturb or remove human remains found outside a cemetery. This code also requires a project owner to halt construction if human remains are discovered and to contact the county coroner.
Local	
County of San Bernardino 2007 General Plan, Conservation Element, Goal CO 3 and Policies 3.1–3.5	The cultural and paleontological resources goal of the County is to preserve and promote its historic and prehistoric cultural heritage. The County intends to achieve this goal through the implementation of policies that identify and protect important archaeological and historic cultural resources in areas of the county that have been determined to have known cultural resource sensitivity, and on all lands where disturbance of previously undisturbed ground will occur. The County will, further, establish programs to preserve the information and heritage value of cultural and historical resources, comply with California Government Code Section 65352.2 (SB18) on all General Plan and specific plan actions, and ensure that important cultural resources are avoided or minimized to protect Native American beliefs and traditions.

SETTING

Information provided regarding the setting of the proposed project places it in its geographical and geological contexts and specifies the technical description of the project. Additionally, the archaeological, ethnographic, and historical, backgrounds provide the contexts for the evaluation of the historical significance of any identified cultural resources within the project area of analysis.

REGIONAL SETTING

The proposed project area is in the Ivanpah Valley of the eastern Mojave Desert approximately 49 miles south-southwest of Las Vegas in San Bernardino County, California. The eastern Mojave Desert is a part of the Basin and Range physiographic province (Fenneman 1931), a broad region of almost parallel, block-faulted mountain ranges that trend approximately north to south and are characteristically separated by internally draining, debris-filled structural basins. The erosion of the largely Cenozoic

era (beginning 65 million years ago and continuing to the present) ranges continues to contribute sediment to the poorly sorted gravel aprons or bajadas that predominate along the range flanks. The bajadas form most valley margins as they slope gradually down to the basin bottoms where seasonal lakes or playas often form. Low fault scarps and alluvial fans at the mouths of canyons periodically break the smooth, low-angle sweep of the bajadas (Eaton 1981; Thompson and Burke 1974). Local elevations in this part of the Mojave Desert range from approximately 1,700 to 2,600 feet above sea level on the valley bottoms to 4,900 to 7,900 feet above sea level along mountain range ridges. A bi-seasonal precipitation pattern in the eastern Mojave Desert delivers an average of six inches of annual rainfall from November through April and from July through September, with cool season precipitation being more significant (Hereford 2004). The largely alluvial parent material of the region's bajadas and valley bottoms, and the desert climate generally, support more weakly developed soil orders (Entisols and Aridisols) (NRCS 2007) where a Mojave Creosote Bush Scrub vegetation type predominates (BSE2007a, p. 5.2-9).

PROJECT, SITE, AND VICINITY DESCRIPTION

The site of the proposed project is on the middle portion of a bajada above and to the west of Ivanpah Dry Lake, a large playa that forms the bottom of Ivanpah Valley. The use of the project area, presently under the jurisdiction of the Needles Field Office in the U. S. Bureau of Land Management's (BLM) California Desert District, has historically been rather marginal. A sparse veneer of stone tools and stone chipping debris evidence a transitory Native American use of the project area in the period prior to complete Euroamerican subjugation. The project area also appears to have been subject to sporadic prospecting for mineral resources over the last approximately 160 years. Sporadic mineral prospecting in and near the project area continues today. The eroded mountain remnants that jut above the relatively smooth, sloping surface of the proposed project area, landforms known as inselbergs, show evidence, in the form of abandoned and active prospect pits, of exploratory activity. The proposed project area's concurrent historic use has been for low intensity livestock grazing. The property continues this tradition of use today as part of the BLM Clark Mountain Allotment Grazing Lease (Clark Mountain Allotment) (BSE2007a, p. 5.6-14) adjacent to the Primm Valley Golf Club, Desert Course.

The proposed project involves the construction and operation of an approximately 400-MW concentrating solar power electric generation facility on a project area of approximately 4,065 acres. The project is proposed to be built in three phases, Ivanpah No. 1(100 MW), Ivanpah No. 2 (100 MW), and Ivanpah No. 3 (200 MW), which would each be separate concentrating solar power plants. The three plants would be developed on contiguous property, sharing an administration and warehouse building, an operation and maintenance building, and a substation. The administration and warehouse building, a substation, a sewage package treatment plant, and detention ponds would be located in between Ivanpah No. 1 and Ivanpah No. 2.

The three power plants each have the same basic types of components, arrays of mirrors or heliostats that are double-mounted on poles around central solar power towers. The Ivanpah No. 1 and Ivanpah No. 2 plants would each consist of approximately 110,000 heliostats, double-mounted on 55,000 poles, in a single array

around a centralized solar power tower. The Ivanpah No. 3 plant would consist of approximately 208,000 heliostats, double-mounted on 104,000 poles, in five separate arrays. The five arrays will each be arced around a separate solar power tower. Each of the seven solar power towers for the project would be 469 feet tall.

Each of the three power plants would have a separate infrastructure system. The infrastructure for each of the three plants would include a power block facility that would house a natural gas-fired start-up boiler, air emission control system for the combustion of natural gas in the start-up boiler, steam turbine generator, an air-cooled condenser, wastewater treatment equipment, auxiliary equipment such as boiler commissioning and emergency outfall holding basins, and chemical storage containment areas. Plant infrastructure would also include a 250,000-gallon capacity raw water tank, dirt, gravel, or paved access and maintenance roads, storm water retention basins and diversion channels, and perimeter fencing.

The operation of the generation facility as a whole would require the development of further infrastructure. The natural gas-fired start-up boiler that is part of the power block facility for each of the three plants would draw natural gas from the Kern River Gas Transmission pipeline that is approximately 0.5 miles north of Ivanpah No. 3. An underground distribution pipeline would need to be installed to feed the start-up boiler at each power block facility. Raw groundwater needed for the whole facility would be drawn from one of two wells which would be constructed at the northwestern corner of Ivanpah No. 1, just outside the perimeter fence. Underground water pipelines would connect each of the three power blocks to the groundwater wells.

The transmission of the electricity that the generation facility produces would also require the construction of new transmission infrastructure and major upgrades to an existing transmission line. The ISEGS project would be interconnected to the Southern California Edison (SCE) grid by three new 115-kV transmission generation tie lines, a new substation that includes 230 kV/115-kV switch-racks, and upgrades to the SCE Eldorado-Baker-Coolwater-Dunn Siding-Mountain Pass 115-kV transmission line, which traverses the project site between the proposed Ivanpah No. 1 and Ivanpah No. 2 (CH2ML2008q). In order to transmit the full generation load projected for the ISEGS project and other planned electric generation projects, the California Independent Systems Operator (ISO) has determined that approximately 36 miles of the existing 115-kV transmission line would need to be upgraded. The upgrade would include constructing a new double-circuit 230-kV transmission line between the Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California, a distance of approximately 36 miles. The existing 115-kV transmission line would be removed and replaced with the proposed 230-kV transmission line. SCE also plans to remove the portion of the subject transmission line from the project area southwest to the Mountain Pass Substation and to replace that portion of the line with two, double-circuit, 115-kV pole lines. Additional upgrades may be required as mitigation prior to final approval of interconnection to California ISO and Non-California ISO controlled facilities (California ISO 2008).

The construction of the proposed project would also require the applicant to take steps to preserve existing public access routes that presently traverse the project area. Vehicle trails run through the proposed project site. To allow continued use and access

the applicant would reroute three public trails and one trail that serves as an access to a mining claim. Colosseum Road would be rerouted between Ivanpah No. 1 and Ivanpah No. 2.

Environmental Setting

The proposed project area is a roughly 4,065-acre expanse of what is today an arid bajada. The environment of the bajada has changed through time causing concomitant shifts in the mosaic of natural resources available on it and adjacent landforms. Human use of the proposed project area over the past several thousand years may partly reflect local changes in the natural resource base. To more reliably assess the likelihood that archaeological deposits representing such use may be present, it is important to consider the historical character of local climate change, or the paleoclimate, and the effects of the paleoclimate on the physical development of the bajada and its ecology.

Paleoclimate

The present climate in the proposed project area represents a moderately dry and harsh period in the climate of the region relative to the last 12,000 years, the minimum timeframe for a human presence in the Mojave Desert. The climate of the Mojave Desert since the late Pleistocene epoch (prior to 10,000 thousand years ago) can be split into three broad phases. The climate of the region during the Pleistocene was relatively much more moist or mesic than the present climate and led to the development of a number of large permanent lakes on the floors of the region's valleys. The lakes slowly evaporated during the early Holocene epoch (10 thousand years ago to present) as the climate progressively became more arid. The period from approximately 5000 to 3000 B.C. marks a time of extreme aridity, often referred to as the mid-Holocene Altithermal (see Antevs 1948), and it marks the final desiccation of the lakes in the region. The climate since approximately 3000 B.C. has typically been more mesic relative to conditions during the Altithermal, and there is evidence for particularly wet periods from approximately 1000 B.C. to A.D. 1, and again from approximately A.D. 500 to 1400 (Bamforth 1990, p. 72).

Geology

The proposed project area lies on the western flank of the Ivanpah Valley in the eastern Mojave Desert. The Ivanpah Valley is an elongate, internally draining, structural basin (Park, et al. 2003, p. 72), a bolson, which trends approximately north to south. It is roughly 44 miles in length, typically averages 15 miles in width, and ranges in elevation from 2,608 feet above sea level on the valley floor to between 5,883 and 7,897 feet above sea level along the surrounding mountain ridges. The Ivanpah Mountains, the Clark Mountain Range, and the Spring Mountains bound the valley to the southwest, west, and northwest, respectively. The Lucy Gray Mountains, McCollough Range, and the New York Mountains bound the valley to the northeast, east, and southeast, respectively. The Clark Mountain Range and the Spring Mountains form an arc of Mesozoic to Paleozoic marine and terrestrial sedimentary rocks around a core of earlier Precambrian metamorphic rocks, with Tertiary volcanic rocks infrequently intruding into the sedimentary formations of the Spring Mountains. Along the eastern margin of the valley, the Lucy Gray Mountains, the McCollough Mountain Range, and the northern portion of the New York Mountains include Precambrian intrusive igneous and

metamorphic rocks and Tertiary volcanic rocks. The balance of the New York Mountains and the Ivanpah Mountains are almost entirely Mesozoic granitic rocks (Jennings 1961; House, Buck, and Ramelli 2006; Ramelli, House, and Buck 2006a, 2006b). This diverse group of rocks is the source of the clastic[1] sediments that make up the Quaternary landforms across the valley and form the substrate in which local soil types develop.

Geomorphology

The discussion of the geomorphology of the proposed project area considers how and when the underlying bajada may have developed, and helps provide the physical contexts to assess whether physical remains from the past human use of former land surfaces on the bajada may be present as archaeological deposits.

Process Geomorphology

The Ivanpah Valley contains examples of most of the major landforms that are characteristic of Basin and Range bolsons. Alluvial fans, fan remnants, and bajadas front the mountain ranges that ring the valley. Below the coarse alluvial fan and remnant fan deposits, the broad bajadas sweep gradually down onto Ivanpah Dry Lake, the playa that forms the bottom of the valley floor. Numerous intermittent stream channels flow out of the mountains over more recent alluvial fans and past older fan remnants to braid across bajada surfaces and terminate out on the playa. The fine sediments that these stream channels transport are the source of playa fill and the dune sand along the playa margins.

The proposed project area is on the middle portion of a bajada that drapes the eastern base of the Clark Mountain Range. The project area ranges from approximately 180 feet to 835 feet above the floor of the playa. Gravity and water variously act to transport and deposit the weathered bedrock sediments that make up the broad bajada of the proposed project area. The sediments are typically larger and more poorly sorted upslope toward the mountains and grade to finer, better sorted particles downslope where the bajada deposits ultimately interfinger with the lacustrine[2] sediments of the playa and other wind-blown or eolian deposits, and water-transported or alluvial deposits related to the playa's hydrological cycles.

The present surface of the proposed project area bajada is a mosaic of interconnected or anastomosing, intermittent stream channels of mostly coarse to very coarse sands, incipient desert pavements[3] of predominately very angular gravels and variable overflow and sheetwash deposits. One large and one small inselberg break the surface of the bajada adjacent to the northern portion of the proposed project area and represent relatively infrequent examples of such landforms in Ivanpah Valley.

The proposed project area bajada is a dynamic landform the development of which has undoubtedly been subject to alternating cycles of deposition and erosion that occur in

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[1] Clasts are rock fragments produced by physical processes.

[2] Derived from lake environments.

[3] Desert pavements are single layers of clasts borne upward over time by the slow, continual accretion of wind-borne silt. They progressively become more level and darker in contrast, and the surface clasts in the pavements become more tightly interlocked with age.

response to regional fluctuations in climate. The presence on the surface of the proposed project area, in overflow and sheetwash deposits and in incipient desert pavements, of mixtures of very angular gravels with relatively fresh faces or new cleavage planes and rounded, sand-blasted gravels with well-developed rock varnish indicate a relatively mobile bajada surface in the recent past where former desert pavements are being eroded as new ones are being formed. A firm understanding of whether the net result of the dynamic processes at work on the surface of the bajada is or has been the thickening of bajada deposits, or the erosion of them, is important to the interpretation of the history of the bajada's development, its potential as a resource base for human use, and its potential to preserve archaeological deposits related to any such use.

Historical Geomorphology

The results of a recent geoarchaeology study of the proposed project area indicates that the present surface of the underlying bajada is a patchwork of actively eroding surfaces amid what have become slightly elevated remnants of older bajada surfaces of predominantly middle-to-late Holocene age (pp. 9–18, CH2ML2008b). An analysis in that study of the beach zones beneath the vicinity of the project area along the edge of Ivanpah Dry Lake suggests that the character of sediment deposition on the bajada was progradational[4] after approximately 6700 B.C. Deposition of sediments along the base of the bajada buried the beach zone there that was formed during the last high stand of Ivanpah Dry Lake during the early Holocene. The depositional regime on the bajada changed to one of net erosion after approximately 2000 B.C., most likely in response to the general increase in effective moisture in the late Holocene that appears to have led to a concomitant increase in vegetation cover and a decrease in the available sediment load.

The morphology of the present surface of the bajada is the result of erosion over the last 4,000 years. A complex network of anastomosing, intermittent stream channels traverse the bajada among remnant patches of older bajada surfaces that now rise several feet above the eroding surface of the broader landform. The remnant surfaces cover approximately 472 acres or 12 percent of the approximately 4,065-acre proposed project area. The remnant older bajada surfaces appear darker in contrast and are stonier relative to adjacent eroded surfaces. Desert pavements or incipient desert pavements form many of the remnant surfaces, while a few are more appropriately considered as stony debris flow remnants. Two of the darker (older) remnant surfaces observed in the recent study appear, on the basis of comparison to pavements in the Mojave Sink approximately 35 miles to the west, to be no older than early Holocene in age.

Pedology

The distribution of soil types over the bajada of the proposed project area provides a further index of the relative stability of different portions of the bajada's surface. The downslope portions of the proposed project area, where more recent alluvial deposits

[4] Progradation refers to a depositional regime on alluvial fans, which are constituent landforms of bajadas, where streams are cutting down through the upper slopes of alluvial fans and depositing the eroding sediments on the lower slopes of those same fans.

such as inset fans and intermittent stream floodplains and channels predominate, support the Arizo loamy sand, a very deep, excessively drained soil that forms in mixed alluvium. Arizo series soils are Entisols, an order where the parent material is clearly evident and where distinct soil horizons are absent.

The upslope portions of the proposed project area where older, more stable landforms such as alluvial fan remnants are present support the Popups sandy loam, a moderately deep, well-drained soil that also forms in mixed alluvium. Popups series soils are Aridisols, an order where soils develop distinct horizons under arid conditions. The development of a weakly cemented duripan approximately 33 to 59 inches below the surface is a characteristic of the Popups series that indicates a relative antiquity for soil types of the series.

Paleoecology

The ecology of the proposed project area has been dynamic through time. The vegetation type that is presently predominant in the project area is the Mojave Creosote Bush Scrub, which is typical in and on the valleys, alluvial fans, and lower mountain slopes of the Mojave Desert. The Mojave Yucca-Nevada Ephedra Scrub and Mojave Wash Scrub types are also present. The diversity of the vegetation types and the plant species in the project area generally decrease as one moves downslope across the project area bajada (BSE2007a, pp. 5.2-9, 5.2-27, and 5.2B-1).

The vegetation types above and to the west of the proposed project area vary as one ascends the slopes of the Clark Mountain Range. The Mojave Creosote Bush Scrub vegetation type grades into the Joshua Tree Woodland which, in turn, grades into the Piñon Pine-Juniper Woodland. This clinal[5] variation in vegetation patterns is common in southern California (Holland and Keil 1995, p. 397).

It is probable that the composition and pattern of local vegetation types has moved up and down in elevation across the proposed project area over the last 12,000 years in response to regional shifts in climate. A woodland association of *Pinus monophylla* (piñon pine), *Juniperus osteosperma* (Utah juniper), *Purshia mexicana* (bitterbush), *Cercocarpus ledifolius* (mountain mahogany), and *Prunus fasciculata* (desert almond) was found prior to approximately 9500 B.C. in areas higher than 3000 feet above sea level where *Larrea tridentata* (creosote bush) presently prevails. A desert scrub association of *Lycium cooperi* (wolfberry), *Salvia mojavensis* (Mojave sage), and *Prosopis juliflora* (mesquite) was found from approximately 8800 to 8400 B.C. near lacustrine shorelines in the region lower than 3,000 feet below sea level. Creosote bush does not appear to have become dominant in the region before 3000 B.C. And modern vegetation associations do not appear to have been in place before approximately 2500 B.C. (Koehler, Anderson, and Spaulding 2005).

Prehistoric Setting

The prehistory of the eastern Mojave Desert is the narrative of how human populations have adapted to marked fluctuations in the local environment over the course of at least

[5] A gradual change in a character or feature across the distributional range of a species or population, usually correlated with an environmental or geographic transition.

the last 12,000 years. The archaeological remains of the region's prehistory are relatively scarce. Sparse scatters of stone tools and chipped stone tool manufacturing debris, and isolated artifacts, resources that typically yield information of marginal value, account for 40 to 60 percent of the archaeological remains found in the Mojave and Colorado Deserts. A relative paucity of intact buried archaeological deposits contributes further to the dearth of information on the prehistory of the region (Lyneis and Macko 1986, p. 52). The availability of water and the location of high-value resource patches in otherwise unproductive habitats appear to influence the distribution of the archaeological sites that are on the desert landscape (Lyneis and Macko 1986, p. 57; Sutton et al. 2007, p. 230). The broad trajectory of cultural development in the Mojave Desert appears to be a steady decline in residential mobility as local populations come to occupy increasingly larger valley or basin bottom base camps, in a few preferred locations, over longer periods of time, rather than working out of temporary camps in particularly productive environmental zones (Bamforth 1990, p. 74).

Over the past seven decades, Mojave Desert archaeologists have developed and refined a broad sequence of approximately six artifact groups or assemblages, each with distinctive types of stone projectiles, that represent the material record of the peoples who once lived in the proposed project area (Bamforth 1990, p. 72; Campbell 1936; Lyneis 1982; Rogers 1939; Sutton, et al. 2007; Warren 1984; Warren and Crabtree 1986). Choosing what staff believes to be a cultural chronology more applicable to the proposed project area than that used in the AFC (BSE2007a, pp. 5.3-7–5.3-10) and acknowledging recent proposed refinements to the chosen chronology (Sutton, et al. 2007), the discussion here of the region's prehistory will rely primarily on Warren's 1984 chronology and Warren and Crabtree's 1986 chronology. Following Warren and Crabtree, the periods of the chronology below represent units of time during which particular artifact assemblages appear to prevail rather than discrete, homogeneous past cultures.

Terminal Pleistocene Period (Prior to 10,000 B.C.)

The archaeological record of the Terminal Pleistocene Period in the Mojave Desert is particularly sparse. The most consistent evidence for human activity during this period are fragments of the characteristic fluted, concave-based, lanceolate spear or projectile point of the Clovis archaeological culture. The Clovis culture is a pan-Western Hemisphere archaeological phenomenon that manifests in diverse material patterns over North and South America. In the Mojave Desert, material culture assemblages that include Clovis projectile point fragments are typically sparse surface deposits (Lyneis and Macko 1986, p. 41). The evidence from such deposits suggests only that human groups during this time were probably small in number, were highly mobile, and lived in small, temporary camps near what were then permanent water sources (Sutton, et al. 2007, p. 234). It is unclear whether the Mojave Desert Clovis assemblages demonstrate a cultural continuity with the material remains of subsequent periods (Warren and Crabtree 1986, p. 184).

Lake Mojave Period (10,000 to 5000 B.C.)

Lake Mojave Period artifact assemblages appear to represent a cultural phenomenon that is antecedent to subsequent cultural developments in the Mojave Desert (Warren and Crabtree 1986, p. 184). Portions of archaeological sites or components that date to

the Lake Mojave Period are typically sparse and vary little in assemblage composition (Bamforth 1990, p. 73), although components that include extensive accumulations of residential debris have more recently been found (Sutton, et al. 2007, p. 237). Lake Mojave components are most often found in the vicinity of high terraces above or on relict shorelines of what are now playas and along relict stream channels (Bamforth 1990, p. 72; Lyneis and Macko 1986, p. 41).

Lake Mojave Period assemblages include a relatively narrow range of stone tools and also represent a narrow range of site types. The index artifacts for the period are the local variants of the Great Basin stemmed series projectile point types, Lake Mojave and Silver Lake points. The balance of period assemblages may include bifaces, steep-edged unifaces, “small beaked gravers,” “narrow concave scrapers,” crescents, and occasional cobble-core tools and ground stone implements (Sutton, et al. 2007, p. 234; Warren 1984, p. 413). The assemblages primarily appear to represent temporary small camps and work stations. Infrequent accumulations of residential debris do indicate, however, that camps with longer use periods are also present.

The archaeological record of the Lake Mojave Period indicates that human populations during the Early Holocene were small, mobile groups practicing a hunting-and-foraging economy whereby groups shifted residency across the landscape among the most productive environmental zones as the resources in those zones became depleted over time (Bamforth 1990, p. 73; Lyneis and Macko 1986, p. 41).

Pinto Period (5000 to 2000 B.C.)

The evidence of human activity found in Pinto Period archaeological sites indicates a behavioral continuity with Lake Mojave Period developments (Warren 1984, p. 414). The Pinto Period witnesses the final desiccation of the Pleistocene pluvial lakes in the Mojave Desert and the adaptive transformation of local populations to the extreme aridity of the mid-Holocene Altithermal (see Antevs 1948). It is unclear whether the Pinto Period directly follows the Lake Mojave Period, or may represent a resumption of the desert’s use after a hiatus during the worst of the mid-Holocene droughts (Warren and Crabtree 1986, p. 184). Pinto Period components are typically surface deposits that are small in area and do not include midden deposits, constituent residential debris of ash, charcoal, and food and other organic residues, although larger components with broader ranges of artifacts and substantial midden deposits have more recently been found (Sutton, et al. 2007, p. 238, Warren 1984, p. 413 and 414). Pinto Period components are generally found on the landscape in the same places as deposits of the Lake Mojave Period (Bamforth 1990, p. 72, Lyneis and Macko 1986, p. 41). The suggestion has been made that the components may actually overlap in time (Bamforth 1990, p. 73, Sutton, et al. 2007, p. 238).

The most important distinction between the artifact assemblages of the Pinto Period and those of the preceding Lake Mojave Period appears to be the relative abundance of ground stone implements or milling tools. More recent research has found milling tools to occur in moderate abundance in most Pinto Period deposits and, occasionally, in great frequency (Sutton, et al. 2007, p. 238). The characteristic Pinto Period assemblage includes large and small leaf-shaped projectile points and knives, domed and elongated keeled scrapers, several forms of well-made flake scrapers, flat

millingstones, and manos. Drills, engraving tools, and *Olivella* spp. shell beads also occur (Sutton, et al. 2008, p. 238; Warren 1984, p. 412; Warren and Crabtree 1986, p. 187). The index artifact for the period is the stemmed, indented-base Pinto series projectile point, the Mojave Desert variety of which is markedly crude in form and manufacture (Warren 1984, p. 411). A broad continuity in the chipped stone technology evident in both the Lake Mojave and Pinto Periods has been noted. Populations during these periods appear to make extensive use of toolstones[6] other than cryptocrystalline silica or obsidian, and they also make regular use of unifacial and bifacial core tool forms (Sutton, et al. 2007, p. 238).

More recent research indicates that Pinto Period assemblages may reflect the emergence of a two-tier settlement pattern. The small temporary or seasonal camps that appear to have been the primary focus of Lake Mojave Period activity may have become more task-specific camps that were subordinate to more permanent residential base camps. The increase during the Pinto Period in the relative frequency of milling tools suggests a corresponding increase in the reliance of local populations on plant resources (Sutton 2007, pp. 238–239).

Gypsum Period (2000 B.C. to A.D. 500)

Gypsum Period artifact assemblages, though scarce relative to earlier and later periods, appear to evidence a shift in the economy of local populations toward a much greater dependence on plant resources (Bamforth 1990, p. 73; Warren 1984, p. 419). Period components are ephemeral in character, relatively more scarce in the southern and eastern portion of the Mojave Desert, smaller yet more numerous than components of the preceding periods, and found in more diverse locations on the landscape (Sutton, et al. 2007, p. 241).

Gypsum Period assemblages encompass a relatively broad array of artifact types. The index artifacts for the period include any combination of Gypsum (Gypsum Cave), Humboldt (Humboldt Concave Base), or Elko (Elko Eared, Elko Corner-notched) series projectile points (Sutton, et al. 2007, p. 241; Warren 1984, p. 414; Warren and Crabtree 1986, p. 187). The balance of period assemblages may include leaf-shaped projectile points; rectangular-based knives; flake scrapers; T-shaped drills; occasional large scraper-planes; choppers; hammerstones; manos and millingstones; mortars and pestles; shaft smoothers incised slate and sandstone tablets and pendants; fragments of drilled slate tubes; *Haliotis* spp. Rings; central California Middle Horizon bead and ornament types; *Olivella* spp. shell beads; and bone awls (Warren 1984, p. 418). The greater presence of quartz crystals, paint, split-twig figurines, and rock art also indicates the elaboration of ritual activity during this period (Warren and Crabtree 1986, pp. 188–189). The influence of the Anasazi archaeological culture of the Southwest is apparent in the eastern Mojave Desert toward the end of the Gypsum Period with the introduction of Anasazi ceramic types to period assemblages, and evidence of the replacement of

[6] Toolstone is a type of stone used to manufacture stone tools. Generally speaking, tools that require a sharp edge are made using cryptocrystalline materials that fracture in an easily-controlled conchoidal manner. Cryptocrystalline tool stones include flint, chert, rhyolite, and obsidian. These materials fracture in a predictable fashion, and are easily resharpened.

the atlatl with the bow and arrow, as the larger Gypsum, Humboldt, and Elko series dart points give way to smaller Eastgate and Rose Spring arrow point types in the subsequent Saratoga Springs Period (Warren 1984, pp. 414–415).

The relative scarcity of Gypsum Period data complicates discussions of period settlement patterns in the Mojave Desert. Available data indicates that the focus of Gypsum Period components was lowland concentrations of plant resources along streams and in the lake basins (Bamforth 1990, p. 73; Sutton, et al. 2007, p. 241). One such resource may have been mesquite. The introduction of the mortar and pestle during this period and the use of these tools in the historic period to process mesquite pods have been taken to indicate that mesquite was first used in the Gypsum Period (Warren 1984, p. 419). Populations appear to have spent a substantial part of each year in residential base camps while dispatching task groups out to hunt (Bamforth 1990, p. 73). The presence of shell ornaments in the assemblages of the period also indicates the establishment of relatively routine trade with the southern California coast (Warren 1984, p. 419).

Saratoga Springs Period (A.D. 500 to 1200)

The artifact assemblages of the Sarasota Springs Period in the eastern Mojave Desert reflect the mixture of cultures that appears to have influenced the region.

Saratoga Springs Period assemblages encompass a broad, diverse array of artifact types, many of which appear to come from outside the region or reflect outside influences. The index artifacts for the period include Eastgate and Rose Spring projectile points. The core of the period assemblage includes millingstones and manos, mortars and pestles, incised stones, and slate pendants (Warren 1984, p. 420). Other characteristic artifact types of the period include small triangular knives, scrapers, drills, hammerstones, choppers, pendants of green schist, and Pacific Coast shell ornaments, including *Olivella* Saucer beads, *Olivella* Barrel beads, and limpet rings (Warren 1984, p. 367). Anasazi grayware ceramics of the Basketmaker III through early Pueblo Periods (Pecos Classification, see Cordell 1984, pp. 55–58) are a notable element of the Saratoga Springs Period assemblage as well.

The archaeological data for the Saratoga Springs Period appear to indicate that local populations were developing broader spheres of interaction with outside groups, perhaps even allowing settlements of outsiders, in the context of a general continuity in local settlement patterns. The basic settlement pattern for the period appears not to change markedly from the Gypsum Period through to the Protohistoric Period (see below). The size of residential base camps and seasonal population dispersions to acquire more remote resources may both have been in slow decline however. The overexploitation of large mammals, due, in part, to the introduction of the bow and arrow during this period and to a deteriorating climate, may have led to a shift in hunting emphasis to small animals and reinforced the primary dependence of local populations on plant seed resources such as mesquite (Bamforth 1990, p. 74).

The Anasazi influence, presumably of the Virgin Branch (see Fowler and Madsen 1986, pp. 175–181), was marked in the eastern Mojave Desert during this period from at least A.D. 700 through A.D. 1150 (Warren 1984, pp. 373–373, 426–427). The distribution of

Anasazi grayware ceramics, the key archaeological index of Anasazi influence, reaches from the lower Virgin River in southern Nevada into California as far west as the Cronise Basin in San Bernardino County. The primary focus of Anasazi influence in the vicinity of the proposed project area appears to have been the turquoise deposits in the area around Halloran Springs, roughly 30 miles southwest of the proposed project area. The sequence of ceramic types found at the turquoise mines in the area indicate that the period of Anasazi influence there was from approximately A.D. 700 to 900, during the Basketmaker III and Pueblo I Periods (Warren 1984, pp. 371–372). It remains unclear whether Anasazi peoples were actually in residence in the area (Warren 1984, p. 422) practicing the Virgin Branch horticultural lifeway, in residence living on stores of provisions, or not in residence and managing the extraction of turquoise through proxy labor. The Anasazi influence over the eastern Mojave Desert ultimately terminates around A.D. 1150 (Warren 1984, pp. 426–427).

Protohistoric Period (A.D. 1200 to present)

The speakers of Numic languages appear to displace the local populations of the eastern Mojave Desert at the outset of the Protohistoric Period, and to decisively eradicate Anasazi influence in the region (Warren 1984, p. 430).

The Protohistoric assemblage has been said to relate directly to the historic Paiute (Warren 1984, p. 427). The characteristic index artifacts for assemblages of the more northerly areas of the eastern Mojave Desert are Desert Side-notched projectile points and coarse, brownware ceramic types. The overall eastern Mojave assemblage strongly resembles assemblages across the northern Mojave Desert to Owens Valley and may derive from that region. Assemblages from the more southerly areas of the eastern Mojave Desert include Cottonwood Triangular projectile points, in addition to Desert Side-notched points, and the ceramic assemblage includes types representative of the Hakataya archaeological culture, a cultural unit of the Lower Colorado River and the Colorado Desert. Among the Hakataya ceramics in the Protohistoric Period assemblages of the eastern Mojave Desert are brownwares, buffwares, and red-on-buff wares (Warren 1984, p. 427; Warren and Crabtree 1986, p. 191).

Despite the apparent shifts in the local populations in the eastern Mojave Desert and the ebb and flow of outside influences during the Sarasota Springs and Protohistoric Periods, the basic economic milieu and the settlement patterns of the local populations continue, in the Protohistoric Period, to reflect the trends in desert adaptation that had been developing in the Mojave Desert for millennia. Among the final elaborations to the local economy of the populations in the Mojave Desert may have been the addition, during the late Saratoga Springs Period and into the Protohistoric Period, of small gardens in preferred areas, the produce from which may have supplemented local diets in a minor way (Lyneis and Macko 1986, p. 41).

The influence of the Anasazi in the eastern Mojave Desert is supplanted by Hakataya influence from the Lower Colorado River and the Colorado Desert. Toward the end of the Saratoga Springs Period or the beginning of the Protohistoric Period around A.D. 1200, there is evidence of Hakataya influence or presence at the Halloran Springs turquoise mines lasting roughly a century. The Paiute have used the mines infrequently

subsequent to the withdrawal of the Hakataya in about the fourteenth century (Warren 1984, p. 372 and 373).

Ethnographic Setting

The project area of analysis appears, on the basis of the available ethnographic literature, to fall in the ancestral territories of three major Native American groups, the Southern Paiute (Las Vegas Paiute and Pahrump Paiute), the Chemehuevi, and the Mojave. The Las Vegas Paiute, the Chemehuevi, and the Mojave made use of overlapping portions of the eastern Mojave Desert. The portions of the region that each group used and the ways that each group made use of those portions varied through time (Bean, Vane, and Young 1982:M-2). Brief discussions of the ethnography and the history of the Numic-speaking Southern Paiute and of the Mojave provide a transition for the cultural history of the region from late prehistory into the period of sustained European and Euroamerican contact and subjugation, and provides one context for the recognition and interpretation of ethnographic resources that may be in the project area of analysis.

Southern Paiute and Chemehuevi

The Southern Paiute peoples and the Chemehuevi, a closely related people, belong to the Southern Numic branch of the Uto-Aztecan language family. The territory of the Las Vegas Paiutes and the Pahrump Paiutes during the nineteenth century included an area from roughly Death Valley east to the Colorado River and from just north of present-day Las Vegas south to just north of the City of Needles, California. Chemehuevi territory during that period abuts the Las Vegas Paiute and Pahrump Paiute territory on the north and runs south to approximately the City of Blythe, California, to the west of the Colorado River (Kelly and Fowler 1986:figure 1). The nineteenth-century territories of the Southern Paiute and Chemehuevi groups reflect the adaptation of each to their unique physical and political environments subsequent to the apparent entry of Numic-speakers into the region at approximately A.D. 1200 (see *Protohistoric Period* section above).

The economy of the Southern Paiute in general was largely one of subsistence. The particular variety of plant and animal resources used in the territory of each Southern Paiute group was dependent upon the mosaic of vegetation types found there. Major plant resources for the Las Vegas Paiute, the Pahrump Paiute, and the Chemehuevi included piñon nuts (*Pinus monophylla*), mesquite pods (*Prosopis juliflora*), and agave (*Agave utahensis*). A variety of seed resources were a lesser, although important food source (Kelly and Fowler 1986:370).

The chief source of protein for Southern Paiute groups was small game. Such game included rabbits, wood rats, mice, gophers, squirrels, chipmunks, and birds. Lizards, snakes, chuckwalla, and tortoise were also eaten, as were insect resources such as locusts, ant larvae, and caterpillars. Large game resources such as antelope and mountain sheep were supplementary protein sources.

Southern Paiute foraging and collecting schemes were supplemented in the late Protohistoric and early historic periods with floodplain and, apparently, irrigation agriculture. Typical cultigens, variously introduced from the North American Southwest,

Mexico, and the lower Colorado River , included maize, squash, pumpkins, gourds, and, less frequently, beans. Other cultigens appear to be more local domesticates that came from the Mojave, and introduced European cultigens ultimately became more significant crop resources (Kelly and Fowler 1986:370).

The sociopolitical organization of the Southern Paiute groups did not include organs of central political control. The boundary for each group appears to have been relatively fluid and permeable. Groups were essentially clusters of individual households that variously coalesced and dispersed during the year to facilitate different economic pursuits. Favored residence locations adjacent to springs or agricultural plots were held as private property and subject to inheritance. Large household clusters often had a headman, whose authority was more advisory than authoritative (Kelly and Fowler 1986:380).

Mojave

The Mojave belong to the River branch of the Yuman language family (Kendall 1983). The core ancestral territory of the Mojave, possibly established as early as A.D. 1150, appears to have been what is now known as the Mohave Valley along the lower Colorado River. By the mid-nineteenth century, Mojave territory expanded to run along the lower Colorado River from roughly 25 miles north of Bullhead City, Nevada south to roughly 5 miles north of the City of Blythe, California (Stewart 1983:55).

The primary focus of the Mojave economy was agriculture. The group farmed the floodplain of the Colorado River relying on the annual overflow deposition of silt and organic matter to rejuvenate soil fertility. The principal crop was maize with Tepary beans, pumpkins, and melons being secondary cultigens (Stewart 1983:57 and 58).

The Mojave supplemented their agricultural pursuits with the foraging and collecting of wild plant resources, with fishing along the Colorado River, and, to a lesser degree, with hunting. Commonly used plant resources included a variety of seed plants, cactus fruit and other desert plants from the mesas adjacent to the river, and the pods of both mesquite (*Prosopis juliflora*) and screwbean (*Prosopis pubescens*) (Stewart 1983:57 and 59).

Fish was the primary source of meat for the Mojave. Fishing was typically done with dip nets, seines or drag nets, traps or weirs, or large, canoe-shaped basketry scoops with long handles along the Colorado River, or in muddy side sloughs or ponds (Stewart 1983:59).

Hunting was of relatively minor significance to the economy of the Mojave and was, as a consequence, less well developed as a cultural skill than among other adjacent groups out in the desert (Stewart 1983:59).

The Mojave may be thought of as a tribe (see Service 1962). They appear to have and to continue to regard themselves as one people. The tribe appears to be divided into three bands or more local groups, the northern, central, and southern divisions. Historically, each band was, in turn, further divided into settlements that were sprawling clusters of residences on low floodplain knolls adjacent to arable land. The nucleus of

each settlement was an extended family. Each settlement appears to have had a group leader, and each band appears to have had one or several subchiefs. The tribe as a whole had a head chief, but the longevity of this position of status, prior to the arrival of the Europeans, is uncertain. Authority among the Mojave was derived from the ongoing consensus of subordinate tribal members. There was also only a minimal or incipient development of tribal political institutions (Stewart 1983:57 and 62).

Historic Setting

Roads

Much of the important history of the Mojave Desert took place beyond the proposed project area. The historic period of the region begins in 1776 with the travels of Francisco Garces between the Colorado River and the Mission system of coastal California. He became the first European to cross the Mojave. His route followed the Native American trails (Mojave Trail) between the Needles area on the Colorado River, across to the Mojave River, and then through the Cajon Pass.

During the time of Mexican sovereignty in the area, in 1826 and again in 1827, Jedediah Strong Smith crossed the Mojave Desert via the Mojave Trail, both times traveling from east to west only. Smith was followed by early travelers to the region such as Ewing Young in 1829. Kit Carson was a notable member of Young's party. The Antonio Armijo party of 1829-30 was the first to complete a trip between Santa Fe and Los Angeles and the first known to have traveled a different route across the Mojave Desert. This route, a more northerly route, connected Las Vegas, Resting Springs, the Amargosa River, Salt Creek, and Bitter Springs with the Mojave Road near present-day Daggett. John C. Fremont traveled this route in 1844. While it is a matter of debate whether or not the Amargosa River Route was the trail of the Spanish caravans, known as the Old Spanish Trail, it became the preferred route of travel between Salt Lake City and San Bernardino, connecting two distant Mormon communities following the War with Mexico in 1846.

Following the discovery of gold in California in 1848 and California statehood in 1850, increased traffic occurred in the Mojave Desert, much of it along the Old Spanish Trail or Mormon Road. Alterations to the Old Spanish Trail occurred after the discovery of the Kingston Cut-off in 1855 as well as other "short-cuts." These two routes, the Mojave Road, and the Old Spanish Trail or Mormon Road, were the primary nineteenth-century transportation routes through the Mojave Desert prior to the construction of railroads in the region (Warren, Knack, and Warren 1980; Warren and Roske 1981).

Mining

In addition to transportation routes, another major historic theme in the Mojave Desert during the American period (post-1846) was mining. A party of Mormons, led by Jefferson Hunt, discovered gold in the Salt Creek area, approximately 44 miles west of the proposed project area, in December of 1849. Sporadic attempts at mining in the Salt Creek area, as well as in other areas of the Mojave Desert and the San Bernardino Mountains, were hampered by ongoing conflicts with local Native American groups, who resisted the invasion of their respective territories.

Killings of miners resulted in a series of American military expeditions into the Mojave Desert around 1860 and led to the establishment of a number of military posts to the south of the proposed project area (Fort Cady, Hancock's Redoubt at Soda Springs, Rock Springs, and Fort Paiute). In addition, military posts were located in the San Bernardino Mountains in the 1850s at Cajon, Jurupa, and Rancho del Chino (Beck and Haase 1974).

In the 1860s prospectors fanned out over the Mojave Desert looking for another Sutter's Mill or Comstock Lode, resulting in the discovery of ore in the Clark Mountain Range, and in the Providence, New York, Whipple, Turtle, and Sacramento Mountains, as well as important silver deposits near Tecopa Pass. Most of these discoveries were made within two days' travel of major transportation routes. Between 1870 and World War I, mining activity continued and gold mining surpassed silver mining in the 1890s.

Precious metals were not the only commodity that was mined near the turn of the twentieth century. Large deposits of borates were discovered in the Calico area (Borate) and in and around Death Valley. Nitre was mined 15–20 miles north of the proposed project area near the turn of the twentieth century, as were gypsum and talc (Vredenburgh, Shumway, and Hartill 1981).

Railroads

By the beginning of the twentieth century, mining interests in the Amargosa Basin saw a need to provide better transportation for minerals and ore to the markets. Rail transportation along the Old Government Road (Mojave Road) had been open since 1883 with the completion of the Atlantic and Pacific Line (Santa Fe Railroad). By 1905 a second rail line bisected the Mojave Desert with the construction of the San Pedro, Los Angeles, and Salt Lake Line (Union Pacific). William T. Coleman of San Francisco had developed the Harmony Borax Works using 20-mule teams to haul the deposits across the Mojave to the town of Mojave on the Southern Pacific Railroad.

In 1888 Coleman's borax properties, the Lila C. and the mines at Borate (Calico), passed to Francis M. "Borax" Smith who had found borates at Teel's Marsh in Nevada. In 1890 Smith combined all three properties to form the Pacific Coast Borax Company. Exhausting the supply at Teel's March, Smith moved operations to Calico. By 1900 the rich deposits at Calico began to give out, and Smith turned his attention to his property near Death Valley.

After a failed attempt in April 1904 to move his ore from the Lila C. mine near Death Valley to the California Eastern Railroad at Ivanpah, 100 miles to the south, via a rock-base wagon road, Smith conceived of a new railroad bisecting the Mojave Desert north to south. On July 19, 1904, he incorporated the Tonapah and Tidewater Railroad Company. Surveys were conducted for several alternate routes, and contracts were arranged. Following conversation with Montana Senator William A. Clark in Nevada, a route was chosen between Las Vegas and the Lila C. The construction of the railroad started in Las Vegas in the spring of 1905. By August it became clear that Senator Clark was building his own railroad to the Tonapah-Goldfield area to provide rail transportation for the newly found gold and silver mines in that area.

After talks with the Santa Fe Railroad, Smith altered his route, and by the latter part of 1905 a tent city had been established at Ludlow to begin the new railroad which was planned to extend 167 miles north to the goldfields, with a branch line cutting over to the Lila C. Smith envisioned a railroad from Tonapah, Nevada, to the tidewater at San Diego, hence the name. On November 19, 1905, the first tracks were laid on the T&T's loop out of Ludlow, and by May of 1906 the rail line extended for 75 miles to just beyond Dumont. Engineering problems slowed construction to Tecopa (Inyo County) due to the twelve mile Amargosa Canyon segment, but a year later trains were operating all the way to Tecopa. In June 1907 the rail line extended to Zabriskie, where wagon-hauled ore from the Lila C. was loaded for the 91-mile trip to Ludlow. Eighteen additional miles were completed to Evelyn by mid-July of that year. On August 16, 1907, the seven-mile branch line from the Lila C. connected with the T&T at Death Valley Junction. Additional construction extended the T&T to Gold Center, Nevada, the end of the line, on October 30, 1907. Smith made arrangements with the recently completed Bullfrog Goldfield Railroad to connect to the T&T and to use the Bullfrog track from Gold Center, north to Beatty, and west to Bullfrog and Rhyolite.

A spur line was constructed to China Ranch to facilitate gypsum and talc shipping in 1915 in the Willow Wash or China Ranch Wash. The T&T railroad was abandoned in 1940 when the rails were removed to support the war effort. Many of the ties were taken to Barstow and used in the construction of the El Rancho Motel (Myrick 1992). An unconfirmed report by Pat Mitchell (1994, personal communication), grazing allottee at Horse Thief Springs, indicates that the railroad tie-constructed cabin or house at Horse Thief Springs was also built of T&T railroad ties.

Hydroelectric Power Generation and Electric Power Transmission

The eastern Mojave Desert has been the major corridor for the transmission of hydroelectric power from Hoover Dam, roughly 51 miles to the northeast of the project site, to Los Angeles, approximately 244 miles to the southwest, since 1936. Hoover Dam and the electric transmission system that distributes the hydroelectric power that it produces underwrote much of the economic development of the West in the twentieth century and were particularly critical to the economic development of southern California during that period (Solar Partners I et al. 2008f:6).

Hoover Dam

Congress authorized the construction of Hoover Dam through the passage of the Boulder Canyon Project Act of 1928. The act was a response to both an increase in the regional demand for electric power and a desire to affect better flood control along the Colorado River. Construction of the dam began in 1931, and the dam structure itself was completed in 1935. The construction of the hydroelectric powerhouse and the installation of the first turbines took another year. The powerhouse went into operation in 1936. The installation of the balance of the turbines in the facility was completed in 1939. The original output of the powerhouse in 1939 was 700 MW, making it the largest hydroelectric facility in the world at that time (Solar Partners I et al. 2008f:5 and 6).

Hoover Dam Transmission System

Transmission systems were needed to power the construction of Hoover Dam and to distribute the hydroelectricity that it would ultimately generate. The design of the

Boulder Canyon Project Act was for the Federal government to build the dam and the powerhouse and to supply the turbines. Power contractors were then to lease the turbines from the government, pay the government for the use of the pooled water, and to themselves supply the electric transmission lines for the distribution of the generated electricity. The government, however, first had to supply a transmission line to power the construction of the dam. Southern Sierras Power Company, subsequently the California Electric Power Company, won the contract to build that initial transmission line and did so in 1930 and 1931. A second contractor, the Interstate Telegraph Company, built a telephone line in 1931 that was necessary to the operation of the Southern Sierras Power Company transmission line. The California Electric Power Company reversed the direction of the transmission line in 1937 to begin delivery of electricity from Hoover Dam to the City of San Bernardino (Solar Partners I et al. 2008f:6 and 7).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Regulatory Context

Various laws apply to the evaluation and treatment of cultural resources. CEQA requires the Energy Commission to evaluate resources by determining whether they meet several sets of specified criteria. These evaluations then influence the analysis of potential impacts to the resources and the mitigation that may be required to ameliorate any such impacts.

The CEQA Guidelines provide a definition of a historical resource as a “resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the CRHR”, or “a resource listed in a local register of historical resources or identified as significant in a historical resource survey meeting the requirements of Section 5024.1 (g) of the Public Resources Code,” or “any object , building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the agency’s determination is supported by substantial evidence in light of the whole record.” (California Code of Regulations, Title 14, section 15064.5(a)). Historical resources that are automatically listed in the CRHR include California historical resources listed in or formally determined eligible for the NRHP and California Registered Historical Landmarks from No. 770 onward (Public Resources Code, Section 5024.1(d)).

Under the CEQA Guidelines, a resource is generally considered to be historically significant if it meets the criteria for listing in the CRHR. These criteria are essentially the same as the eligibility criteria for the NRHP. In addition to being at least 50 years old,[7] a resource must meet at least one (and may meet more than one) of the following four criteria (Public Resources Code section 5024.1):

[7] The Office of Historic Preservation’s Instructions for Recording Historical Resources (1995) endorses recording and evaluating resources over 45 years of age to accommodate a five-year lag in the planning process.

- Criterion 1, is associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion 2, is associated with the lives of persons significant in our past;
- Criterion 3, embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values; or
- Criterion 4, has yielded, or may be likely to yield, information important to history or prehistory.

In addition, historical resources must also possess integrity of location, design, setting, materials, workmanship, feeling, and association (California Code of Regulations, Title 14, section 4852(c)).

Even if a resource is not listed or determined to be eligible for listing in the CRHR, CEQA allows the lead agency to make a determination as to whether the resource is a historical resource as defined in Public Resources Code sections 5020.1 (j) or 5024.1. Whether a proposed project would cause a substantial adverse change in the significance of historical resources is the issue that staff analyzes to determine if the project may have a significant effect on the environment. The significance of an impact depends on:

- The cultural resource impacted;
- The nature of the resource's historical significance;
- How the resource's historical significance is manifested physically and perceptually;
- Appraisals of those aspects of the resource's integrity that figure importantly in the manifestation of the resource's historical significance; and
- How much the impact will change those integrity appraisals.

Historical Resources Inventory

The development of the inventory of historical resources in and near the proposed project area is the requisite first step in the assessment of whether the project may, under Public Resources Code section 21084.1, cause a substantial adverse change in the significance of a historical resource, and may, therefore, have a significant effect on the environment. The effort to develop the inventory has involved conducting a sequence of investigatory phases that includes doing background research, consulting with local Native American communities, conducting primary field research, interpreting the results of the inventory effort, as a whole, and evaluating whether found cultural resources are historically significant. This section discusses the methods and the results of each inventory phase, develops the historical resources inventory for the analysis of the proposed project, and interprets the inventory to assess how well it represents the archaeology of the project area of analysis.

The project area of analysis is the geographic area in which the construction and operation of the proposed project may have the potential to directly and indirectly impact cultural resources. For the purpose of the present analysis, this geographic area

includes the project site, which is the footprint of the concentrating solar power electric generation facility, the broader project area, which is the area that encompasses the project site and ancillary facilities, such as natural gas pipelines, water pipelines, transmission infrastructure, and access roads requisite to the operation of the generation facility, and areas beyond the project area where the project may visually intrude on cultural resources.

Background Research

The background research for the present analysis employs information that the applicant and the BLM gathered from literature and record searches, and information that the BLM and Energy Commission staff gathered as a result of consultation with local Native American communities and with other potential public interest groups. The purpose of the background information is to help formulate the initial cultural resources inventory for the present analysis, to identify information gaps, and to inform the design and the interpretation of the field research that will serve to complete the inventory.

Literature and Records Search

The literature and records search portion of the background research attempts to gather and interpret documentary evidence of the known cultural resources in the project area of analysis. The sources for the present search include the San Bernardo Archeological Information Center (SBAIC) of the California Historical Resources Information System (CHRIS), and the BLM Needles Field Office.

CHRIS Search

Methods

CH2M HILL, the cultural resources consultant to the applicant, requested a records search from the SBAIC on June 21, 2007 (BSE2007a, App. 5-3C). The record search was limited to the area within a one-mile radius around the project site and 0.25 miles to each side of the linear infrastructure proposed for the project. The search returned information on the known inventory of prehistoric and historical archaeological resources, built-environment resources, cultural landscapes, traditional cultural resources, and the heritage resources for which designations of significance already exist, that fell within the defined search area. The search also provided information on the technical reports for the previous archaeological surveys that have taken place wholly or partly within 0.25 miles of the area subject to archaeological survey for the present analysis, and for the archaeological excavations and built-environment surveys that have taken place in the records search area. The CHRIS records search also accessed the *Survey of Surveys: A Summary of California's Historical and Architectural Resource Surveys* (1986), the *Five Views: An Ethnic Sites Survey for California* (1988), the listed California Historical Landmarks and California Points of Historical Interest, and the California Office of Historic Preservation's Determinations of Eligibility and Directory of Historic Properties.

Results

The SBAIC record search found that 21 investigations, 20 pedestrian surveys, and one ethnographic study, had been wholly or partially conducted in the record search area between 1978 and 1995 (Cultural Resources Table 2).

CULTURAL RESOURCES TABLE 2
Previous Cultural Resources Investigations in the Records Search Area

Type of Investigation	Number of Investigations of Type	Dates of Investigations	CHRIS Document Nos.
Linear pedestrian electric transmission line surveys	8	Late 1970s to mid-1990s	1060614, 1060763, 1060764, 1060874, 1061280, 1061479, 1062170, 1063668
Areal pedestrian survey to inventory California desert area archaeological site types	1	Late 1970s	1062218
Linear and areal pedestrian surveys for the ISEGS project	2	Early 1980s	1061156, 1061219
Ethnographic Study for the ISEGS project	1	Early 1980s	1061220
Linear pedestrian motorcycle race course survey	1	Early 1980s	1061381
Linear and areal pedestrian surveys for drilling areas and associated access roads	2	Mid-1980s	1061599, 1061605
Areal pedestrian parcel surveys	2	Mid-1980s	1061602, 1061612
Linear pedestrian fiber optic cable surveys	2	Late 1980s	1061613, 1061734
Linear pedestrian natural gas pipeline surveys	2	Late 1980s to early 1990s	1062211, 1062571

The total survey coverage in the project area that is the result of these previous investigations is roughly 242 acres or 6 percent.

While eight cultural resources are known for the record search area (Cultural Resources Table 3), only one is located in the project area of analysis, the Hoover Dam-to-San Bernardino Transmission Line (CA-SBR-10315H), originally built as a 132-kV line and presently operating as a 115-kV line.

CULTURAL RESOURCES TABLE 3
Previously Recorded Cultural Resources in the Records Search Area

Resource Designation No.	Description	Approximate Distance and Direction to Project Area
CA-SBR-816, 2341	Rock shelter	1.0 miles NW of Ivanpah No. 3
CA-SBR-2342	Rock shelter	1.0 miles NW of Ivanpah No. 3
CA-SBR-6956	Rock shelters and milling features	0.85 miles NW of Ivanpah No. 3
CA-SBR-7347H	Dirt road, two-track with low side berms	0.5 miles WSW of Ivanpah No. 1
CA-SBR-7689H	Arrowhead Trail Highway (State Route 31)	0.6 miles E of Ivanpah No. 1
CA-SBR-7694H	Boulder Transmission Lines 1, 2, and 3	0.8 miles N of Ivanpah No. 3
CA-SBR-10315H	Original 132-kV transmission line from the City of San Bernardino to the Hoover Dam, now known as the Eldorado-Baker-Coolwater-Dunn Siding-Mountain Pass 115-kV transmission line	Between Ivanpah No. 1 and Ivanpah No. 2
CA-SBR-10803H	Stock-loading facility with ancillary improvements	0.5 miles E of Ivanpah No. 1

BLM Needles Field Office National Environmental Policy Act (NEPA) Document

Document Origins and Purpose

The BLM Needles Field Office has a NEPA document on file, an Environmental Assessment (EA), for the recent renewal of the Clark Mountain grazing allotment that is useful to the present analysis (BLM 2007). The Clark Mountain allotment includes 97,848 acres of public land across a number of different environmental zones in Ivanpah and Mesquite Valleys in San Bernardino County, and encompasses the proposed project area.

The EA provides important information on the distribution of cultural resources beyond the one major environmental zone of the project area, mid-slope bajada with Mojave Creosote Bush Scrub. The cultural resources inventory in the EA for the Clark Mountain allotment offers a broader context of the different types of archaeological sites that reflect the variations in the prehistoric human use of the different environmental zones in the project vicinity through time, of the potential for shifts in the composition of archaeological site types across the project area bajada over the last 12,000 years as part of the human response to fluctuations in the climate of the region, and of the range of historical archaeological sites that may be found in the area of analysis for the project.

Results

The cultural resources inventory for the Clark Mountain allotment in the EA is primarily the result of sporadic pedestrian surveys that have taken place over the last 30 years. Approximately 2,661 acres of the 97,848 acres of public land in the allotment, or 2.7 percent, have been subject to survey. The result of the work has been the identification of 46 cultural resources (Cultural Resources Table 4).

The EA splits out the cultural resources inventory of the allotment relative to three major environmental zones, mountain ranges, valley floors, and zones of transition between the mountain ranges and valley floors. The Mountain Environmental Zone in Cultural Resources Table 4 relates solely to the mountain ranges proper in the allotment, the Clark Mountain Range and the Mesquite Mountains. The Valley Environmental Zone includes the alluvial and eolian landforms on or near the floors of Ivanpah and Mesquite Valleys and the inselbergs along the margins of the valleys. The Transition Environmental Zone covers the lower slopes of the mountains, the adjacent upper portions of local bajadas, and the canyons and springs that are found at that physiographic interface.

CULTURAL RESOURCES TABLE 4
Clark Mountain Allotment Cultural Resources Inventory

CHRIS Trinomial	Environmental Zone	Site Type
Prehistoric Archaeological Resources		
CA-SBR-817	Mountain (hillside)	Campsite
CA-SBR-7348	Mountain	Lithic scatter
CA-SBR-816	Mountain (hillside)	Rock shelter
CA-SBR-840	Mountain (hillside)	Rock shelters
CA-SBR-2342	Mountain (hillside)	Rock shelter (habitation)
CA-SBR-807	Transition	Roasting pits[8]
CA-SBR-809	Transition	Roasting pit
CA-SBR-838	Transition	Roasting pits
CA-SBR-859	Transition	Roasting pit
CA-SBR-2335	Transition	Rock shelter, small
CA-SBR-2395	Transition	Roasting pit
CA-SBR-5120	Transition	Roasting pits
CA-SBR-5317	Transition	Rock shelter
CA-SBR-7392	Transition	Campsite, temporary
CA-SBR-2969	Valley	Campsite
CA-SBR-2970	Valley	Campsite

[8] "Roasting pits" here, also known as "ring midden roasting pits," are "elevated ring-shaped piles composed of stone and soil" that are commonly thought to derive from repeated episodes of roasting mescal (*Agave* spp.) or sotol (*Dasylirion* spp.). These archaeological features are most often found in the deserts of the Southwest (Kroesen and Schneider 2008, pp. 43 and 44).

CHRIS Trinomial	Environmental Zone	Site Type
CA-SBR-2971	Valley	Campsite
CA-SBR-4944	Valley (private land)	Campsite
CA-SBR-2791	Valley	Campsite, temporary
CA-SBR-5222	Valley	Campsite, temporary
CA-SBR-5439	Valley	Campsite, temporary
CA-SBR-5440	Valley	Campsite, temporary
CA-SBR-5223	Valley	Ceramic scatter, small
CA-SBR-3727	Valley	Lithic scatter
CA-SBR-5224	Valley	Lithic scatter, small
CA-SBR-6955	Valley	Lithic scatter
CA-SBR-4920	Valley	Trail
Historical Archaeological Resources		
CA-SBR-6835H	Mountain/ Transition/Valley	Von Schmidt 1872 Boundary Survey for California and Nevada
CA-SBR-7694H	Mountain/ Transition/Valley	Boulder Transmission Corridor right-of-way
CA-SBR-9740[H]	Mountain	Historic mining
CA-SBR-6563H	Transition	Historic trash scatter
CA-SBR-6591H	Transition	Historic trash scatter
CA-SBR-10803H	Valley	Cattle corral
CA-SBR-10315H	Valley	Electric transmission line
CA-SBR-7347H	Valley	Historic road
CA-SBR-7689H	Valley	Historic road
CA-SBR-10802H	Valley	Historic road
CA-SBR-10806H	Valley	Historic road
CA-SBR-5221[H]	Valley	Historic salt works
CA-SBR-10804H	Valley	Historic site
CA-SBR-4701[H]	Valley	Historic stone walls
CA-SBR-6248H	Valley	Historic trash scatter
CA-SBR-6592H	Valley	Historic trash scatter
CA-SBR-6957H	Valley	Historic trash scatter
CA-SBR-6562H	Valley	Telegraph station
Dual-Component Archaeological Resource		
CA-SBR7098/H	Valley	Lithic scatter/historic trash scatter

The cultural resources inventory for the Clark Mountain allotment demonstrates distinct patterns for the prehistoric and historic human use of the environmental zones above, in, and below the proposed project area (Cultural Resources Table 5). The evidence for the prehistoric use of the Mountain Environmental Zone includes rock shelters, an open

campsite, and a lithic scatter. The inventory for the Transition Environmental Zone in the allotment similarly includes a small rockshelter and a temporary open campsite, but is the only environmental zone in the allotment where roasting pits are found. The Valley Environmental Zone has the highest frequency of prehistoric archaeological sites. The Valley cultural resources inventory includes open temporary campsites and campsites that evidence more enduring use, scatters of lithic and ceramic artifacts, and a trail.

CULTURAL RESOURCES TABLE 5
Clark Mountain Allotment Cultural Resources Types and Environmental Zones

Archaeological Site Type	**Environmental Zone**		
	Mountain	**Transition**	**Valley**
Prehistoric Archaeological Sites			
Campsite	1	1	8
Ceramic scatter			1
Lithic scatter	1		3
Rock art			
Rock shelter	3	2	
Roasting pit		6	
Trail			1
Total (Number/Percent)	5/19%	9/33%	13/48%
Historical Archaeological Sites			
Cattle corral			1
Electric transmission line	1	1	2
Historic mining	1		
Historic road			4
Historic salt works			1
Historic site			1
Historic stone wall			1
Historic trash scatter		2	3
Land surveying boundary	1	1	1
Telegraph station			1
Total (Number/Percent)	3/14%	4/18%	15/68%

The evidence for the historic human use of the environmental zones in the vicinity of the project area exhibits markedly different patterns of activity from those characteristic of the prehistoric period. The Mountain Environmental Zone has been the focus of mining in the historic period and is represented in the cultural resources inventory for the Clark Mountain allotment by CA-SBR-9740[H]. Over time, intermittent stream flow has flushed historic refuse from the mines in the Clark Mountain Range and the Mesquite Mountains down into the Transition Environmental Zone where deposits of this refuse sporadically line the streambeds and banks of dry washes. The Valley Environmental Zone has been the focus of a more diverse range of uses in the historic period. The historic-period resources inventory for the Valley Environmental Zone includes evidence of livestock management and the development of electric transmission and transportation corridors,

communications infrastructure, and manufacturing enterprises. The historic trash scatters, stone wall configurations, and the nondescript historic site are evidence of the more peripheral aspects of the range of historic activity out on the floors of Ivanpah and Mesquite Valleys.

Native American Consultation

The applicant, the BLM, and Energy Commission staff have undertaken to consult with the Native American groups that may have an interest in the project area, beginning with the applicant in June, 2007. The BLM, as the local federal land manager, is coordinating the ongoing Native American consultation for the proposed project on its own behalf and on behalf of the Energy Commission. The results of that consultation will be detailed in the DEIS/FSA.

Methods

CH2M HILL, the consultant to the applicant, contacted the California Native American Heritage Commission (NAHC) on June 27, 2007 to request that the NAHC search its Sacred Lands File to determine whether there are any reported Native American cultural resources in the proposed project area, and to request that the NAHC provide a list of Native American contacts that may have knowledge of cultural resources in the project area. On June 29, 2007, CH2M HILL, on the basis of the response from the NAHC, sent out letters to initiate correspondence with Native Americans that the NAHC thought may have an interest in the project area (BSE2007a, p. 5.3-21 and appendix 5.3A). The BLM is coordinating the ongoing Native American coordination for the proposed project. The further results of that consultation will be related in the DEIS/FSA.

Results

The June 29, 2007 response of the NAHC to the above request says that the Sacred Lands File did not indicate any Native American cultural resources in the immediate project area and provides a list of Native American contacts (Cultural Resources Table 6). CH2M HILL mailed and emailed letters to each of the contacts on the list of June, 29 2007 asking them to please contact the consultant if they had any knowledge of traditional cultural properties or areas of traditional cultural value in the project area, or if they had any concerns about the proposed project. As of August 13, 2007, the month of the filing of the AFC for the proposed project, CH2M HILL had received no responses to the letters sent out on June 29 (BSE2007a, p. 5.3-21 and appendix 5.3A).

CULTURAL RESOURCES TABLE 6 (BSE2007a, Appendix 5.3A)
Native American Contacts

Native American Group	Location of Group Contact
Cahuilla Band of Indians	Community of Anza, Riverside County
Ramona Band of Mission Indians	Community of Anza, Riverside County
San Manuel Band of Mission Indians	City of Highland, San Bernardino County
Chemehuevi Reservation	Chemehuevi Valley, San Bernardino County
AhaMaKav Cultural Society, Fort Mojave Indian Tribe	Mohave Valley, Mohave County, Arizona
Morongo Band of Mission Indians	City of Cabazon, Riverside County
San Manuel Band of Mission Indians	City of Highland, San Bernardino County
Fort Mojave Indian Tribe	City of Needles, San Bernardino County
Serrano Band of Indians	City of Highland, San Bernardino County

Consultation with Others

CH2M HILL made telephone calls to the San Bernardino Historical and Pioneer Society in the City of San Bernardino on June 27, 2007 in an attempt to reach Steve Shaw, President, and to the Nevada State Museum and Historical Society in Las Vegas on June 28, 2007 in an attempt to reach David Millman, Curator of Collections (History). Voicemails were left for both. As of August 13, 2007, the month of the filing of the AFC for the proposed project, CH2M HILL had received no responses (BSE2007a, p. 5.3-19).

Cultural Resources Distribution Models

One critical use of the information drawn together during the background research for a cultural resources analysis is to inform the design and the interpretation of the field research that will complete the cultural resources inventory for the analysis. The background research for the present analysis has identified one previously recorded cultural resource on the project site, CA-SBR-10315H (see *California Historical Resources Information System Search* section above), and found that roughly 94 percent of the project area has never been subject to cultural resources survey. A further role of background research is to help develop predictive or anticipatory models of the distribution of cultural resources across a project area of analysis. Such models of the types of archaeological, ethnographic, and built-environment resources, and the patterns of their distribution across and beneath the surface of the landforms of the project area of analysis, provide the means to tailor more appropriate research designs for the field investigations that will complete a cultural resources inventory, and help gauge the degree to which the results of those investigations may reflect the actual population of archaeological, ethnographic, and built-environment resources in the project area of analysis. Such models also provide important contexts for the ultimate interpretation of the results of those investigations.

Models of the distribution of prehistoric archaeological sites, of ethnographic resources, and of historical archaeological sites and built-environment resources are developed here and draw on information above in the “Environmental Setting,” “Prehistoric Setting,” “Ethnographic Setting,” and “Historic Setting” subsections, in addition to the

above information in the “Background Research” subsection. Staff formulated data requests during the discovery phase of the present certification process on the basis these models to ensure the collection of enough information to factually support the conclusions of this analysis. The discussions in the “Interpretation of Results” subsection below also employ the models.

Model of Prehistoric Archaeological Resources

The analysis of the information in the “Environmental Setting,” “Prehistoric Setting,” and “Literature and Records Search” subsections leads to the conclusion that subsurface prehistoric archaeological deposits are unlikely to be present in the project area and that the likelihood of prehistoric archaeological deposits across the surface of the project area is generally low, with the possible exception that roasting pits and rock shelters could be present on the inselbergs adjacent to the project site.

The age of the constituent sedimentary deposits that make up the project area landform, the bajada, and the geomorphic processes that have been actively shaping it constrain the age and the physical integrity of the surface and subsurface archaeological deposits that may be present there. The subsurface portion of the bajada appears to have been formed between approximately 8,700 and 4,000 years ago. Processes of erosion appear to have been reworking the sedimentary deposits of the bajada over the course of the last 4,000 years (see “Historical Geomorphology” subsection, above).

Subsurface archaeological deposits that may be present in the project area would include cultural materials from the time range of 8,700 to 4,000 years ago that would have been left on former bajada surfaces and then buried during the most recent cycle of sedimentary deposition on the middle and lower slopes of the bajada. This time range corresponds to the late Lake Mojave Period (10,000 to 5000 B.C.) and the Pinto Period (5000 to 2000 B.C.) (see “Prehistoric Setting” subsection, above). Lake Mojave and Pinto Period deposits are typically small, rather sparse accumulations of stone tools and stone tool manufacturing debris that are found in the vicinity of high terraces above or on relict shorelines along what are now playas. The portions of archaeological sites or components that date to this time range and largely represent temporary small camps and work stations are also found along relict stream channels. As the terraces and shorelines of Ivanpah Dry Lake are lower down on the bajada beneath the proposed project area, and as the ephemeral washes that course over the present surface of the project area are not the type of relict stream channels that would have held more perennial water sources in prehistory, the presence of subsurface Lake Mojave and Pinto Period archaeological deposits in the project is unlikely.

Archaeological deposits that may be present on the surface of the proposed project area would include cultural materials that date from 4,000 years ago to the present. Deposits of this age may survive with physical integrity on the more stable patches of the surface of the bajada, or have no physical integrity due to the erosion and re-deposition of the original deposits in ephemeral stream channels and over the adjacent channel banks. The time range for most surface archaeological manifestations would correspond to the Gypsum (2000 B.C. to A.D. 500), Saratoga Springs (A.D. 500 to 1200), and Protohistoric (A.D. 1200 to present) Periods. Gypsum Period components

are ephemeral in character and are relatively scarcer in the vicinity of the project area. The basic settlement pattern from the Gypsum through the Protohistoric Period appears to demonstrate a focus on lowland concentrations of plant resources along streams and in the lake basins. Despite considerable evidence of outside (Virgin Anasazi and Hakataya) influence in the region during the Sarasota and Protohistoric Periods, the basic economic milieu and the associated settlement patterns reflect the ongoing local trends in desert adaptation that had been in place for millennia. As the stream and lake basin environments that would have been conducive to the development of plant resource concentrations in the Gypsum through Protohistoric Periods do not appear to have been present in the project area, modern vegetation associations having been in place by approximately 4,500 years ago (see “Paleoecology” subsection above), the presence of period surface deposits is unlikely.

The results of the CHRIS records search and the EA for the Clark Mountain allotment differ in their support of the above conclusions. The records search notes three prehistoric archaeological sites in the vicinity of the proposed project area, CA-SBR-816 (-2341), CA-SBR-2342, and CA-SBR-6956, and none in it. The three sites are rock shelters, one of which includes milling features, which lie approximately 0.85 to 1.0 miles to the northwest and approximately 160 feet above the project area at the base of the Clark Mountain Range. The project area encompasses the lower portion of what the EA for the Clark Mountain allotment delimits as the Transition Zone and the upper portion of the Valley Zone in that classification. On the basis of the results of the EA, the prehistoric archaeological record for the project area may include roasting pits, rockshelters, and campsites in the Transition Zone and campsites, lithic and ceramic scatters, and trails in the Valley Zone. The question of how many of these different site types may be found in the project area is dependent upon where in the Transition and Valley Zones the different types cluster. The project area, being on the broad bajada slopes in the lower portion of the Transition Zone appears to be just beneath the lower mountain slopes and the upper bajada surfaces, where the surface presence of the roasting pits and the rockshelters appear to cluster (Kroesen and Schneider 1991, p. 50). Topographic exceptions are the inselbergs that flank the Ivanpah No. 3 portion of the project site, which may have geologic formations that would accommodate rockshelters and may host vegetation types that include the plant species that were being processed in the roasting pits. The site types characteristic of the Valley Zone typically cluster down on the valley floor in the vicinity of Ivanpah Dry Lake (BLM 2007), below the project area. As the project site is in the upper portion of the Valley Zone, the frequency of the Valley Zone site types may be rather low.

Model of Ethnographic Resources

The available information on the types of ethnographic resources that would be or are characteristic of the Southern Paiute or Mojave groups are too general and too spare to develop a useful predictive model about the resources that may be present in the project area of analysis. The study by Bean, Vale, and Young (1982) indicates that, in the vicinity of the proposed project area, known ethnographic areas of value include playa edges such as those around Ivanpah Dry Lake, grinding rock and roasting pit sites at Mountain Pass roughly eight miles to the southwest of the project site, piñon stands in the New York Mountains on the southeastern margin of Ivanpah Valley, and turquoise deposits in the Clark Mountain Range and in the vicinity of Turquoise

Mountain roughly 30 miles to the west-southwest of the project site. The identification of ethnographic resources for the present analysis must rely on efforts to identify ethnographic resources in the field and on further Native American consultation (Bean, Vale, and Young 1982:6-6–6-39).

Model of Historical Archaeological and Built-Environment Resources

The analysis of the information in the “Environmental Setting,” “Historic Setting,” and “Literature and Records Search” subsections leads to the conclusion that subsurface historical archaeological deposits are most likely not present in the project area and that historical archaeological deposits and built-environment resources are likely present in low to moderate frequency across the surface of the project area.

As the subsurface portion of the bajada is 8,700 to 4,000 years of age and the surface of it has been subject to erosive forces for the last 4,000 years (see “Historical Geomorphology” subsection, above), there is almost no chance that buried historical archaeological deposits exist in the project area that are not detectable from the surface. Constructed subsurface features, such as basements, cellars, and trash and privy pits, would have been dug into the eroding surface of the bajada and would still be apparent today.

Historical archaeological deposits and built-environment resources that may be present on the surface of the proposed project area could hypothetically include cultural materials that date from the mid-nineteenth century to the present, the principal period of the historic use of the project area (see “Historic Setting” subsection, above). Historical archaeological deposits would be present with physical integrity on the more stable patches of the surface of the bajada or have no physical integrity due to the erosion and re-deposition of the original deposits in ephemeral stream channels and over the adjacent channel banks. Surface deposits of historical archaeological materials that retain physical integrity, or primary deposits, would most likely relate to debris that was the result of the moderately heavy use of transportation routes from the floor of Ivanpah Valley to the mines in the Clark Mountain Range, to the west of the project area, and of transportation routes through the valley, parallel to its long axis. Evidence of such materials and of the actual transportation routes are moderately likely to be present in the project area, as are secondary deposits (deposits that lack physical integrity) of mining-related refuse that has washed down from the mountains and that now lie in and adjacent to ephemeral stream channels. Other historical archaeological materials and built-environment resources that may be present at lower frequency include resources related to ranching, homesteading, local industry, and the development of the utility infrastructure of the region.

The results of the CHRIS records search and the EA for the Clark Mountain allotment support the above conclusion. The records search notes five historical archaeological sites and built-environment resources in the vicinity of the proposed project area, including one that falls inside it (CA-SBR-10315H). These resources include a segment of a dirt road (CA-SBR-7347H), a segment of former State Route 31, or the Arrowhead Trail Highway (CA-SBR-7689H), portions of two utility corridors, operational and abandoned (CA-SBR-7694H and CA-SBR-10315H), and a livestock loading facility (CA-SBR-10803H). The EA for the Clark Mountain allotment indicates that the record of

historical archaeological sites and built-environment resources in the project area may also include resources related to the development of local industry. The EA further notes the presence of several resource types that may relate to a number of the known historic themes that are germane to the project area. These resource types include nondescript historic sites, stone wall segments, and historic trash scatters. These more generic resource types, particularly the historic trash scatters, are more likely to be found higher in the project area toward the mines of the Clark Mountain Range, lower in the project area toward the floor of the valley, and along the routes of travel and utility corridors that traverse the project area.

Cultural Resources Inventory Fieldwork

The field efforts to identify the cultural resources in the proposed project area of analysis include a geoarchaeology study, a pedestrian reconnaissance survey, a helicopter reconnaissance survey, and two intensive pedestrian surveys (Cultural Resources Table 7). While the complete results of these efforts are not yet available, three new cultural resources have been found to date in the area of analysis, not including the discovery of six isolate resources, and one previously known cultural resource has been re-recorded (Cultural Resources Table 8). On the basis of the background research for the present analysis and the results of the field efforts that are presently available, the total cultural resources inventory for the project area of analysis includes one archaeological resource, no ethnographic resources, and three built-environment resources. The outstanding results of the helicopter reconnaissance survey may add to the cultural resources inventory.

CULTURAL RESOURCES TABLE 7
Cultural Resources Inventory Investigations for the Present Analysis

Investigation Type	Results	Report Reference
Geoarchaeology Study	Conclusion that surface and subsurface potential for archaeological remains is negligible	pp. 9–18, CH2ML2008b
Primary Intensive Pedestrian Cultural Resources Survey	Relocated one built-environment resource; found two new built-environment resources and six isolated artifacts	Fergusson 2007
Supplemental Intensive Pedestrian Cultural Resources Survey	No cultural resources found	Fergusson 2007
23 May 2008 Pedestrian Reconnaissance Survey of Project Area Inselbergs	Found one archaeological resource	Energy Commission staff field notes
Helicopter Reconnaissance Survey	Pending	Pending

CULTURAL RESOURCES TABLE 8
Present Inventory of Cultural Resources in the Project Area of Analysis

Cultural Resource Type (Year of Initial Recordation)	Description	Location	California Register of Historical Resources Eligibility (CRHR) and National Register of Historic Places (NRHP) Status	Siting Case Report Reference
Historic Built-Environment Resources				
CA-SBR-10315H (1988)	Hoover Dam-to-San Bernardino transmission line, now known as the Eldorado-Baker-Coolwater-Dunn Siding-Mountain Pass 115 kV transmission line	Sec. 3, T. 16 N., R. 14 E., Between Ivanpah No. 1 and Ivanpah No. 2	Consensus determination (2S2) as individually eligible for the NRHP (10/22/93), and therefore listed on the CRHR	Fergusson 2007
CA-SBR-12574H (2007)	Dismantled telephone line and dirt road, two -track	Sec. 3 and 4, T. 16 N., R. 14 E., Through NW quadrant of Ivanpah No. 1	See "California Register of Historical Eligibility" subsection, below	Fergusson 2007
CA-SBR-12575H (2007)	Dirt road, faint two-track	Sec. 3, T. 16 N., R. 14 E, Through NW quadrant of Ivanpah No. 1.	See "California Register of Historical Eligibility" subsection, below	Fergusson 2007
Archaeological Resources				
ISEGS-01 (2008)	Complex of dry-stacked masonry features that include apparent terraces, niches, and a bench	Sec. 34, T. 17 N, R. 14 E., E of Ivanpah No. 2	See "California Register of Historical Eligibility" subsection, below	
Ethnographic Resources				
Determination				

Cultural Resource Type (Year of Initial Recordation)	Description	Location	California Register of Historical Resources Eligibility (CRHR) and National Register of Historic Places (NRHP) Status	Siting Case Report Reference
incomplete				

This section discusses the methods and the results of each field inventory phase and interprets the resultant inventory relative to the cultural resources distribution models above to assess how well the inventory represents the archaeology of the project area. Descriptions of each cultural resource in the inventory, evaluations of the eligibility of each resource for inclusion in the CRHR , assessments of project impacts on each known historical resource, consideration of and potential impacts on archaeological resources that may lie buried on the project site, and proposed mitigation measures for significant impacts may be found in the "California Register of Historical Resources Eligibility" and "Identification and Assessment of Direct Impacts on Built-Environment Resources and Proposed Mitigation" subsections below.

Geoarchaeology Study

Staff made a request to the applicant (Data Request No. 40) to provide information that would facilitate the assessment of the potential for the project to encounter buried archaeological deposits during the construction, operation, and maintenance of the project. The response from the applicant was a geoarchaeology[9] study that, on the basis of background research, spatial analysis, and primary field research, provides a thorough discussion of the historical geomorphology of the project area and an assessment of the likely presence of buried archaeological deposits there.

Methods

Data for the recent study of the geoarchaeology of the proposed project area (pp. 9–18, CH2ML2008b) comes from the use of remote sensing techniques and field observation. The study began with an analysis of satellite imagery of the northern end of Ivanpah Dry Lake to try and discern aspects of the depositional history of the bajada that underlies the project area, as a whole. A high- resolution aerial photograph of the project area was then used to analyze the surface morphology of the bajada and to delimit, on the basis of visual albedo[10], the darker (older) surface areas of the bajada that would not have been subject to more recent erosion. The resultant surface areas were then scored separately for albedo and apparent surface roughness, both being age-dependent attributes. A sample of the remotely delimited surface areas (N = 28) and two younger surface areas were field-inspected to evaluate the accuracy of the remote

[9] Geoarchaeology is a subdiscipline of archaeology that uses the techniques and approaches of earth sciences such as geology, geomorphology, sedimentology, pedology, and stratigraphy to identify, investigate, and interpret the history of the human use of present and former landscapes.

[10] The fraction of incident electromagnetic radiation reflected by a surface.

analysis and to more closely observe the sample surfaces for prehistoric archaeological remains.

Results

The geoarchaeology study (pp. 9–18, CH2ML2008b) concludes that the surface and subsurface prehistoric archaeological potential of the proposed project area, which is on the middle reaches of the Clark Mountain bajada, is negligible. The field inspection of a sample of 28 of the remnant patches of the older bajada surface did not result in the location of any archaeological remains. If buried prehistoric archaeological deposits were a component of the sedimentary matrix of the Clark Mountain bajada, then artifacts would be anticipated to be constituents of the surfaces of the remnant patches. They are not. The surfaces of the remnant patches are clad in what is referred to as desert pavements, accretionary deposits that form over a long period of time where a single layer of clasts is borne upward on a continually accreting layer of wind-blown or eolian silt. A subset of the artifacts that would be present on a hypothetical former surface of the bajada would become incorporated into a desert pavement that slowly developed over that former surface, leaving the balance of the artifacts on the former surface beneath the forming desert pavement. The absence of artifacts on or in the desert pavements of the remnant patches in the present investigation provides objective evidence that buried prehistoric archaeological deposits may be largely absent on the bajada. Further evidence that would appear to support this conclusion is that only three isolate prehistoric artifacts have been found as the result of the pedestrian surveys of the entire project area (see “Pedestrian Surveys” subsection, below). If buried prehistoric archaeological deposits were present in the project area, then, presumably, the artifacts and the sedimentary matrix from such deposits would be eroding out in places and open to observation on the surface of the bajada, what is now known to be an erosional landform. This does not occur.

One ancillary application of the results of the geoarchaeology study is the observation that even portions of the surface of the bajada that are more recent in age than the above remnant patches may have been stable for a while. A subfossil piñon log (*Pinus monophylla*) was found on a more recent bajada surface among recently active ephemeral streams. The log is thought to be anywhere from 1,100–3,400 years old and may date the surface on which it was found to that approximate age. This information and the recent inadvertent discovery of an intact historical archaeological site (Temporary field no. ISEGS-02) approximately 1,700 feet to the east of Ivanpah No. 2 (see “Traditional Cultural Property Reconnaissance Surveys” subsection, below) demonstrates that, although the bajada is subject to a geomorphic regime of net erosion, the landform provides enough stable surface patches to preserve a representative sample of the historical archaeological deposits that would reflect historic activity on the bajada.

Intensive Pedestrian Surveys

Primary Intensive Pedestrian Cultural Resources Survey

The applicant undertook an intensive pedestrian cultural resources survey of the originally proposed project area to comply with the Energy Commission’s siting regulations. The purpose of the survey was to provide information on the location and

the character of the cultural resources that may lie on the surface of the project area. The results contribute to the compilation of the cultural resources inventory of the proposed project area. .

Methods

CH2M HILL conducted the survey of the project area from April 25 through May 22, 2007, adjusting the survey methods while the survey was in progress. The survey of the majority of Ivanpah No. 1 was done using transects that were 15 meters apart. On the basis of the field perception that the potential for encountering cultural resources was low due to disturbance from active, braided, ephemeral drainages, the BLM agreed to a request from CH2M HILL to widen the transect interval to 30 meters with the condition that survey areas that had desert pavements or rock outcrops with desert varnish would be examined more intensively. Ivanpah No. 2 and Ivanpah No. 3, and, apparently, the balance of the project area were surveyed under the latter protocol. When cultural resources were found during the survey, the field archaeologists would delimit the surface extent of each resource, plot the resource on a United States Geological Survey (USGS) 7.5-minute topographic quadrangle series map, and acquire global positioning system (GPS) data for the resource using a Trimble Geo XH mapping-grade unit. Additional field recordation efforts for archaeological sites were to photograph artifacts and site features, and to count and classify artifacts, where reasonable. No artifacts were collected during the survey. The archaeologists reported the ground visibility in the project area to have been approximately 90 percent, or excellent.

Results

CH2M HILL found two new cultural resources in the proposed project area (CA-SBR-12574H and CA-SBR-12575H) and six cultural resources isolates in primary depositional contexts. The isolate resources include a horseshoe, two mining prospects, an obsidian flake, an obsidian nodule, and a chert biface. It is of note that the lithic artifacts are of stone types for which there are no sources in Ivanpah Valley or the mountain ranges that form its margins. Historic tin cans, most apparently dating to the late 1800s, were also found in the stream beds and on the banks of nearly every major ephemeral stream in the project area. These artifacts were not recorded as isolate resources, because they were interpreted, in the field, as being the result of secondary re-deposition from upstream mining-related sites in the Clark Mountain Range.

Supplemental Intensive Pedestrian Cultural Resources Survey

Subsequent to the August 31, 2007 filing of the AFC for the proposed project, a number of the components of the project were altered, which resulted in the expansion of the project site. CH2M HILL, the consultant to the applicant, conducted additional intensive pedestrian survey on 371.45 acres to take into account portions of the expanded project site that had not been subject to prior survey.

Methods

Two CH2M HILL field archaeologists conducted the survey of 371.45 acres from April 29 through May 1, 2008, approximately six person- days, walking transects 15 meters apart. The archaeologists used USGS 7.5-minute topographic quadrangle series maps, aerial photographs, and Trimble hand-held GPS units to navigate to survey areas and to

help record their observations. The visibility of the ground surface in the survey areas was reported to have been excellent, at approximately 90 percent.

Results

The archaeologists report the complete absence of prehistoric or historic cultural resources in the areas surveyed. They described the surface of the surveyed areas as exhibiting no evidence of modern development. Widespread evidence of bajada flooding events and sheetwash deposition was also noted.

Traditional Cultural Property Reconnaissance Surveys

May 23, 2008 Pedestrian Reconnaissance Survey of Project Area Inselbergs

Staff asked the applicant (Data Request No. 41) to provide information that would facilitate the assessment of the potential for the built project to affect Native American traditional use areas that may be in sight of the project area. The request sought discussions of both known ethnographic resources, and the potential for ethnographic resources that may not yet be known. To fulfill the request, the applicant would have had to more actively research extant ethnographic sources and expand the project area of analysis beyond the minimum requirements in the Energy Commission's siting regulations to include what were then unsurveyed lands surrounding the project site. The applicant's response to the data request was that the AFC already documented requests that the applicant had made of others for information on known Native American traditional use areas. Staff chose to conduct a pedestrian reconnaissance of a portion of the inselbergs in the vicinity of the project site to help develop a reasonable scope for a more specific request to the applicant to conduct an ethnographic field survey for the present analysis. The purpose of the reconnaissance was to acquire a sense of how likely ethnographic resources were to be present on the inselbergs adjacent to the project area, and to acquire a sense of the topography of the Clark Mountain Range foothills, beyond the inselbergs, and the potential for the project to affect any ethnographic resources that may be present there.

Methods

On May 23, 2008, Energy Commission staff Michael McGuirt and Misa Milliron, Energy Commission consultant Susan Sanders, and BLM staff Colin Grant conducted a biological and cultural resources reconnaissance survey of the Paleozoic marine limestone inselberg just to the west of the Ivanpah No. 3 project area boundary. Later in the day, during a brief respite in a rolling series of thunderstorms, the same group, minus Colin Grant, conducted further reconnaissance of the southern portion of the Precambrian metamorphic inselberg complex just to the east of the Ivanpah No. 3 project area boundary.

The reconnaissance entailed a brisk walk-over of the two areas. The group first drove to the northern end of the limestone inselberg and hiked along its single crest to its southern terminus. The smaller group then later hiked out from near the intersection of the Hoover Dam- to- San Bernardino 115- kV Transmission Line (CA-SBR-10315H) and Colosseum Road approximately 0.7 miles to the low hill that is the most southerly extent of the metamorphic inselberg complex. The latter group hiked the crest of the low hill from south to north and then hiked up to the summit of the most southerly crest of the

primary inselberg of the complex, before returning to Colosseum Road. Navigation for the reconnaissance was done using a computer-generated TOPO! topographic map and a hand-held Suunto compass. Field notes and digital images made with a Nikon CoolPix P3 camera variably record the observations made on the reconnaissance. Ground surface visibility on both the limestone inselberg and the metamorphic inselberg complex was excellent as they are bedrock formations. Visibility ranged from 90 to 100 percent.

Results

Energy Commission staff found two new archaeological sites as a result of the brief reconnaissance (Temporary field nos. ISEGS-01 and ISEGS-02). Archaeological site ISEGS-02 was found on the way from Colosseum Road to the metamorphic inselberg complex, and, although it falls outside the project area of analysis, a brief description and interpretation of it is given here, because the presence of the site has a bearing on the potential frequency of historical archaeological sites across the middle reaches of the Clark Mountain bajada and on the differential stability of portions of the bajada surface. The discussion of archaeological site ISEGS-01 can be found in the “California Register of Historical Resources Eligibility” subsection below.

ISEGS-02 is a historic trash scatter or refuse deposit that appears to date roughly to the 1890s to 1910s. The site appears to be a discrete, primary deposit, measuring approximately 15–20 feet in diameter. It was found on a bajada surface slightly higher than the ephemeral stream channels nearby that flank it, on a bajada interfluve. The frequency of the artifacts in the deposit is moderate, and the deposit artifact assemblage includes one whole, embossed, manganese-decolorized, beverage bottle, two whole, colorless, wide-mouthed pickle jars with “Heinz” embossments, and many apparent food and evaporated milk tins. The food tins are hole-in-cap cans with apparent lock or folded-edge side seams, flush, stamped can ends, roughly 1–1½-inch-diameter, hand-soldered caps, and hand-soldered cap vents. The evaporated milk tins have flush, stamped can ends and hand-soldered, matchstick filler closures. The deposit, as a whole, appears to represent a single episode or cycle of activity, as multiple points of discard were not apparent. Given the distance of the deposit from any known or apparent roads or trails, or from any known or apparent loci of habitation, and given the apparent age of the deposit, it most likely represents the locus of a temporary campsite.

Helicopter Reconnaissance Survey

Staff reinitiated discussions with the applicant on Data Request No. 41 at the June 23, 2008 Data Response and Issues Resolution Workshop in Primm, Nevada, and at the July 2, 2008 continuance of that workshop in Sacramento. Staff sought to encourage the applicant to provide information on the potential presence of Native American traditional use areas beyond the project site that would be subject to the direct impact of the stark visual intrusion that the project would impose on any such resources. To demonstrate the potential presence of Native American traditional use areas in sight of the proposed project, staff shared the preliminary results of the May 23, 2008 pedestrian reconnaissance survey of the project area inselbergs as evidence that such use areas may be present. Staff asked at the June 23 workshop that the applicant more formally evaluate the archaeological site that was found as a result of that

reconnaissance (ISEGS-01) and that the applicant conduct a pedestrian reconnaissance of the inselbergs adjacent to the project site and along the ridgelines of the toe of approximately eleven of the Clark Mountain Range foothills that overlook the project site. The applicant agreed to the requests at the July 2 continuance of the workshop and asked, in turn, that CEC and BLM staff provide field protocols for both the evaluation of ISEGS-01 and the reconnaissance survey. CEC and BLM staff jointly developed the protocols, which incorporate a subsequent request by the applicant to integrate the use of a helicopter in the reconnaissance survey. The BLM provided the protocols to the applicant on or about July 21, 2008. The applicant produced a preliminary summary of the results of the field efforts in a confidential technical memorandum of September 17, 2008 (Helton, Lawson, and Spaulding 2008), which references a forthcoming, more detailed letter report. That report is yet pending. The conclusions that will be drawn from it remain open and tentative until its receipt.

Methods

The discussion of the methods used in the helicopter reconnaissance survey will be forthcoming upon receipt of the survey report.

Results

The discussion of the results of the helicopter reconnaissance survey will be forthcoming upon receipt of the survey report.

Interpretation of Results

The total cultural resources inventory for the project area of analysis includes one previously known and two new built-environment resources, and one new archaeological resource (see Cultural Resources Table 8, above). The comparison and interpretation of the results of the efforts to develop the project inventory are made here, relative to the cultural resources distribution models above, to assess the reliability of the results.

Model of Prehistoric Archaeological Resources

Comparison

The results of the efforts to identify prehistoric archaeological resources in the project area of analysis conform well to the predictions of the above model for this resource class. The composite pedestrian survey of 100 percent of the project area resulted in the identification of only three isolate prehistoric artifacts, one obsidian flake, one obsidian nodule, and one complete chert biface.

Interpretation

The extremely low frequency of prehistoric material culture across the project area of analysis confirms the above anticipatory model for the area and appears to indicate almost no use of this portion of the Clark Mountain bajada throughout prehistory. The dearth of prehistoric artifacts in the area suggests that this portion of the bajada has been nothing more than a transit zone between the floor of Ivanpah Valley and the Clark Mountain Range. The use of this portion of the bajada for any kind of resource collection or processing over the millennia would have undoubtedly left at least a low-

frequency material trace. There is virtually none. The material trace of human activity in the area is so faint that the use of the project area as a transit zone must have been light as well. One would anticipate a higher frequency of artifacts resulting even from incidental discard had the use of the area been greater. A useful focus of future inquiry would be to investigate whether analogous environmental contexts in the region evidence a similarly light mode of human use.

Model of Historical Archaeological and Built-environment Resources

Comparison

The historical archaeological and built-environment resources found in the project area include a variety of the resource types that the above model anticipates, but the frequency of the resources is a bit lower than the model predicts. The built-environment resources include one operational (CA-SBR-10315H) and one abandoned (CA-SBR-12574H) utility corridor, and a roughly east-to-west-trending segment of a dirt road (CA-SBR-12575H). The frequency of primary deposits of historical archaeological resources in the project area is particularly low and includes only three isolate resources, a horseshoe and two mining prospects.

Interpretation

The inventory of built-environment resources comports relatively well with the anticipatory model for historical archaeological and built-environment resources. The extremely low frequency of primary deposits of historical archaeological resources in the project area is a phenomenon of interest. Given the presumed relatively high volume of foot, horse, wagon, and, most recently, automobile traffic that would have passed through the project area coming up off of the valley floor and heading toward the mines in the Clark Mountain Range from the 1860s through the 1910s, one would anticipate a higher frequency of intact deposits of historical archaeological materials. One would anticipate finding debris along the travel corridors in proportion to the volume of the traffic that passed though the area, and one would further anticipate finding refuse deposits related to temporary camps, such as ISEGS-02, that would have been used during travel to and to stage departures into the Clark Mountain Range, and to support mine prospecting efforts closer to the project area, on the limestone inselberg and in the metamorphic inselberg complex. The low frequency of primary deposits of historical archaeological materials may, therefore, indicate a lower volume of transit through the project area than had been presumed and further indicate that transit was typically without stops.

Reliability of Cultural Resources Inventory

Energy Commission staff finds, on the basis of the above analysis, that the cultural resources inventory for the project area of analysis is a reliable body of information on which the Siting Committee can, in part, base its decision on the potential for the construction, operation, and maintenance of the proposed project to have a significant effect on the environment, as such an effect would relate to cultural resources.

California Register of Historical Resources Eligibility

The cultural resources inventory for the project area of analysis presently includes three built-environment resources and one archaeological resource (Cultural Resources Table 8). One of the built-environment resources, the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H), has already been determined eligible, by consensus, for inclusion in the NRHP and is listed on the CRHR as a consequence of that determination. The CRHR eligibility of the other three resources, CA-SBR-12574H, CA-SBR-12575H, and ISEGS-01, is formally being considered here for the first time. ISEGS-01 is an enigmatic archaeological site that has the potential to be an ethnographic resource. The pending results of a field investigation of the resource and the conclusion of Native American consultation on it will ultimately inform the evaluation of its CRHR eligibility.

Evaluation of Archaeological Site ISEGS-01

Archaeological site ISEGS-01 was found as a result of the May 23, 2008 pedestrian reconnaissance survey of the inselbergs in the project area of analysis (see “Traditional Cultural Property Reconnaissance Surveys” subsection, above). Staff asked at the June 23, 2008 Data Response and Issues Resolution Workshop in Primm, Nevada, that the applicant more formally evaluate ISEGS-01. The applicant agreed to that request at the July 2, 2008 continuance of the workshop in Sacramento. The results of the CRHR evaluation of the site is outstanding and are to be a part of the helicopter reconnaissance survey report (see “Helicopter Reconnaissance Survey” subsection, above).

Methods

The discussion of the methods used in the evaluation of ISEGS-01 will be forthcoming upon receipt of the helicopter reconnaissance survey report (see “Helicopter Reconnaissance Survey” subsection, above).

Results

The complete discussion of the results of the evaluation of ISEGS-01 will be forthcoming upon receipt of the helicopter reconnaissance survey report (see “Helicopter Reconnaissance Survey” subsection, above). The preliminary results of the evaluation indicate a relatively unusual circumstance where the resource appears to be not eligible for either the CRHR or the NRHP, because the site cannot be reliably associated with any time period, or any archaeological, ethnographic, or historic culture.

Prehistoric Archaeological Resources

No CRHR-eligible prehistoric archaeological resources have been found in the project area.

Ethnographic Resources

No CRHR-eligible ethnographic resources have yet been found in the project area of analysis.

Historical Archaeological and Built Environment Resources

Historical Archaeological Resources

No CRHR-eligible historical archaeological resources have been found in the project area.

Built-Environment Resources

Three built-environment resources are now known to be present in the proposed project area. They include the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H), a dismantled, early-to-mid-twentieth-century telephone line and an unimproved, two-track dirt road that parallels it (CA-SBR-12574H), and an approximately 1,200-foot -long segment of a faint, unimproved two-track dirt road (CA-SBR-12575H).

Additional consideration is given here to the presence and the historical significance of a discontiguous, multi-element resource, the Hoover Dam-to-San Bernardino transmission facility, which incorporates the material elements that are critical for the resource to transmit electricity.

Hoover Dam-to-San Bernardino Transmission Line (CA-SBR-10315H)

The Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H) continues in operation today as the Eldorado-Baker-Coolwater-Dunn Siding-Mountain Pass 115-kV transmission line. The line trends approximately northeast to southwest between the proposed Ivanpah No. 1 and No. 2. The typical structures that make up the transmission line are metal, H-frame, riveted, latticed masts and metal crossbeams. The design specifications for the H-frame structures call for the masts to be 17 feet apart and 52 feet tall. The crossbeams that span each pair of masts are approximately 34 feet in length and carry three transmission cables. Only one of the H-frame structures in the project area appears to have been replaced since the original construction of the line. The replacement structure has wooden masts and a wooden crossbeam (pp. 12–14, Solar Partners I et al. 2008f).

Southern Sierras Power Company, a wholly-owned ally company of the Nevada-California Power Company, began construction of the original 132-kV Hoover Dam-to-San Bernardino transmission line in 1930 in BLM Right-of-Way (ROW) Grant No. R 01730 (p. 7, Solar Partners I et al. 2008f). The 225-mile-long line was completed in 1931 in a record 225 days. The original purpose of the line was to carry electricity from the City of San Bernardino to the construction site for Hoover Dam. The line was reversed in August of 1937 to carry electricity back to San Bernardino from Unit A-8, a 55,000-h.p., 40-MW hydroelectric turbine, at Hoover Dam. A telephone line, CA-SBR-12574H, was built in 1931 approximately 3,000 feet to the southeast of the transmission line, also inside the bounds of ROW Grant No. R 01730, to facilitate operational communications along the transmission line (pp. 7, 10, Solar Partners I et al. 2008f).

The BLM and the California State Historic Preservation Officer (SHPO) concluded a consensus determination for the Hoover Dam-to-San Bernardino transmission line on October 22, 1993, as part of a consultation under Section 106 of the National Historic Preservation Act (California Office of Historic Preservation File Nos. ADOE-36-93-007-

00 and BLM841127R) (confidential appendix 5.3C, BSE2007a,). The BLM and the SHPO agreed that the resource was individually eligible for inclusion in the NRHP under Criterion A apparently due to its association with the construction of Hoover Dam, and the role of Hoover Dam in the development of the energy industry in the West (p. 9, Solar Partners I et al. 2008f). Under Title 14, California Code of Regulations, section 4851, subdivision (a)(1), the transmission line is on the CRHR as a result of the above consensus determination.

Staff believes that the preponderance of the available evidence argues against the eligibility of the Hoover Dam-to-San Bernardino transmission line for the CRHR as an individual resource. The transmission line is one element of a transmission facility that now includes the transmission line, the remnants of the original 1931 telephone line (CA-SBR-12574H), microwave signal transmitters, and control mechanisms such as the transformers, switches, and circuit breakers that are integral parts of electric substations. The transmission line, the control mechanisms, and one form of communication system are each critical to the operation of the transmission facility. The facility, absent any one of the critical elements, cannot sustain the function of the facility. The Hoover Dam-to-San Bernardino transmission facility, as a composite resource, appears, in turn, to be more appropriately considered as an element of a potential Hoover Dam Historic District, one aspect of the eligibility of which would be, under CRHR Criterion 1, the association that the potential district has as the major source of the generation and distribution of electric power for the Southwest and parts of California during the first half of the twentieth century, electric power that was critical to industrial and agricultural development, and to the urbanization of the region during that period. Absent the association that the Hoover Dam-to-San Bernardino transmission facility would have with a potential Hoover Dam Historic District, the transmission facility would not appear to be CRHR-eligible under any of the other CRHR criteria. Staff therefore recommends that the Hoover Dam-to-San Bernardino transmission line is not eligible for listing in the CRHR as an individual or stand-alone resource, because it is only one element of a multi-element resource. Staff further recommends that the transmission line be considered one element of a single, discontiguous resource, the Hoover Dam-to-San Bernardino transmission facility, which includes, but is not limited to, the transmission line and the original 1931 telephone line, and which is also not eligible for listing in the CRHR as an individual or stand-alone resource because the resource is not historically significant absent its association with Hoover Dam. Staff provides recommendations on the CRHR eligibility of the transmission facility, as a contributing element to a potential Hoover Dam Historic District, below.

CA-SBR-12574H

CA-SBR-12574H is a dismantled telephone line and a parallel, unimproved, two-track dirt access or service road. Only a portion of the resource appears to have been recorded in the project area, an approximately 2,200-foot long segment through the northwestern quadrant of Ivanpah No. 1. The telephone line and the road trend approximately northeast to southwest. Both elements of the resource are traceable in aerial photographs east of Interstate Route 15 and out across Ivanpah Valley.

The telephone line is now a line of wooden utility pole bases that have been cut off approximately 6–12 inches above the present surface of the project area. There is an

assemblage of artifacts from the downed line among the pole bases. The assemblage includes a few of the downed cedar poles, which appear to have originally been 25 feet tall with hardware consisting of metal nuts and bolts, metal brackets or plates, metal cable, wooden cross beams, and glass insulators. The insulators (McLAUGHLIN No. 19 and HEMINGRAY–42) indicate a date range for the construction of the telephone line sometime from 1920 to 1967.

The approximately ten-foot-wide, two-track dirt road is about ten feet northwest of and parallel to the telephone line. Ephemeral stream channels appear to dissect the road in a number of places along the recorded road segment.

No other artifacts, beyond the parts of the utility line, were found in association with either element of the resource (DPR 523 series forms, Fergusson 2007).

The telephone line and the dirt access road were built in 1931 in BLM ROW Grant No. R 01730 by the Interstate Telegraph Company, a subsidiary of the Nevada-California Electric Corporation, for the apparent sole purpose of facilitating private transmission line communications along the Hoover Dam-to-San Bernardino transmission line (p. 7, Solar Partners I et al. 2008f). The CRHR eligibility of the resource, the telephone line and the access road together, is considered here as a stand-alone resource, above as a critical element of the stand-alone Hoover Dam-to-San Bernardino transmission facility, and, below as a critical element of the Hoover Dam-to-San Bernardino transmission facility, itself a contributing element of a potential Hoover Dam Historic District. Given the resource's obvious loss of integrity of design, materials, and workmanship, staff recommends that the Energy Commission, as lead agency and pursuant to Title 13, Public Resources Code, section 21084.5, determine that the portion of CA-SBR-12574H in the project area would not contribute to the CRHR eligibility of the stand-alone resource, as a whole, if it were ever found to be so eligible.

Hoover Dam-to-San Bernardino Transmission Facility

The Hoover Dam-to-San Bernardino transmission facility now includes, potentially, the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H), the remnants of the original 1931 telephone line (CA-SBR-12574H), microwave signal transmitters, and control mechanisms such as the transformers, switches, and circuit breakers that are integral parts of electric substations. To date, there is documentation of the transmission line and the original telephone line. Neither the transmission line or the telephone line are recommended as eligible for listing in the CRHR, as stand-alone resources, nor is the subject transmission facility, as a stand-alone resource (see above). The question remains whether the facility may be eligible for listing in the CRHR as a contributing element to a potential Hoover Dam Historic District. Staff recommends that the transmission facility is not eligible for listing in the CRHR as a contributing element to a potential Hoover Dam Historic District, because the facility does not retain its ability to convey its historical significance. The transmission facility lacks integrity of design, materials, workmanship, and association, because one critical element of the resource, the original 1931 telephone line, has been dismantled. The sustained operation of the transmission facility would not have been possible without the telephone line, so the property is no longer able to adequately convey the sense of how it functioned during most of its apparent period of significance, 1931–1958.

CA-SBR-12575H

CA-SBR-12575H is a faint segment of an unimproved, two-track dirt road that appears to have been abandoned for a while. Only a portion of the road in the project area, an approximately 1,200-foot-long segment through the northwestern quadrant of Ivanpah No. 1, was recorded. The approximately eight-foot-wide dirt road trends roughly east-southeast to west-northwest. The western end of the road continues on out of Ivanpah No. 1 toward the Clark Mountain Range, while the eastern portion of the road becomes progressively more difficult to trace as ephemeral stream channels obliterate the road tracks. No artifacts were found in direct association with the road (p. 5.3-20, BSE2007a; p. 19 and DPR 523 series forms, Fergusson 2007).

Given that the resource cannot be associated with events that have made a significant contribution to the broad patterns of our history or with the lives of persons significant in our past, that it does not embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, that it has not yielded, and is not likely to yield, information important to history, and that the resource does not retain integrity of design, workmanship, feeling, or association, staff recommends that the portion of the resource in the project area would not contribute to the CRHR eligibility of the road, as a whole, if it were ever found to be so eligible.

Summary of CRHR-Eligible Resources for the Ivanpah SEGS Project

There presently appears to be one cultural resource in the proposed project area that is CRHR-eligible, i.e., that is a historical resource for the purposes of CEQA. This is the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H). The potential impact of the project on this resource and a proposal to mitigate that impact are developed below.

DIRECT/INDIRECT IMPACTS AND MITIGATION

In the abstract, direct impacts to cultural resources are those associated with project development, construction, and co-existence. Construction usually entails surface and subsurface disturbance of the ground, and direct impacts to archaeological resources may result from the immediate disturbance of the deposits, whether from vegetation removal, vehicle travel over the surface, earth-moving activities, excavation, or demolition of overlying structures. Construction can have direct impacts on historic standing structures when those structures must be removed to make way for new structures or when the vibrations of construction impair the stability of historic structures nearby. New structures can have direct impacts on historic structures when the new structures are stylistically incompatible with their neighbors and the setting, and when the new structures produce something harmful to the materials or structural integrity of the historic structures, such as emissions or vibrations.

Generally speaking, indirect impacts to archaeological resources are those which may result from increased erosion due to site clearance and preparation, or from inadvertent damage or outright vandalism to exposed resource components due to improved accessibility. Similarly, historic structures can suffer indirect impacts when project construction creates improved accessibility and vandalism or greater weather exposure becomes possible.

Ground disturbance accompanying construction at a proposed plant site, along proposed linear facilities, and at a proposed laydown area has the potential to directly impact archaeological resources, unidentified at this time. The potential direct, physical impacts of the proposed construction on unknown archaeological resources are commensurate with the extent of ground disturbance entailed in the particular mode of construction. This varies with each component of the proposed project. Placing the proposed plant into this particular setting could have a direct impact on the integrity of association, setting, and feeling of nearby standing historic structures.

Construction Impacts and Mitigation

Identification and Assessment of Direct Impacts on Archaeological Resources and Proposed Mitigation

Archaeological Resources on the Surface of the Project Site

No CRHR-eligible prehistoric or historical archaeological resources are now known to be on the surface of the project site. Given the thorough investigation of the surface of the project site for the present analysis and the dearth of archaeological resources found, it appears to be highly improbable that the construction-related ground disturbance of the project would directly impact surface archaeological resources that would qualify as historical resources under CEQA.

Buried Archaeological Resources in the Project Site

No CRHR-eligible archaeological resources are now known to be beneath the surface of the project site. On the basis of the results of the geo-archaeology study above (pp. 9–18, CH2ML2008b), it is highly improbable that the construction-related ground disturbance of the project, on the portions of the project site where deep (> 1 meter) ground disturbance would occur, would directly impact buried archaeological resources that would qualify as historical resources under CEQA.

Identification and Assessment of Direct Impacts on Ethnographic Resources

No CRHR-eligible ethnographic resources are now known to be on the project site or in the project area of analysis. On the basis of the results of the literature and records search above and Native American consultation, to date, it presently appears unlikely that construction-related ground disturbance for the project would directly impact ethnographic resources that would qualify as historical resources under CEQA. This conclusion is, however, tentative. Native American consultation on the results of the helicopter reconnaissance survey above and the evaluation of archaeological resource ISEGS-01 is ongoing. The conclusion of the assessment of the project's potential to directly impact ethnographic resources awaits the outcome of that consultation.

Identification and Assessment of Direct Impacts on Built-Environment Resources and Proposed Mitigation

Construction of the proposed project presently appears to have the potential to adversely impact one CRHR-eligible built-environment resource, the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H). The BLM, pursuant to stipulation V.E.1 of the 2007 *State Protocol Agreement among the California State Director of the*

Bureau of Land Management and the California State Historic Preservation Officer and the Nevada State Historic Preservation Officer Regarding the Manner in which the Bureau of Land Management Will Meet its Responsibilities under the National Historic Preservation Act and the National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers, has determined that the status of the transmission line as individually eligible for inclusion in the NRHP, a consensus determination concluded by the BLM and the California State Historic Preservation Officer in 1993, stands. As such, the transmission line remains listed on the CRHR, notwithstanding the recommendation of staff to the contrary (see "Built-Environment Resources" subsection, above), and is a historical resource for the purpose of the present analysis.

The transmission of the electricity that the proposed ISEGS facility is to generate, one aspect of the operation of the facility, would require the destruction of a significant portion of the Hoover Dam-to-San Bernardino transmission line. The California Independent System Operator (California ISO) Interconnection System Impact Study (CH2ML2008e) unambiguously concludes that the full output of even one of the three proposed generation components of the proposed project would require the destruction of approximately 36 miles of the Eldorado leg of the Eldorado-Baker-Coolwater-Dunn Siding-Mountain Pass transmission line, the line which now includes the remaining portion of the original Hoover Dam-to-San Bernardino transmission line. The portion of the Eldorado leg which the California ISO recommends removing runs from the proposed project area approximately northeast to the Eldorado Substation. The California ISO proposes to re-construct the removed portion of the line to facilitate a higher transmission capacity of 230 kV (CH2ML2008e pp. ii–iii). The California ISO states that these proposed modifications to the Eldorado leg of the subject transmission line take into account the approximately 400-MW output of the proposed project plus approximately 1,500 additional MW of output from other generation projects that have requested interconnection in the same general area (CH2ML2008e p. 10).There are other plans to modify the Hoover Dam-to-San Bernardino line, through the project area. The applicant relates that SCE plans to remove the portion of the transmission line from the project area southwest to the Mountain Pass Substation and to replace it with two, double-circuit, 115-kV pole lines (p. 6, CH2ML2008m). It is presently unclear whether or to what degree this latter modification to the transmission line is related to the transmission needs of the proposed project. Staff understands the interconnection of the project to the SCE electric system and the modifications necessary to facilitate that interconnection to be a significant direct impact of the operation of the proposed facility, once constructed.

The applicant has been clear throughout the present proceeding that they believe that the consideration of the proposed modifications to the Hoover Dam-to-San Bernardino transmission line are irrelevant to the decision before the Energy Commission in this siting case. The applicant states in their responses to Data Requests 36 and 37 (pp. 31 and 32, CH2ML2008a), in a May 29, 2008 letter to the Energy Commission Siting Committee (Solar Partners I et al. 2008c), at the June 23, 2008 Data Response and Issues Resolution Workshop in Primm, Nevada, and in their responses to questions posed at that workshop (CH2ML2008q), that the proposed replacements for and upgrades to the Hoover Dam-to-San Bernardino transmission line are not required for

the proposed project, and that the replacements and upgrades compose a separate project being built by others. The applicant, while upholding their objection to providing information related to the proposed modifications to the Hoover Dam-to-San Bernardino transmission line, ultimately agreed to provide the information that they found to be available. That information included a physical description of the interconnection of the proposed project to the proposed replaced and upgraded transmission line (CH2ML2008q), and evaluations (see "Built-environment Resources" subsection, above) of the historical significance of the transmission line and potentially related cultural resources (Solar Partners I et al. 2008f).

Staff disagrees with the perspective of the applicant. The differences in ownership that exist among the facilities that compose the energy system in Ivanpah Valley, of which the proposed project is a part, do not constrain the analysis of the potential for the ISEGS project to effect a substantial adverse change in the significance of a historical resource, the Hoover Dam-to-San Bernardino transmission line. The apparent fact that the proposed project cannot transmit the electricity that it would generate absent modifications to the Hoover Dam-to-San Bernardino transmission line make those modifications a direct impact of the proposed project and, therefore, an appropriate factor in the present analysis. The apparent fact that others may also use the modified transmission line is material to considerations of the scope of the impact of the proposed project to the line and to considerations of the appropriate scope of the mitigation for that impact. Given that the California ISO assigns approximately 400 MW of the approximately 1,900-MW capacity of the modified transmission line to the proposed project, a reasonable share of the mitigation for the partial destruction of the Hoover Dam-to-San Bernardino transmission line that the proposed project would cause would be approximately 21 percent. Staff proposes mitigation measures for the effect of the proposed project, proposed Conditions of Certification **CUL-8** and **CUL-9**, which are appropriate to the scope of the impact of the project. The mitigation would consist of the Historic American Engineering Record (HAER) recordation of the tower types and the cabling system of the portion of the Hoover Dam-to-San Bernardino transmission line that traverses the project area. While the proposed mitigation would result in the recordation of significantly less than the approximate 21 percent share of the destruction that the proposed project would cause, staff believes that the scope of the mitigation reasonably takes into account the likelihood that the historical resource would undergo HAER recordation as a result of the National Environmental Policy Act analysis that the BLM would conduct in conjunction with its planning for and authorization of SCE's modifications to the Hoover Dam-to-San Bernardino transmission line. Staff also believes that the mitigation would be sufficient to compensate for any modifications to the line that would be necessary to accommodate only the proposed project if SCE were to downgrade the scale of the modifications to the line to take into account any of the other presently proposed projects withdrawing from the California ISO queue.

Indirect Impacts

Neither the applicant nor staff have identified any indirect impacts to any CRHR-eligible resources in the project area of analysis. Staff believes, therefore, that mitigation for indirect impacts is not necessary for the proposed project.

Operation Impacts and Mitigation

Staff does not believe that the operation of the proposed power plant would impact any CRHR-eligible resources in the project area of analysis. Any reasonably foreseeable task that the applicant would perform to operate the facility would not impact CRHR-eligible resources, because no such resources appear to be present on the surface of the project area of analysis and the presence of archaeological resources beneath the surface of the project area of analysis is thought to be negligible (see “Cultural Resources Inventory Fieldwork” subsection, above). If any CRHR-eligible resources are ultimately identified as a result of the helicopter reconnaissance survey or evaluation of archaeological resource ISEGS-01, or as a result of further Native American consultation, staff believes that the operation of the proposed project power plant would still not impact any such resources in the project area of analysis, because the operation of the facility would almost certainly not entail any changes to the direct visual impacts that the construction of the facility would have on ISEGS-01 or any historically significant resources identified in the helicopter reconnaissance survey area. Any substantive change to the direct visual impacts that the proposed power plant would have at the time of its construction would most likely require the applicant to file an amendment to the license for the facility, which would initiate a new round of environmental review.

As staff does not anticipate the operation of the proposed power plant to impact any CRHR-eligible resources in the project area of analysis, staff does not believe that mitigation is necessary for the operation of the facility.

Cumulative Impacts and Mitigation

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (Cal. Code Regs., ti. 14, § 15130).

There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. The analysis of cumulative impacts here is based on data provided in the following maps and tables (see “Cumulative Scenario” section, above):

- Cumulative Figure 1, Regional Renewable Applications
- Cumulative Figure 2, Regional Renewable Applications (Detail)
- Cumulative Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Table 1, Renewable Energy Projects in the CDD
- Cumulative Table 2, Existing Development in the Ivanpah Valley
- Cumulative Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts to cultural resources could occur. The cumulative impact analysis itself

describes the potential for cumulative impacts to occur as a result of the implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts can occur if the implementation of the ISEGS project could combine with the impacts of other local or regional projects. Cumulative impacts would occur locally if ISEGS project impacts combined with the impacts of projects located within the Ivanpah Valley. Cumulative impacts could also occur as a result of the development of some of the many proposed solar and wind development projects that have been, or are anticipated to be, under consideration by the BLM and the Energy Commission in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

Therefore the geographic extent for the analysis of *local* cumulative impacts is defined as the Ivanpah Valley. The proximity of cultural resources to the ISEGS project would be of interest only to the extent that such proximity would considerably affect the context or integrity of cultural resources. This geographic scope is appropriate because it is likely that cultural resources similar to those in the ISEGS project area of analysis are present throughout this area.

Regional cumulative impacts are those that could occur as a result of the implementation of future solar and wind development projects that are currently proposed on over one million acres of the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona. Therefore, the geographic extent for the analysis of *regional* cumulative impacts is defined as the desert areas of southeastern California, southern Nevada, and western Arizona, as shown on Cumulative Figure 1 (Regional Renewable Applications).

Cumulative Impact Analysis

Local Projects

The construction of other projects in the same vicinity as the proposed project could affect *unknown* cultural resources of the types that the ISEGS project would affect. A large number of other projects are proposed and under consideration in the Ivanpah Valley area, and many would involve ground disturbance and visual intrusion. For example, the OptiSolar project would involve ground disturbance across thousands of acres of land adjacent to the project site, and construction of the Las Vegas regional airport would disturb many more acres. Therefore, it appears that the ISEGS project does have the potential to contribute to a cumulative impact in the Ivanpah Valley. However, project proponents for other future projects in the area may be able to avoid causing substantial adverse changes to CRHR-eligible cultural resources through deliberate project planning, or reduce such impacts to presently unknown cultural resources to less than significant by implementing mitigation measures requiring construction monitoring, evaluation of resources discovered during monitoring, and avoidance or data recovery for resources evaluated to be historically CRHR eligible. Such avoidance or mitigation of potential future significant impacts to cultural resources would render the potential contribution of the ISEGS project to cumulative impacts negligible.

As discussed above, there is one built-environment resource that the construction and operation of the ISEGS project would affect. Staff anticipates no impacts that the applicant cannot mitigate. While known project impacts would be reduced to a less-than-significant level by implementation of staff's proposed mitigation measures, the impacts of the ISEGS project could still combine with impacts of the past, present, or reasonably foreseeable projects identified in Cumulative Table 1 and Cumulative Table 2 to result in cumulative impacts to *known* cultural resources.

Unknown, unrecorded cultural resources may be found at nearly any development site. As they are discovered, resources are recorded and information retrieved. If the nature of the resource requires it, the resource is protected. When discovered, cultural resources are treated in accordance with applicable federal and state laws and regulations as well as in compliance with the mitigation measures and permit requirements applicable to a project. It is not known what cultural resources, if any, would be affected by development of all present and future projects within the Ivanpah Valley, however, it is reasonable to assume that cultural resources exist and could be expected to be uncovered at some of these sites. As would be done during ISEGS construction, should resources be discovered during the construction of current and future projects, they would be subject to legal requirements designed to protect them, thereby reducing the effect of impacts. Therefore ISEGS impacts, when combined with impacts from past, present and reasonably foreseeable projects would not be significant.

Regional Projects

The development of urban, residential, military, and infrastructure uses of land within the geographic extent of regional cumulative impacts has likely resulted in impacts to cultural resources. Many archaeological resources occur within the California Desert Conservation Area that could be destroyed through construction activities of these renewable projects. For example, nearly 12,000 cultural resources have been identified within San Bernardino County. Because only 15 percent of San Bernardino County has been surveyed for cultural resources, there is a high potential to discover previously unknown resources. If resources are impacted where the values can be fully recovered through data recovery or other recordation (photography, drawings, and descriptive history), the cumulative impact of these future projects would not be significant. However, even with mitigation of individual projects at specific sites, there would still be a loss of resources due to the large number of acres disturbed.

Buildings and structural sites throughout the desert would also be impacted by the numerous proposed renewable projects. Potential impacts would include physical disturbance or alteration directly as a result of construction activities or diminished visual character of such sites due to the presence of industrial structures. Mitigation would be implemented for each project to minimize impacts.

Construction of the solar and wind projects proposed throughout this region would result in substantial changes in the setting and feeling, and association of the areas in which they are constructed. The current design of these projects would result in a significant cumulative impact to the region. Within the desert region there are numerous traditional

use areas, and lands sacred to Native Americans are present. Potential impacts would include physical disturbance or alteration directly as a result of construction activity or diminished visual character of traditional use areas due to the presence of industrial structures. If impacts to traditional use areas would occur at any individual site, mitigation would be implemented to minimize project impacts; however the potential for vast disturbance of the desert would potentially lead to a loss of resources and impacts to visual character, thereby resulting in a significant cumulative impact.

However, as discussed above, there is one built-environment resource that the construction and operation of the ISEGS project would affect, and staff's proposed conditions of certification provide for the mitigation of that impact to that resource. The ISEGS project would, therefore, have minimal potential to combine with the impacts of any of the reasonably foreseeable renewable energy projects shown on Cumulative Figure 1 and Cumulative Figure 2 to result in cumulative impacts to known cultural resources.

Unknown, unrecorded cultural resources may be found at nearly any development site. When discovered, cultural resources are treated in accordance with applicable Federal and State laws and regulations as well as in compliance with the mitigation measures and permit requirements applicable to a project. It is not known what cultural resources, if any, would be affected by development of all present and future projects within southeastern California, southern Nevada, and western Arizona. Because, however, of the large area of proposed development (over one million acres of desert land), it is reasonable to assume that cultural resources exist and would be expected to be uncovered at some of these sites. As would be done during the construction of the ISEGS project, should resources be discovered during construction of any of the proposed solar and wind development projects, they would be subject to legal requirements designed to protect them, thereby reducing the effect of impacts. Additionally, by developing sites with solar reflective mirrors, photovoltaic panels, or wind turbines, the potential also exists for these projects to preclude the potential for discovery of unknown cultural resources. Therefore, although the discovery of unknown cultural resources can be mitigated for individual projects, the scale of future renewable energy development with the potential to disturb unknown resource or to preclude the potential for discovery of unknown discoveries would be significant, and the contribution of the ISEGS project to this cumulative impact would be cumulatively considerable.

Cumulative Impact Conclusion

Impacts of the ISEGS project would not have the potential to combine with impacts of past, present, and reasonably foreseeable projects to result in a significant contribution to either local or regional cumulative impacts to known cultural resources. However, impacts of the ISEGS project would combine with impacts of proposed solar and wind development projects in southeastern California, southern Nevada, and western Arizona to result in cumulatively considerable impacts to unknown cultural resources.

COMPLIANCE WITH LORS

If the conditions of certification (below) are properly implemented, the proposed ISEGS project would tentatively result in a less-than-significant impact on known and newly

identified, CRHR-eligible resources. The project would therefore be in compliance with all applicable state laws, ordinances, regulations, and standards (LORS) listed in Cultural Resources Table 1. A more definitive declaration of the ability of the project to comply with CEQA and other State LORS must await the results of the helicopter reconnaissance survey report (see *Helicopter Reconnaissance Survey* section above).

The County of San Bernardino's General Plan has broad language that declares its goal of preserving and promoting the county-wide preservation of cultural resources, but the only County cultural resources LORS with which a development project must comply, by taking specific actions, apply only to the unincorporated areas of the County. Staff's proposed conditions of certification require specific actions to promote and to effect historic preservation, and to mitigate impacts to CRHR-eligible resources in order to ensure CEQA compliance. Consequently, if ISEGS implements these conditions, its actions would be consistent with the cultural resources goals of the County of San Bernardino.

CONCLUSIONS AND RECOMMENDATIONS

This cultural resources analysis is presently unable to definitively conclude that the ISEGS project would have no significant impact on known, CRHR-eligible archaeological, ethnographic, or built-environment resources. Staff may be able to make such a conclusion upon receipt of the helicopter reconnaissance survey report (see "Helicopter Reconnaissance Survey" subsection, above), the results of which would complete the cultural resources inventory for the project area of analysis. With the adoption and implementation of staff's proposed Conditions of Certification **CUL-8** and **CUL-9**, staff can conclude that the impacts of the proposed project on the one presently known CRHR-eligible resource, the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H), would be reduced to less than significant. Staff therefore recommends that the Commission adopt these conditions.

Staff further recommends that the Commission adopt the following additional cultural resources Conditions of Certification, **CUL-1** through **CUL-7**, and **CUL-10**. These measures are intended to facilitate the identification and assessment of previously unknown archaeological resources encountered during construction-related ground disturbance and to mitigate any significant impacts from the project on any newly found resources assessed as CRHR-eligible. To accomplish this, the conditions provide for the hiring of a Cultural Resources Specialist and archaeological monitors, for cultural resources awareness training for construction workers, for the archaeological and Native American monitoring of ground-disturbing activities, in particular situations, for the recovery of data from CRHR-eligible discovered archaeological deposits, for the writing of a technical archaeological report on all archaeological activities and findings, and for the curation of recovered artifacts and other data. When properly implemented and enforced, staff believes that these conditions of certification would reduce to less than significant any impacts to previously unknown cultural resources encountered during construction or operation. Additionally, with the adoption and implementation of these conditions, the ISEGS project would be in conformity with all applicable LORS.

PROPOSED CONDITIONS OF CERTIFICATION

CUL-1 Prior to the start of ground disturbance (includes "preconstruction site mobilization;" "construction ground disturbance;" and "construction grading, boring, and trenching," as defined in the General Conditions for this project), the project owner shall obtain the services of a Cultural Resources Specialist (CRS), and one or more alternate CRSs, if alternates are needed. The CRS shall manage all consultation, monitoring, mitigation, curation, and reporting activities required in accordance with the Conditions of Certification (Conditions). The CRS may elect to obtain the services of Cultural Resource Monitors (CRMs) and other technical specialists, if needed, to assist in monitoring, mitigation, and curation activities. The project owner shall ensure that the CRS makes recommendations regarding the eligibility to the California Register of Historical Resources (CRHR) of any cultural resources that are newly discovered or that may be affected in an unanticipated manner. No ground disturbance shall occur prior to CPM approval of the CRS, unless specifically approved by the CPM. Approval of a CRS may be denied or revoked for non-compliance on this or other projects.

CULTURAL RESOURCES SPECIALIST

The resumes for the CRS and alternate(s) shall include information demonstrating to the satisfaction of the CPM that their training and background conform to the U.S. Secretary of Interior Guidelines, as published in the Code of Federal Regulations, 36 CFR Part 61. In addition, the CRS shall have the following qualifications:

1. The CRS's qualifications shall be appropriate to the needs of the project and shall include a background in anthropology, archaeology, history, architectural history, or a related field; and

2. At least three years of archaeological or historic, as appropriate, resource mitigation and field experience in California.

The resume of the CRS shall include the names and telephone numbers of contacts familiar with the work of the CRS on referenced projects, and demonstrate that the CRS has the appropriate education and experience to accomplish the cultural resource tasks that must be addressed during ground disturbance, grading, construction, and operation.

CULTURAL RESOURCES MONITORS

CRMs shall have the following qualifications:

1. a BS or BA degree in anthropology, archaeology, historical archaeology or a related field and one year experience monitoring in California; or

2. an AS or AA degree in anthropology, archaeology, historical archaeology or a related field, and four years experience monitoring in California; or

3. enrollment in upper division classes pursuing a degree in the fields of anthropology, archaeology, historical archaeology or a related field, and two years of monitoring experience in California.

CULTURAL RESOURCES TECHNICAL SPECIALISTS

The resume(s) of any additional technical specialists, e.g., historical archaeologist, historian, architectural historian, and/or physical anthropologist, shall be submitted to the CPM for approval.

Verification:

1. At least 45 days prior to the start of ground disturbance, the project owner shall submit the resume for the CRS, and alternate(s), if desired, to the CPM for review and approval.
2. At least 10 days prior to a termination or release of the CRS, or within 10 days after the resignation of a CRS, the project owner shall submit the resume of the proposed new CRS to the CPM for review and approval. At the same time, the project owner shall also provide to the approved new CRS the AFC and all cultural documents, field notes, photographs, and other cultural materials generated by the project. If there is no alternate CRS in place to conduct the duties of the CRS, a previously approved monitor may serve in place of a CRS so that construction may continue up to a maximum of 3 days without a CRS. If cultural resources are discovered, then construction will remain halted until there is a CRS or alternate CRS to make a recommendation regarding significance.
3. At least 20 days prior to ground disturbance, the CRS shall provide a letter naming anticipated CRMs for the project and stating that the identified CRMs meet the minimum qualifications for cultural resource monitoring required by this Condition. If additional CRMs are obtained during the project, the CRS shall provide additional letters to the CPM identifying the CRMs and attesting to the qualifications of the CRMs, at least five days prior to the CRMs beginning on-site duties.
4. At least 10 days prior to beginning tasks, the resume(s) of any additional technical specialists shall be provided to the CPM for review and approval.
5. At least 10 days prior to the start of ground disturbance, the project owner shall confirm in writing to the CPM that the approved CRS will be available for onsite work and is prepared to implement the cultural resources Conditions.

CUL-2 Prior to the start of ground disturbance, if the CRS has not previously worked on the project, the project owner shall provide the CRS with copies of the AFC, data responses, and confidential cultural resources reports for the project. The project owner shall also provide the CRS and the CPM with maps and drawings showing the footprint of the power plant and all linear facilities. Maps shall include the appropriate USGS quadrangles and a map at an appropriate scale (e.g., 1:2000 or 1” = 200’) for plotting cultural features or materials. If the CRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the CRS and CPM. The CPM shall review submittals and, in consultation with the CRS, approve those that are appropriate for use in cultural resources planning activities. No ground

disturbance shall occur prior to CPM approval of maps and drawings, unless specifically approved by the CPM.

If construction of the project would proceed in phases, maps and drawings, not previously provided, shall be submitted prior to the start of each phase. Written notification identifying the proposed schedule of each project phase shall be provided to the CRS and CPM.

At a minimum, the CRS shall consult weekly with the project construction manager to confirm area(s) to be worked during the next week, until ground disturbance is completed, and the project owner shall ensure that the project construction manager is available for such weekly consultations.

The project owner shall notify the CRS and CPM of any changes to the scheduling of the construction phases. No ground disturbance shall occur prior to CPM approval of maps and drawings, unless specifically approved by the CPM.

Verification:

1. At least 40 days prior to the start of ground disturbance, the project owner shall provide the AFC, data responses, and confidential cultural resource documents to the CRS, if needed, and the subject maps and drawings to the CRS and CPM. The CPM will review submittals in consultation with the CRS and approve maps and drawings suitable for cultural resources planning activities.

2. If there are changes to any project related-footprint, revised maps and drawings shall be provided at least 15 days prior to start of ground disturbance and construction for those changes.

3. If project construction is phased, if not previously provided, the project owner shall submit the subject maps and drawings 15 days prior to each phase.

4. On a weekly basis during ground disturbance, a current schedule of anticipated project activity shall be provided to the CRS and CPM by letter, email, or fax.

5. Within five days of identifying changes, the project owner shall provide written notice of any changes to scheduling of construction phase.

CUL-3 Prior to the start of ground disturbance, the project owner shall submit the Cultural Resources Monitoring and Mitigation Plan (CRMMP), as prepared by or under the direction of the CRS, to the CPM for review and approval. The CPM shall provide the project owner with a model CRMMP to adapt for project use. The CRMMP shall identify general and specific measures to minimize potential impacts to sensitive cultural resources. Implementation of the CRMMP shall be the responsibility of the CRS and the project owner. Copies of the CRMMP shall reside with the CRS, alternate CRS, each monitor, and the project owner's on-site construction manager. No ground disturbance shall occur prior to CPM approval of the CRMMP, unless specifically approved by the CPM.

The CRMMP shall include, but not be limited to, the following elements and measures:

1. The following statement included in the Introduction: “Any discussion, summary, or paraphrasing of the Conditions in this CRMMP is intended as general guidance and as an aid to the user in understanding the Conditions and their implementation. The Conditions, as written in the Commission Decision, shall supersede any summarization, description, or interpretation of the Conditions in the CRMMP. The Cultural Resources Conditions of Certification from the Commission Decision are contained in Appendix A.”

2. A proposed general research design that includes a discussion of archaeological research questions and testable hypotheses specifically applicable to the local prehistory and history of the project area, and a discussion of artifact collection, retention/disposal, and curation policies as related to the research questions formulated in the research design. The research design shall specify that the preferred treatment strategy for any buried archaeological deposits is avoidance. A mitigation plan shall be prepared for any CRHR-eligible resource (as determined by the CPM), impacts to which cannot be avoided. A prescriptive treatment plan may be included in the CRMMP for limited data types.

3. Specification of the implementation sequence and the estimated time frames needed to accomplish all project-related tasks during the ground disturbance and post-ground–disturbance analysis phases of the project.

4. Identification of the person(s) expected to perform each of the tasks, their responsibilities, and the reporting relationships between project construction management and the mitigation and monitoring team.

5. A description of the manner in which Native American observers or monitors will be included, the procedures to be used to select them, and their role and responsibilities.

6. A description of all impact avoidance measures (such as flagging or fencing), to prohibit or otherwise restrict access to sensitive resource areas that may be found during construction and/or operation and may subsequently need to be avoided, and identification of the areas where these measures are to be implemented. The description shall address how these measures would be implemented and how long they would be needed to protect the resources from project-related effects.

7. A statement that all cultural resources encountered shall be recorded on a DPR form 523 and mapped and photographed. In addition, all archaeological materials collected as a result of the archaeological investigations (survey, testing, and data recovery) shall be curated in

accordance with the State Historical Resources Commission's "Guidelines for the Curation of Archaeological Collections," into a retrievable storage collection in a public repository or museum.

8. A statement that the project owner will pay all curation fees for artifacts recovered and for related documentation produced during cultural resources investigations conducted for the project. The project owner shall identify three possible curation facilities that could accept cultural resources materials resulting from project activities.

9. A statement that the CRS has access to equipment and supplies necessary for site mapping, photographing, and recovering any cultural resource materials that are encountered during ground disturbance and that cannot be treated prescriptively.

10. A description of the contents and format of the Cultural Resource Report (CRR), which shall be prepared according to ARMR Guidelines.

Verification:

1. Upon approval of the CRS proposed by the project owner, the CPM will provide to the CRS an electronic copy of the model CRMMP.

2. At least 30 days prior to the start of ground disturbance, the project owner shall submit the subject CRMMP to the CPM for review and approval. Ground disturbance may not commence until the CRMMP is approved, unless specifically approved by the CPM.

3. At least 30 days prior to the start of ground disturbance, a letter shall be provided to the CPM indicating that the project owner agrees to pay curation fees for any materials collected as a result of the archaeological investigations (survey, testing, data recovery).

CUL-4 The project owner shall submit the Cultural Resources Report (CRR) to the CPM for approval. The CRR shall be written by or under the direction of the CRS and shall be provided in the ARMR format. The CRR shall report on all field activities related to the implementation of the CRMMP including dates, times and locations, findings, samplings, and analyses. All survey reports, Department of Parks and Recreation (DPR) 523 forms, and additional research reports not previously submitted to the California Historic Resource Information System (CHRIS) and the State Historic Preservation Officer (SHPO) shall be included as an appendix to the CRR.

If the project owner requests a suspension of ground disturbance and/or construction activities, then a draft CRR that covers all cultural resources activities associated with the project shall be prepared by the CRS and submitted to the CPM for review and approval on the same day as the suspension/extension request. The draft CRR shall be retained at the project site in a secure facility until ground disturbance and/or construction resumes or the project is withdrawn. If the project is withdrawn, then a final CRR shall

be submitted to the CPM for review and approval at the same time as the withdrawal request.

Verification:

1. Within 90 days after completion of ground disturbance (including landscaping), the project owner shall submit the CRR to the CPM for review and approval. If any reports have previously been sent to the CHRIS, then receipt letters from the CHRIS or other verification of receipt shall be included in an appendix.

2. Within 90 days after completion of ground disturbance (including landscaping), the project owner shall provide to the CPM a copy of an agreement with, or other written commitment from, a curation facility that meets the standards stated in the California State Historical Resources Commission's *Guidelines for the Curation of Archaeological Collections*, to accept cultural materials, if any, from this project. Any agreements concerning curation will be retained and available for audit for the life of the project.

3. Within 10 days after CPM approval of the CRR, the project owner shall provide documentation to the CPM that copies of the CRR have been provided to the SHPO, the CHRIS, the curating institution, if archaeological materials were collected, and to the Chairperson(s) of any Native American groups requesting copies of project-related reports.

4. Within 30 days after requesting a suspension of construction activities, the project owner shall submit a draft CRR to the CPM for review and approval.

CUL-5 Prior to and for the duration of ground disturbance, the project owner shall provide Worker Environmental Awareness Program (WEAP) training to all new workers within their first week of employment at the project site and on the linear facilities. The training shall be prepared by the CRS, may be conducted by any member of the archaeological team, and may be presented in the form of a video. The CRS shall be available (by telephone or in person) to answer questions posed by employees. The training may be discontinued when ground disturbance, including landscaping, is completed. The training shall include:

1. A discussion of applicable laws and penalties under the law;

2. Samples or visuals of artifacts that might be found in the project vicinity;

3. A discussion of what such artifacts may look like when partially buried, or wholly buried and then freshly exposed;

4. A discussion of what prehistoric and historical archaeological deposits look like at the surface and when exposed during construction, and the range of variation in the appearance of such deposits;

5. Instruction that the CRS, alternate CRS, and CRMs have the authority to halt construction in the area of a discovery to an extent sufficient to ensure

that the resource is protected from further impacts, as determined by the CRS;

6. Instruction that employees are to halt work on their own in the vicinity of a potential cultural resources discovery and shall contact their supervisor and the CRS or CRM, and that redirection of work would be determined by the construction supervisor and the CRS;

7. An informational brochure that identifies reporting procedures in the event of a discovery;

8. An acknowledgement form signed by each worker indicating that they have received the training; and

9. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

No ground disturbance shall occur prior to implementation of the WEAP program, unless such activities are specifically approved by the CPM.

Verification:

1. At least 30 days prior to the beginning of ground disturbance, the CRS shall provide the training program draft text and graphics and the informational brochure to the CPM for review and approval, and the CPM will provide to the project owner a WEAP Training Acknowledgement form for each WEAP-trained worker to sign.

2. On a monthly basis, the project owner shall provide in the Monthly Compliance Report (MCR) the WEAP Training Acknowledgement forms of persons who have completed the training in the prior month and a running total of all persons who have completed training to date.

CUL-6 The project owner shall ensure that construction is immediately halted should anyone discover buried archaeological materials on the project site or linear facilities (Discovery). Archaeological materials may include, but are not limited to, such items as whole or fragmentary flaked or ground stone tools, stone flaking debris, discolored, fire-altered rock, animal bone, charcoal, ash, discolored, burned earth, rocks and minerals not common to the project site, and fragments of ceramic, glass, or metal. In the event of such a Discovery, the project owner shall ensure the immediate notification of the CRS, who shall either assess the historical significance of the Discovery, in person, on the project site, or supervise the assessment that a CRM or an appropriate cultural resources technical specialist would make of the historical significance of the Discovery, also in person, on the project. The recommendation of significance shall be substantiated by and reported to the CPM by the CRS. Redirection of ground disturbance shall be accomplished under the direction of the construction supervisor, in a manner agreed to by the CRS.

In the event cultural resources that are over 50 years of age or that may be considered CRHR-eligible are found, or impacts to such resources can be anticipated, construction shall be halted or redirected in the immediate vicinity of the Discovery sufficient to ensure that the resource is protected from further impacts. The halting or redirection of construction shall remain in effect until either the CRS, a CRM, or appropriate cultural resources technical specialist has made an assessment of the significance of the Discovery, and all of the following have also occurred:

1. The CRS has notified the project owner, and the CPM has been notified within 24 hours of the Discovery, or by Monday morning if the cultural resources Discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning, including a description of the Discovery (or changes in character or attributes), the action taken (i.e. work stoppage or redirection), a recommendation of eligibility, and recommendations for mitigation of any cultural resources Discoveries, whether or not a determination of significance has been made.

2. The CRS has ensured completion of field notes, measurements, and photography for a DPR 523 primary form. The "Description" entry of the 523 form shall include a recommendation on the significance of the find. The project owner shall submit completed forms to the CPM.

3. The CRS, the project owner, and the CPM have conferred, and the CPM has concurred with the recommended eligibility of the Discovery and approved the CRS's proposed data recovery, if any, including the curation of the artifacts, or other appropriate mitigation; and any necessary data recovery and mitigation have been completed.

4. The CRS and the CPM have conferred, and the CPM has determined whether the Discovery reveals new information about the subsurface archaeological character of the project site that warrants the initiation of monitoring for portions of the project site.

5. When the CPM makes a determination that a Discovery does reveal new information about the subsurface archaeological character of the project site that warrants the initiation of monitoring for portions of the project site, the CPM shall provide notification, by letter or e-mail, to the project owner and the CRS, where on the project site monitoring shall be necessary and why, and notification that **CUL-7** shall be implemented for the subject portions of the project site.

Verification:

1. At least 30 days prior to the start of ground disturbance, the project owner shall provide the CPM and CRS with a letter confirming that the CRS, alternate CRS, and CRMs have the authority to halt construction activities in the vicinity of a cultural resources Discovery, and that the project owner shall ensure that the CRS notifies the CPM within 24 hours of a Discovery, or by Monday morning if the cultural resources Discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning.

2. Completed DPR form 523s shall be submitted to the CPM for review and approval no later than 24 hours following the notification of the CPM, or 48 hours following the completion of data recordation/recovery, whichever is more appropriate for the subject cultural material.

CUL-7 If there is a discovery of archaeological material, and after the CPM notifies the project owner and the CRS that the initiation of monitoring is necessary for portions of the project site or linear facilities, the project owner shall ensure that the CRS, alternate CRS, or CRMs shall monitor full time on the portions of the project site and linear facilities which the CPM may specify, and ground disturbance full time on the portions of the laydown areas or other ancillary areas which the CPM may also specify, to ensure there are no impacts to further undiscovered resources and to ensure that newly found resources are not further impacted in an unanticipated manner.

Full-time archaeological monitoring for this project shall be the archaeological monitoring of all earth-moving activities on the portions of the construction site or the linear facility routes which the CPM may specify for as long as the activities are ongoing. Full-time archaeological monitoring shall require one monitor per active earthmoving machine working in archaeologically sensitive areas, as determined by the CRS in consultation with the CPM. If an excavation area is too large for one monitor to effectively observe the soil removal, one or more additional monitors shall be retained to observe the area.

In the event that the CRS determines that the current level of monitoring is not appropriate in certain locations, a letter or e-mail detailing the justification for changing the level of monitoring shall be provided to the CPM for review and approval prior to any change in the level of monitoring.

The research design in the CRMMP shall govern the collection, treatment, retention/disposal, and curation of any archaeological materials encountered.

On forms provided by the CPM, CRMs shall keep a daily log of any monitoring and other cultural resource activities and any instances of non-compliance with the Conditions and/or applicable LORS. Copies of the daily logs shall be provided to the CPM by the CRS as directed by the CPM. The CRS shall use these logs to compile a monthly summary report on the progress or status of cultural resources-related activities. If there are no monitoring activities, the summary report shall specify why monitoring has been suspended. The CRS or alternate CRS shall report daily to the CPM on the status of cultural resources-related activities at the project site, unless reducing or ending daily reporting is requested by the CRS and approved by the CPM.

The CRS, at his or her discretion, or at the request of the CPM, may informally discuss cult ural resource monitoring and mitigation activities with Energy Commission technical staff.

Cultural resources monitoring activities are the responsibility of the CRS. Any interference with monitoring activities, removal of a monitor from duties assigned by the CRS, or direction to a monitor to relocate monitoring activities by anyone other than the CRS shall be considered non-compliance with these Conditions.

Upon becoming aware of any incidents of non-compliance with the Conditions and/or applicable LORS, the CRS and/or the project owner shall notify the CPM by telephone or e-mail within 24 hours. The CRS shall also recommend corrective action to resolve the problem or achieve compliance with the Conditions. When the issue is resolved, the CRS shall write a report describing the issue, the resolution of the issue, and the effectiveness of the resolution measures. This report shall be provided in the next MCR for the review of the CPM.

A Native American monitor shall be obtained to monitor ground disturbance in areas where Native American artifacts may be discovered. Informational lists of concerned Native Americans and Guidelines for monitoring shall be obtained from the Native American Heritage Commission. Preference in selecting a monitor shall be given to Native Americans with traditional ties to the area that shall be monitored.

Verification:

1. At least 30 days prior to the start of ground disturbance, the CPM will provide to the CRS an electronic copy of the form to be used as a daily monitoring log.

2. Daily, the CRS shall provide a statement that “no cultural resources over 50 years of age were discovered” to the CPM as an e-mail or in some other form acceptable to the CPM. If the CRS concludes that daily reporting is no longer necessary, a letter or e-mail providing a detailed justification for the decision to reduce or end daily reporting shall be provided to the CPM for review and approval at least 24 hours prior to reducing or ending daily reporting.

3. On a monthly basis, while monitoring is on-going, the project owner shall include in each MCR a copy of the monthly summary report of cultural resources-related monitoring prepared by the CRS. Copies of daily logs shall be retained by the project owner and made available for audit by the CPM.

4. At least 24 hours prior to implementing a proposed change in monitoring level, documentation justifying the change shall be submitted to the CPM for review and approval.

CUL-8 Prior to the dismantling, by any party, of any portion of the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H) located with the boundaries of the project site, the project owner shall obtain the services of an architectural historian. The project owner shall provide the CPM with the name and resume of the architectural historian. No ground disturbance shall occur prior to CPM approval of the architectural historian, unless specifically approved by the CPM.

The resume for the architectural historian shall include names and telephone numbers of contacts familiar with the architectural historian's work and all information needed to demonstrate that the architectural historian has the following qualifications:

1. meets the Secretary of Interior's Professional Standards for architectural history;

2. has at least three years experience in recording twentieth-century industrial structures; and

3. has completed at least one recordation project within the past five years involving coordination with the National Park Service's Heritage Documentation Program (HDP).

Verification:

1. At least 90 days prior to the dismantling of any portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site, the project owner shall submit the name and resume of the selected architectural historian to the CPM for review and approval.

2. At least 75 days prior to the dismantling of any portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site, the project owner shall confirm in writing to the CPM that the approved architectural historian is available for onsite work and provide a date by which the architectural historian will undertake the HAER-type documentation of the tower types and the cabling system of the portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site.

CUL-9 Prior to the dismantling, by any party, of any portion of the Hoover Dam-to-San Bernardino transmission line (CA-SBR-10315H) located within the boundaries of the project site, the project owner shall ensure that the approved architectural historian prepares HAER-type documentation of the historic context and historic setting of the resource, and recordation of those physical parts of the Hoover Dam-to-San Bernardino transmission line that are located within the boundaries of the project site. The project owner shall ensure that the architectural historian consults with the HABS/HAER Coordinator in the Pacific West Regional Office of the HDP, in Oakland, and complies with the Coordinator's guidance on the extent and content of documentation appropriate for the Hoover Dam-to-San Bernardino transmission line, as a historical resource under CEQA and as a resource eligible for inclusion in the National Register of Historic Places, and on the format and materials to be used in the documentation. No dismantling of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project area shall occur prior to the completion, by the architectural historian, of the recording, in the field, of the historic setting and the portion of the line located within the boundaries of the project site, and the submission to and approval by the CPM of the draft HAER-type

documentation of the Hoover Dam-to-San Bernardino transmission line, unless specifically allowed by the CPM.

Verification:

1. At least 60 days prior to the dismantling, by any party, of any portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site, the project owner shall submit to the CPM a letter or memorandum from the architectural historian detailing the scope of the HDP-recommended documentation of the resource.

2. At least 30 days prior to the dismantling, by any party, of any portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site, the project owner shall provide a copy of the draft HAER-type documentation of the resource to the CPM for review and approval.

3. Within 90 days after completion of ground disturbance (including landscaping) the project owner shall include in an appendix to the CRR copies of the transmittal letters for the submission of copies of the final HAER-type documentation of the portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site to the California State Library and to at least two local libraries in San Bernardino County, and a copy of the letter of acceptance of the final HAER documentation by the Library of Congress, if accepted by that repository.

4. Alternately, at least 150 days prior to the dismantling, by any party, of any portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site, the project owner may submit to the CPM, for review and approval, a copy of final HAER-type documentation of the portion of the Hoover Dam-to-San Bernardino transmission line located within the boundaries of the project site produced by any party, that meets HAER-type standards. If the project owner chooses this alternative, within 90 days after completion of ground disturbance (including landscaping), the project owner shall include in an appendix to the CRR copies of the transmittal letters for the submission of copies of the alternative final HAER-type documentation to the California State Library and to at least two local libraries in San Bernardino County.

CUL-10 If fill soils must be acquired from a non-commercial borrow site or disposed of to a non-commercial disposal site, unless less-than-five-year-old surveys of these sites for archaeological resources are documented to and approved by the CPM, the CRS shall survey the borrow and/or disposal site(s) for cultural resources and record on DPR 523 forms any that are identified. When the survey is completed, the CRS shall convey the results and recommendations for further action to the project owner and the CPM, who will determine what, if any, further action is required. If the CPM determines that significant archaeological resources that cannot be avoided are present at the borrow site, all these conditions of certification shall apply. The CRS shall report on the methods and results of these surveys in the CRR.

Verification:

1. As soon as the project owner knows that a non-commercial borrow site and/or disposal site will be used, he/she shall notify the CRS and CPM and provide documentation of previous archaeological survey, if any, dating within the past five years, for CPM approval.

2. In the absence of documentation of recent archaeological survey, at least 30 days prior to any soil borrow or disposal activities on the non-commercial borrow and/or disposal sites, the CRS shall survey the site/s for archaeological resources. The CRS shall notify the project owner and the CPM of the results of the cultural resources survey, with recommendations, if any, for further action.

CULTURAL RESOURCES ACRONYM GLOSSARY

IVANPAH SOLAR ENERGYGENERATING SYSTEM

AFC	Application for Certification
ARMR	Archaeological Resource Management Report
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System
Conditions	Conditions of Certification
CRHR	California Register of Historical Resources
CRM	Cultural Resources Monitor
CRMMP	Cultural Resources Monitoring and Mitigation Plan
CRR	Cultural Resource Report
CRS	Cultural Resources Specialist
DPR 523	Department of Parks and Recreation cultural resources inventory form
FSA	Final Staff Assessment
LORS	laws, ordinances, regulations, and standards
MCR	Monthly Compliance Report
MLD	Most Likely Descendent
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
OHP	Office of Historic Preservation
PSA	Preliminary Staff Assessment
SHPO	State Historic Preservation Officer
Staff	Energy Commission cultural resources technical staff
WEAP	Worker Environmental Awareness Program

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HAZARDOUS MATERIALS MANAGEMENT

Geoff Lesh, PE and Rick Tyler

SUMMARY OF CONCLUSIONS

Staff's evaluation of the proposed project, along with staff's proposed mitigation measures, indicate that hazardous materials use at the proposed Ivanpah Solar Electric Generating System (ISEGS) would not present a significant impact on the public. With adoption of the proposed conditions of certification, the proposed project will comply with all applicable laws, ordinances, regulations, and standards (LORS).

INTRODUCTION

The purpose of this **HAZARDOUS MATERIALS MANAGEMENT** analysis is to determine if the proposed ISEGS could potentially cause significant impacts on the public from the use, handling, storage, or transportation of hazardous materials at the proposed project site. If significant adverse impacts on the public are identified, Energy Commission staff must evaluate 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 project site. Employers must inform employees of hazards associated with their work and provide those employees with special protective equipment and training to reduce the potential of health impacts from the handling of hazardous materials. The **WORKER SAFETY AND FIRE PROTECTION** section of this document describes the protection of workers from those risks.

Other hazardous materials such as mineral and lubricating oils, corrosion inhibitors, herbicides, and acids and bases to control pH will be present at the proposed project site. Hazardous materials used during the construction phase include gasoline, diesel fuel, motor oil, lubricants, and small amounts of solvents and paint. No acutely toxic hazardous materials will be used on-site during construction. None of these materials pose a significant potential for off-site impacts as a result of the quantities on-site, their relative toxicity, their physical states, and/or their environmental mobility. Although no natural gas is stored, the project will involve the handling of moderate amounts of natural gas. Natural gas poses some risk of both fire and explosion. Natural gas will be delivered via an existing Kern River Gas Transmission (KRGT) pipeline near the property at its northern boundary. A new 6-inch diameter pipeline spur will be installed to transport the gas needed for ISEGS the 0.5 miles distance to a fenced metering site at Ivanpah 3 (BSE2007a, section 4.0). From there a 3.8-mile 4-inch pipeline will pass through Ivanpah 2 ending at Ivanpah1. The total distance from the KRGT pipeline tap point to the Ivanpah 1 site is about 5.3 miles. The ISEGS will also require the transportation of certain liquid and solid hazardous materials to the facility. This document addresses all potential impacts associated with the use, storage, and transport 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 (LORS)

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)	Establishes a nationwide emergency planning and response program, and imposes 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 to inform 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	Requires that the suppliers of hazardous materials prepare and implement security plans in accordance with U.S. Department of Transportation (DOT) regulations.
49 CFR Part 1572, Subparts A and B	Requires that suppliers of hazardous materials ensure that their hazardous material drivers comply 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.
Title 49, Code of Federal Regulations, Part 190	Outlines gas pipeline safety program procedures.
Title 49, Code of Federal Regulations, Part 191	Addresses the transportation of natural and other gases by pipeline. Requires preparation of annual reports, incident reports, and safety-related condition reports. Also requires operators of pipeline systems to notify the U.S. Department of Transportation

	DOT) of any reportable incident by telephone and submit a follow-up written report within 30 days.
Title 49, Code of Federal Regulations, Part 192	Addresses transportation of natural and other gases by pipeline: Requires minimum federal safety standards, specifies minimum safety requirements for pipelines, and includes material selection, design requirements, and corrosion protection. The safety requirements for pipeline construction vary according to the population density and land use that characterize the surrounding land. This part also contains regulations governing pipeline construction, which must be followed for Class 2 and Class 3 pipelines, and requirements for preparing a pipeline integrity management program.
6 CFR Part 27	The CFATS (Chemical Facility Anti-Terrorism Standard) regulation of the U.S. Department of Homeland Security (DHS) that requires facilities that use or store certain hazardous materials to submit information to the DHS so that a vulnerability assessment can be conducted to determine what certain specified security measures shall be implemented.
State	
California Health and Safety Code, section 25531 to 25543.4	The California Accidental Release Program (Cal-ARP) requires the preparation of a Risk Management Plan (RMP) and Off-site Consequence Analysis (OCA) and submittal to the local Certified Unified Program Authority (CUPA) for approval.
Title 8, California Code of Regulations, Section 5189	Requires facility owners to develop and implement effective safety management plans to ensure that large quantities of hazardous materials are handled safely. While these requirements primarily provide for the protection of workers, they also indirectly improve public safety and are coordinated with the RMP process.
Title 8, California Code of Regulations, Section 5189	Sets forth requirements for design, construction, and operation of the vessels and equipment used to store and transfer ammonia. These sections generally codify the requirements of several industry codes including the American Society for Material Engineering (ASME) Pressure Vessel Code, the American National Standards Institute (ANSI) K61.1, and the National Boiler and Pressure Vessel Inspection Code. These codes apply to anhydrous ammonia but are also used to design storage facilities for aqueous ammonia.
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	Prevents certain chemicals that cause cancer and reproductive

Drinking Water and Toxic Enforcement Act (Proposition 65)	toxicity from being discharged into sources of drinking water.
LOCAL	
	San Bernardino County does not have additional LORS that apply to Hazardous Materials Handling, but administers the State of California programs as the CUPA.

The San Bernardino County Fire Department (SBCFD) acts as the Certified Unified Program Authority (CUPA), and is responsible for reviewing Hazardous Materials Business Plans. With regard to seismic safety issues, the proposed ISEGS site is located in Seismic Risk Zone 4. The construction and design of buildings and vessels storing hazardous materials will meet the seismic requirements of the Uniform Building Code (BSE2007a, section 5.5.2.4).

SETTING

Several characteristics of an area in which a project is located affect its potential for an accidental release of a hazardous material. 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 health risks. When wind speeds are low and the atmosphere is stable, dispersion is severely reduced and can lead to increased localized public exposure.

Recorded wind speeds and ambient air temperatures are described in the Air Quality section (6.3.2) and Appendix G.1 of the Application for Certification (AFC) (BSE2007a).

TERRAIN CHARACTERISTICS

The location of elevated terrain is often an important factor in assessing potential exposure. An emission plume from an accidental release may impact high elevations before it impacts lower elevations. The topography of the ISEGS site is essentially flat at about 2,600 feet above sea level, as are the immediately surrounding areas. Because of the nature of the surrounding area, terrain above stack height is not of concern for the project.

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 large bearing on health risk. There are no sensitive receptors within a 6-mile radius of the project vicinity (BSE2007a, section 5.9.3). The nearest residence to ISEGS is in Primm, Nevada, five miles northeast of the site SEGS2007a, figure 5.9-1).

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 and natural gas were evaluated. Staff's analysis examines 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 utilizes the most current acceptable public health exposure levels (both acute and chronic) to protect the public from the effects of an accidental chemical release.

In order to assess the potential of released hazardous materials traveling off-site and affecting the public, staff analyzed several aspects of the proposed use of materials at the facility. Staff recognizes that some hazardous materials must be used at power plants. Therefore, staff conducted its analysis by focusing on the choice and amount of chemicals to be used, the manner in which the applicant will use the chemicals, the manner by which it will be transported to the facility and transferred to facility storage tanks, and the way in which the applicant plans to store those materials on-site.

Staff reviewed the applicant's proposed engineering and administrative controls for hazardous material use. Engineering controls are physical or mechanical systems such as storage tanks or automatic shut-off valves that can prevent a spill of hazardous material from occurring, or that can limit the spill to a small amount or confine it to a small area. Administrative controls are rules and procedures that workers must follow to help either prevent accidents or keep them small if they do occur. Both engineering and administrative controls can act as either methods of prevention or methods of response and minimization. In both cases, the goal is to prevent a spill from moving off-site and harming the public.

Staff reviewed and evaluated the proposed use of hazardous materials, as described by the applicant (BSE2007a, section 5.5). Staff's assessment followed the five steps listed below:

- Step 1: Staff reviewed the chemicals and amounts proposed for on-site use, as listed in Table 5.5-3 of the AFC and determined the need and appropriateness of their use. Only those that are needed and appropriate are allowed to be used. If staff

feels that a safer alternative chemical can be used, staff will recommend or require its use, depending upon the impacts posed.

- 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 the 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 size 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 even with 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 project be allowed to use hazardous materials.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Small Quantity Hazardous Materials

In conducting this analysis, staff determined in Steps 1 and 2 that most of the proposed materials, although present at the proposed facility, pose a minimal potential for off-site impacts since they will be stored in either solid form or in small quantities, have low mobility, low vapor pressure, or low levels of toxicity. These hazardous materials, which were eliminated from further consideration, are discussed briefly below.

During the construction phase of the project, the only hazardous materials proposed for use include paint, cleaners, solvents, gasoline, diesel fuel, motor oil, and lubricants. Any impact of spills or other releases of these materials would be limited to the site because of the small quantities involved, the infrequent use and hence 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 all have very low volatility and would represent limited off-site hazards, even in larger quantities.

During operations, hazardous chemicals such as cleaning agents, lube oil, sulfuric acid, sodium hydroxide, ammonium hydroxide, diesel fuel and other various chemicals (see **Hazardous Materials Appendix A** for a list of all chemicals proposed to be used and stored at ISEGS) would be used and stored on-site and represent limited off-site hazard due to their small quantities, low volatility, and/or low toxicity.

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 material: natural gas.

Large Quantity Hazardous Materials

Natural Gas

Natural gas poses a fire and/or possible explosion risk because of its flammability. Natural gas is composed mostly of methane, but it 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's concentration exceeds 90%. Methane is flammable when mixed in air at concentrations of 5-14%, which is also its detonation range. Natural gas therefore poses a risk of fire and/or explosion if a release were to occur 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 result in an unconfined vapor cloud explosion than many other fuel gases such as propane or liquefied petroleum gas although an unconfined vapor cloud of natural gas can explode under certain conditions (as demonstrated by the natural gas explosion in Belgium in July 2004).

While natural gas will be used in significant quantities, it will not be stored on-site. It will be delivered via an existing underground pipeline that runs within a half-mile of the northern perimeter of the ISEGS site. 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 85A) requires 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 both the handling and use of natural gas and significantly reduce the potential for equipment failure due to either improper maintenance or human error.

Mitigation

Staff believes that this project's use of hazardous materials poses no significant risk but only if mitigation measures are used. These mitigation measures are discussed in this section. Condition of certification **HAZ-1** ensures that no hazardous material would be used at the facility except as listed in the AFC (and in Hazardous Materials Appendix A of this analysis), unless there is prior approval by the Energy Commission Compliance Project Manager (CPM).

The potential for accidents resulting in the release of hazardous materials is greatly reduced by the implementation of a Safety Management Program (see **HAZ-3**), which includes both engineering and administrative controls. Elements of facility controls and the safety management plan are summarized below.

Engineering Controls

Engineering controls help prevent accidents and releases (spills) from moving off-site and impacting the community by incorporating engineering safety design criteria into the project's design. Engineering safety features proposed by the applicant include:

- Usage of secondary containment areas surrounding each of the hazardous materials storage areas, designed to contain accidental releases during storage;
- Physical separation of stored chemicals in isolated containment areas, separated by a noncombustible partition in order to prevent the accidental mixing of incompatible materials, which may in turn cause the formation and release of toxic gases or fumes.

Administrative Controls

Administrative controls help prevent accidents and releases (spills) from moving off-site and impacting the community by establishing worker training programs and process safety management programs.

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/FIRE PROTECTION** section in this PSA for specific regulatory requirements):

- Worker training on 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 that use hazardous materials;
- Fire safety and prevention; and
- Emergency response actions including facility evacuation, hazardous material spill cleanup, and fire prevention.

At ISEGS, the project owner will be required to designate an individual who will have the responsibility and authority to ensure a safe and healthful workplace. This project health and safety official will oversee the health and safety program and will have the authority to halt any action or modify any work practice in order to protect the workers, facility, and the surrounding community in the event that the health and safety program is violated.

A Hazardous Materials Business Plan (HMBP) will also be prepared by the applicant that would incorporate state requirements for the handling of hazardous materials (see **HAZ-2**) (BSE2007a, section 5.5.6.4.1). A Spill Prevention Control and Countermeasure Plan (SPCC) is required by Federal Regulations (see LORS above) and will be prepared for the petroleum-containing hazardous materials.

On-site Spill Response

In order to address spill response, the facility will prepare and implement an emergency response plan which includes information on hazardous materials contingency and

emergency response procedures, spill containment and prevention systems, personnel training, spill notification, on-site spill containment, prevention equipment and capabilities, etc. Emergency procedures will be established which include evacuation, spill cleanup, hazard prevention, and emergency response.

The San Bernardino County HazMat Team is currently based at Fire Station No. 78, in Fontana, California, which is located approximately 175 miles from the project site. The San Bernardino County HazMat Team response time to a hazmat emergency call from ISEGS is approximately 3 hours (Crawford 2008).

Staff concludes that, given the remote location, the hazardous material response time is acceptable, and that the San Bernardino County HazMat Team is adequately trained and equipped to respond to an emergency at ISEGS in a timely manner. The remote location lengthens the response but, at the same time, eliminates the risk of off-site consequences to the public.

Transportation of Hazardous Materials

Containerized hazardous materials including sulfuric acid, and cleaning chemicals, will be transported to the facility via truck. While many types of hazardous materials will be transported to the site, previous modeling of spills involving much larger quantities of more toxic materials, (aqueous ammonia and 93% sulfuric acid) - two hazardous materials that will be used, stored, and transported at the proposed power plant – has demonstrated that minimal airborne concentrations would occur at short distances from the spill.

During construction and operation of ISEGS, staff believes that minimal amounts and types of hazardous materials (paint, cleaners, solvents, gasoline, diesel fuel, motor oil, lubricants, 20% sulfuric acid, and welding gases in standard-sized cylinders) do not pose a significant risk of either spills or public impacts along any transportation route. Staff therefore does not recommend a specific route.

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 Interstate highway (I-15). Staff believes it is appropriate to rely upon the extensive regulatory program that applies to shipment of hazardous materials on California Highways to ensure safe handling in general transportation (see the Federal Hazardous Materials Transportation Law 49 USC §5101 et seq, the U.S. Department of Transportation Regulations 49 CFR Subpart H, §172-700, and the California DMV Regulations on Hazardous Cargo). These regulations also address issues of driver

competence. See AFC section 6.13.1 for additional information on regulations governing the transportation of hazardous materials.

Seismic Issues

The possibility exists that an earthquake could cause the failure of a hazardous materials storage tank. A quake could also cause the failure of the secondary containment system (berms and dikes), as well as electrically controlled valves and pumps. The failure of all these preventive control measures might then result in a vapor cloud of hazardous materials that could move off-site and impact residents and workers in the surrounding community. The effects of the Loma Prieta earthquake of 1989, the Northridge earthquake of 1994, and the earthquake in Kobe, Japan, in January 1995, heighten concerns about earthquake safety.

Information obtained after the January 1994 Northridge earthquake showed that some damage was caused to several large and small storage tanks at the water treatment system of a cogeneration facility. The tanks with the greatest damage, including seam leakage, were older tanks, while newer tanks sustained lesser damage with displacements and attached line failures. Therefore, staff conducted an analysis of the codes and standards, which should be followed to adequately design and build storage tanks and containment areas that could withstand a large earthquake. Staff also 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 were impacted by this quake. Referring to the sections on **GEOLOGIC RESOURCES AND HAZARDS** and **FACILITY DESIGN** in the AFC, staff notes that the proposed facility will be designed and constructed to the applicable standards of the 2007 California Building Code for Seismic Zone 4 (BSE2007a, section 5.4.2, Table 5.4-1). Therefore, on the basis of occurrences at 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 likely and do not represent a significant risk to the public.

Site Security

ISEGS proposes to use hazardous materials identified by the US EPA as materials where special site security measures should be developed and implemented to prevent unauthorized access. US EPA published a *Chemical Accident Prevention Alert* regarding site security (EPA 2000a), the U.S. Department of Justice published a special report on Chemical Facility Vulnerability Assessment Methodology (US DOJ 2002), 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. Staff believes that all power

plants under the jurisdiction of the Energy Commission should implement a minimum level of security consistent with the guidelines listed here.

In order to ensure that this facility (or a shipment of hazardous material) is not the target of unauthorized access, staff's proposed conditions of certification **HAZ-4** and **HAZ-5** 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 ISEGS 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 will be strictly controlled. Consistent with current state and federal regulations governing the transport of hazardous materials, hazardous materials vendors will have to maintain their transport vehicle fleets and employ only drivers who are properly licensed and trained. The project owner will 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 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 IMPACTS AND MITIGATION

Staff considered the potential for impacts due to a simultaneous release of any of the hazardous chemicals from the proposed ISEGS with any other nearby facilities. Because of the small amounts of the hazardous chemicals to be stored at the facility, Staff determined that there was no possibility of producing an offsite impact. Because of this determination, and the additional fact that there are no nearby facilities 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.

COMPLIANCE WITH LORS

Staff concludes that construction and operation of ISEGS would be in compliance with all applicable LORS for both 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 will not pose a significant impact on the public. Staff's analysis also shows that there will be no significant cumulative impact. With adoption of the proposed conditions of certification, the proposed project will 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 will 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 will not present a significant risk to the public.

Staff proposes five conditions of certification which are mentioned in the above text and listed below. **HAZ-1** ensures that no hazardous material would be used at the facility except as listed in the AFC, unless there is prior approval by the Energy Commission Compliance Project Manager.

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 will 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. Site security during both the construction and operation phases is addressed in **HAZ-4** and **HAZ-5.**

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 than those identified by chemical name in **Appendix A,** 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 concurrently provide a Business Plan to the Hazardous Materials Division of the County of San Bernardino Fire Department and the CPM for review. After receiving comments from the Hazardous Materials Division of the County of San Bernardino Fire Department and the CPM, the project owner shall reflect all recommendations in the final documents. Copies of the final Business Plan shall then be provided to the Hazardous Materials Division of the County of San Bernardino 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 Business Plan to the CPM for approval.

HAZ-3 The project owner shall develop and implement a Safety Management Plan for delivery 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 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-5 The project owner shall prepare a site-specific Security Plan for the operational phase and shall be made available to the CPM for review and approval. The project owner shall implement site security measures addressing 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 around the Power Block and Solar Field;

2. Main entrance security gate, either hand operable or motorized;

3. Evacuation procedures;

4. Protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency;

5. Written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on-site or off-site;

6. a. A statement (refer to sample, attachment “A”) signed by the project owner certifying that background investigations have been conducted on all project personnel. Background investigations shall be restricted to ascertain the accuracy of employee identity and employment history, and shall be conducted in accordance with state and federal law 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 contractor personnel that visit the project site.

7. Site access controls for employees, contractors, vendors, and visitors;

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) capable of viewing, at a minimum, the main entrance gate; and

9. Additional measures to ensure adequate perimeter security consisting of either:

   a. Security guard present 24 hours per day, seven days per week, **OR**

   b. Power plant personnel on-site 24 hours per day, seven days per week and **all** of the following:

      1) The CCTV monitoring system required in number 8 above shall include cameras that are able to pan, tilt, and zoom (PTZ), have

low-light capability, are recordable, and are able to view 100% of the perimeter fence, the outside entrance to the control room, and the front gate from a monitor in the power plant control room; **AND**

2) Perimeter breach detectors **or** on-site motion detectors.

The project owner shall fully implement the security plans and obtain CPM approval of any substantive modifications to the security plans. The CPM may authorize modifications to these measures, or may require additional measures, such as protective barriers for critical power pant components (e.g., transformers, gas lines, compressors, etc.) depending on 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 appropriate law enforcement agencies and the applicant.

Verification: At least 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 updated certification statements are appended to the Operations Security Plan. In the Annual Compliance Report, the project owner shall include a statement that the Operations Security Plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.

SAMPLE CERTIFICATION (Attachment "A")

Affidavit of Compliance for Project Owners

I, _____
(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

_____
(Company Name)

for employment at

_____
(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

_____
(Signature of Officer or Agent)

Dated this _____ day of _____, 20 _____.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

SAMPLE CERTIFICATION (Attachment "B")

Affidavit of Compliance for Contractors

I, _____
(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

_____
(Company Name)

for contract work at

_____
(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

_____
(Signature of Officer or Agent)

Dated this _____ day of _____, 20 _____.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

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Hazardous Materials
Appendix A

Hazardous Materials Proposed for Use At the ISEGS Power Project

August 2007

Hazardous Materials Appendix A

Hazardous Materials Proposed for Use at ISEGS

Trade Name	Chemical Name	CAS Number	Application	Maximum Quantity Onsite
Antiscalant (Permatreat PC-391)	Not Available	None	Antiscalant for boiler and steam turbine	70 gal
Cleaning chemicals/detergents	Various	None	Periodic cleaning of steam turbine	100 gal
Diesel No. 2	Oil	None	Fuel for fire pump engine/generators	9,000 gal
Hydraulic oil	Oil	None	High-pressure turbine starting system, turbine control valve actuators	500 gal
Lubrication oil	Oil	None	Lubricate rotating equipment (e.g., steam turbine bearings)	30,000 gal
Mineral insulating oil	Oil	8012-95-1	Transformers/switchyard	105,000 gal
Oxygen scavenger (Cortrol OS5607)	Carbonic Dyhdrazide	497-18-7	Oxygen scavenger for boiler cleaning solution and steam-water cycle	170 gal
Phosphate Treatment (Optisperse HP3100)	Sodium Hydroxide	1310-73-2	Phosphate treatment for boiler internal treatment	62 gal
Sodium Hydroxide Solution	Sodium hydroxide (30%)	1310-73-2	pH Control	170 gal
Steam Condensate Treatment (Steamate NA1321)	Ammonium Hydroxide	1336-21-6	Condensate and feedwater pH control	300 gal
Sulfuric Acid	Sulfuric acid (20%)	7664-93-9	pH control	670 gal
Lead Acid Batteries (Sulfuric Acid and Lead) size of batteries approx 10cm x 5cm x 7cm	Sulfuric acid (10%-30%) Lead (45-60%)	7664-93-9 7439-92-1	Electrical power	272,000 batteries
Sulfur hexafluoride	Sulfur hexafluoride	2551-62-4	Switchyard/switchgear devices	200 lb

a. Source: BSE2007a, Tables 5.5-3, 5.5-4

LAND USE

Amanda Stennick

SUMMARY OF CONCLUSIONS

Land use staff has reviewed the proposed project in light of the California Environmental Quality Act (CEQA) Guidelines' and the National Environmental Policy Act's (NEPA) criteria for a significant land use impact. The criteria include an assessment of whether a proposed project will conflict with any applicable land use plan. The key land use plans affecting this project are the U.S. Bureau of Land Management's (BLM) California Desert Conservation Area (CDCA) Plan of 1980, as amended, and the Northern and Eastern Mojave Desert Management Plan (NEMO), which amends the CDCA for those areas identified as the northern and eastern Mojave Desert. These plans require that potentially significant impacts in various environmental resource areas be addressed and mitigated. The existing BLM CDCA Plan does not allow the construction of new power plant projects within Multiple Use Class L (Limited Use). BLM would have to amend the CDCA plan prior to approving any right-of-way grant for a solar power project on public land. The amendment decision would be part of the BLM Record of Decision for the issuance of a right-of-way grant and would occur after the Final Environmental Impact Statement.

Impacts of the Ivanpah Solar Electric Generating System project would combine with impacts of present and reasonably foreseeable projects to result in a significant contribution to local cumulative impacts related to land use. When combined with impacts of the future solar and wind development projects that are currently proposed on over one million acres of land within southeastern California, southern Nevada, and western Arizona, regional impacts of the ISEGS project to land use would be cumulatively considerable and unavoidable.

INTRODUCTION

The land use analysis of the Ivanpah Solar Electric Generating System (ISEGS) Application for Certification (07-AFC-5) focuses on the project's consistency with the land use laws, ordinances, regulations standards, plans and policies, and the project's compatibility with existing and planned land uses. In general, a power plant and its related facilities have the potential to create land use impacts if they create unmitigated noise, dust, public health hazard or nuisance, traffic, or visual impacts. These individual resource areas are discussed in separate sections of this document. A power plant would also create a significant impact if it converts prime or unique farmland or farmland of statewide importance to non-agricultural uses. Because the power plant site and associated linear project features are located on public land managed by the Bureau of Land Management (BLM) the project will require federal environmental review before BLM can issue a right-of-way grant allowing the use of public land.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following table contains all applicable land use laws, ordinances, regulations, and standards.

LAND USE Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal Bureau of Land Management	California Desert Conservation Area (CDCA) Plan Northern and Eastern Mojave (NEMO) Desert Management Plan Code of Federal Regulations Title 40; § 1508.27 Code of Federal Regulations Title 43; §1610.5-3, 2800 Federal Land Policy and Management Act (1976) California Desert Protection Act (1994)
State	There are no state land use LORS for this project
Local	San Bernardino County General Plan San Bernardino County 2007 Development Code

SETTING

The Ivanpah Valley area has approximately 37,280 acres of land bounded by the Mojave National Preserve at Nipton Road on the south and southwest, a power line road parallel to and south of Interstate 15 (I-15) across Ivanpah Dry Lake on the northwest and north, and the Nevada border on the east. It is also adjacent to the Stateline and Mesquite Wilderness Areas. The easternmost portion of the valley includes extensive private land, and is undergoing substantial development at the Nevada border. This development includes casinos and associated hotels, restaurants, a golf course and other tourist attractions. Future development in the area would include solar facilities and a commercial service airport (Ivanpah Airport) north of Primm, Nevada.

The proposed ISEGS project would be located in the Mojave Desert, in San Bernardino County, 3.1 miles west of the California/Nevada border on public land managed by the BLM. The project would be west of Ivanpah Dry Lake, north of I-15.

The project would be located entirely on public land and would be under federal jurisdiction. There are no schools, day-care facilities, convalescent centers, or hospitals within the immediate vicinity of the project study area. The town of Primm, Nevada (population 436), is located about 4.5 miles northeast of the project site. Edwards Air Force Base is located 145 miles west-southwest of the site.

Interstate 15 provides access from southern California to Nevada. I-15 is located to the east of the project area and crosses into Nevada approximately 4 miles northeast of the project site. State Route (SR) 164 intersects I-15 just south of the project area. The I-15 Yates Well Road northbound and southbound off-ramps are the exits for access to the project site. Access to the site is provided by Colosseum Road, an existing road that is paved to the Primm Valley Golf Club, but unpaved the remainder of its length. Primm Valley Golf Club is located about 0.5 mile east of the Ivanpah 1 site boundary. The golf

course is affiliated with the Primm Valley Casino Resorts located in Las Vegas, Nevada and is a public course.

The Ivanpah Dry Lake is located approximately 1.6 miles east of the project site and covers approximately 35 square miles. This area is open to non-motorized vehicles and is a popular destination for recreational activities such as land sailing, archery, and kite demonstrations. The NEMO plan area is also a popular area that provides diverse recreational and scenic opportunities for off-highway vehicle use. To determine the proposed project's consistency with the NEMO plan, potential impacts to **Recreation Resources** will be analyzed in the Final Staff Assessment/Draft Environmental Impact Statement.

The applicant proposes to develop the ISEGS project in three phases that are designed to generate a total of 400 megawatts (MW) of electricity. The first two phases of the project, Ivanpah 1 and 2 are designed to provide 100 MW of electricity and the third phase, Ivanpah 3, is designed to provide 200 MW of electricity. The 100 MW phases, Ivanpah 1 and 2, would each occupy approximately 914 acres and 921 acres respectively; the 200 MW phase, Ivanpah 3, would require occupy approximately 1,843 acres. All three phases would be developed on contiguous property, sharing an administration building, an operation and maintenance building and a substation. An additional 66 acres would be used for the administration building/warehouse, a substation, two groundwater wells, and detention ponds that would be located between Ivanpah 1 and 2. An additional area of approximately 234 acres is needed under a temporary basis for construction staging activities. ISEGS total project footprint amounts to approximately 4,065 acres (approximately 6.4 square miles).

Ivanpah 1 would initially be interconnected to an existing SCE 115kV transmission line. Ivanpah 2 and 3 would be interconnected to the SCE grid through upgrades to SCE's 115-kilovolt (kV) line passing through the site on a northeast/southwest right-of-way. These upgrades would include replacement of the existing 115kV line with a double circuit 220kV transmission line and construction of a new 220/115-kV breaker-and-a-half substation between the Ivanpah 1 and 2 project sites. The new substation and the 220-kV upgrades would benefit Ivanpah and other proposed interconnection customers in the region. The upgrade transmission line is being addressed in a separate analysis by the California Public Utilities Commission and BLM.

The applicant has defined the study area as the area within 1 mile of the project site boundary and within 0.25 mile of the centerline of proposed linear facilities. All project phases, the substation, the administration/warehouse building, and the linear facilities are within the site boundary (minor exceptions are noted below). Please refer to the **Project Description** section of this document for further discussion of this topic. Aspects of the ISEGS include the following.

- Transmission lines from the power block to the switchyard (a portion of which are outside the site boundaries).
- A new SCE 115/220-kV substation to be located between Ivanpah 1 and Ivanpah 2.
- A small segment of water line that goes from the two wells to the east of Ivanpah 2 into the site.

- An administration and maintenance complex located near the entrance to the Ivanpah 1 plant.
- A new 5.3-mile-long, 4- to 6-inch natural gas distribution pipeline that provides natural gas from the Kern River Gas Transmission (KRGT) line to each of the project sites. Most of this gas pipeline is within the developed area; with only 0.5 mile extending beyond Ivanpah 3 to the KRGT line on the north
- Shared access roads, including a portion of the perimeter road on the southern and western edge of Ivanpah 2.
- Temporary construction and laydown yard areas.

Land Use Table 2 gives the land use and general plan designations for each project component.

LAND USE Table 2
Existing Land Uses and General Plan Designations

Project Component	Existing Land Uses	Land Management or General Plan Land Use and Zoning Designations
Site Vicinity	SCE 115kV transmission line is located adjacent to the site boundary in a southwest to northeast orientation. The Kern River Gas Transmission Company line is located less than a half mile from the Ivanpah 3 boundary. Both utilities are within designated Utility Corridors for major utilities.	**BLM** Multiple-Use Class L Limited Use Designated Utility corridor **San Bernardino County General Plan and Development Code Land Use Zones** Resource Conservation (RC)
ISEGS Site	The project site is mostly undeveloped, vacant land. Existing transmission lines cross the project site in a southwest to northeast orientation between Ivanpah 1 and Ivanpah 2. Colosseum Road passes through the southeast portion of Ivanpah 2 and travels in a west to southwesterly direction. Unpaved dirt roads also cross the project site, some of which are located adjacent to the transmission lines. No additional development is present on the site.	**BLM** Multiple-Use Class L Limited Use Designated Utility corridor **San Bernardino County General Plan and Development Code Land Use Districts** Resource Management District and Resource Conservation (RC)
Gas Line	Onsite and offsite gas lines are located on structurally undeveloped land. The Ivanpah 1 gas line would cross under existing transmission lines. The gas lines would cross an existing unpaved	**BLM** Multiple-Use Class L Limited Use **San Bernardino County General Plan and Development Code Land Use Districts**

	road.	Resource Management District and Resource Conservation (RC)
Transmission Lines	Onsite and offsite transmission lines would be located for the most part within the site boundary, those linears that extend outside of the site boundary are located within existing rights-of-way.	**BLM** Multiple-Use Class L Limited Use **San Bernardino County–General Plan and Development Code Land Use Districts** Resource Management District and Resource Conservation (RC)
Source: Ivanpah AFC		

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Federal/NEPA

Under federal law, BLM is responsible for processing requests for rights-of-way to authorize the projects and associated transmission lines and other appurtenant facilities to be constructed and operated on land it manages. In processing the applications, BLM must comply with NEPA and with Title 40, Code of Federal Regulations (CFR), § 1508.27, which requires that potential impacts be evaluated for significance, as defined and used in NEPA with consideration given to both context and intensity. BLM must also comply with 43 CFR §1610.5 Resource Management Plan that requires the proposed project to conform to an approved plan, which in this case is the CDCA and the NEMO. BLM right-of-way regulations that govern the issuance of right-of-way grants are found at 43 CFR 2800. The existing BLM CDCA Plan does not allow the construction of new power plant projects within multiple use class L limited areas. BLM would have to amend the CDCA plan prior to approving any right-of-way grant for a solar power project on public land.

State/CEQA

Significance criteria used in this document are based on the CEQA Guidelines and performance standards or thresholds identified by the Energy Commission staff, based on applicable LORS and utilized by other governmental regulatory agencies. An impact may be considered significant if the project results in:

- Conversion of Farmland.
  - Converts Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency and the USDA Natural Resources Conservation Service Web Soil Survey, to non-agricultural uses.
  - Conflicts with existing zoning for agricultural use, or a Williamson Act Contract.
  - Involves other changes in the existing environment which, due to their location or nature could result in conversion of farmland to nonagricultural use.

- Physical disruption or division of an established community.
- Conflict with any applicable habitat conservation plan or natural community conservation plan.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction, or that would normally have jurisdiction over the project. This includes, but is not limited to, a General Plan, community or specific plan, local coastal program, airport land use compatibility plan, or zoning ordinance.
- Individual environmental effects which, when considered with other impacts from the same project or in conjunction with impacts from other closely related past, present, and reasonably foreseeable future projects, are considerable or compound or increase other environmental impacts.

A power plant and its related facilities may also be incompatible with existing or planned land uses, resulting in potentially significant impacts if they create unmitigated noise, dust, public health or safety hazard or nuisance; result in adverse traffic or visual impacts; or preclude, interfere with, or unduly restrict existing or future uses.

DIRECT/INDIRECT IMPACTS AND MITIGATION

The project's determination of consistency with applicable land use LORS is provided in **Land Use Table 3**.

U.S. Bureau of Land Management

In accordance with 43 CFR §1610.5-3, all actions on public lands must be in conformance with applicable BLM land use plans. Any proposals or actions determined not to be in conformance with these plans would require the analysis of a land use plan amendment. The CDCA Plan states, "Sites associated with power generation or transmission not identified in the Plan will be considered through the Plan Amendment process. Because the existing BLM CDCA Plan does not allow construction of new power plant projects within multiple use class L limited areas, BLM would have to amend the CDCA plan prior to approving any right-of-way grant for a solar power project on public land. The amendment decision would be part of the BLM Record of Decision for the issuance of a right-of-way grant and would occur after the Final Environmental Impact Statement.

In addition, to protect the public interest, BLM must optimize the use of the utility corridor to best accommodate multiple existing and future projects, minimize adverse environmental impacts, and minimize duplication or proliferation of similar facilities. BLM's requirement for minimizing transmission line duplication or proliferation is consistent with the Energy Commission's mandated transmission planning/siting principles. These principles are stated in Transmission System and Right of Way Planning for the 1990s and Beyond (California Energy Commission, March 1992 Pursuant to Senate Bill 2431).

1. The use of existing right of way should be encouraged by upgrading existing transmission facilities where technically and economically feasible.

2. Expansion of existing right of way should be encouraged whenever construction of new transmission lines is required.

3. New right of way should be created when justified by environmental, technical, or economic reasons, as determined by the appropriate licensing agency.

4. Agreement among all interested utilities should be sought on efficient use of new transmission capacity whenever there is need to construct such capacity.

Chapter 3 of the CDCA (Energy Production and Utility Corridors Element) includes criteria used to determine decisions affecting the planning of land use corridors. Applicable decision criteria are as follows:

1. Minimize the number of separate right-of-way by utilizing existing rights-of-way as a basis for planning corridors; and

2. Encourage joint use of corridors for transmission lines, canals, pipelines, and cables.

Conversion of Farmland

Based on the applicant's review of aerial photographs and field surveys and staff's independent review, there are no agricultural uses or properties within one mile of the proposed project site that are identified as Unique Farmland, or Farmland of Statewide Importance; there are no lands mapped as Important Farmlands, as defined for the Farmland Mapping and Monitoring Program (California Department of Conservation, 2004). No land within one mile of the proposed project site is subject to the restrictions of a Williamson Act contract.

Neither the construction nor operation of the proposed project would result in any impacts to existing agricultural operations or foreseeable future agricultural use. Therefore, the proposed project would not result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to a non-agricultural use or conflict with existing agricultural zoning or Williamson Act contracts. The project would have no impact with respect to farmland conversion. The project study area is part of the existing BLM Clark Mountain Allotment Grazing Lease. An analysis of **Livestock Grazing** will be included in the Final Staff Assessment/Draft Environmental Impact Statement.

Physical Division of an Existing Community

The project would not physically divide an established community because the power plant project site and linear features would be located on undeveloped public lands in unincorporated San Bernardino County and would not be located within or near an established community. Neither the size nor the nature of the project would result in a physical division or disruption of an established community, no new physical barriers would be created by the project.

As discussed in the applicant's response to data request 44, 18 vehicle trails run through the proposed project site and three would be impacted by the project. To allow continued use and access of these trails, the applicant has proposed (Figure DR44-1 and Table DR44-1) to reroute the three trails, including one trail that serves as an

access to a mining claim. A complete analysis of vehicle trails, potential impacts, and proposed mitigation will be provided in the **Recreation** section, which will be published at a later date.

Because the applicant has agreed to reroute three trails, staff concludes that the ISEGS would not create new physical barriers and would not block existing roadways or pathways.

Conflict with any Applicable Habitat or Natural Community Conservation Plan

The project site is in the general area addressed by the United States Fish and Wildlife Service (USFWS) Desert Tortoise Recovery Plan and Critical Habitat Designation. The recovery plan describes a strategy for recovery and delisting of the desert tortoise. Please refer to the **Biological Resources** section of this document for a thorough discussion of the project's potential impacts on biological resources and compliance with the Desert Tortoise Recovery Plan and Critical Habitat Designation.

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

The California Desert Conservation Area Plan

The California Desert Conservation Area (CDCA) was designated by Congress in 1976 through the Federal Land Policy and Management Act (FLPMA) and covers 25 million acres of land. For lands under the jurisdiction of the BLM, land use planning guidance for the area is found in the CDCA plan of 1980, as amended. FLPMA provided how the BLM should manage public lands, and recognized that the California desert is fragile, and contains historic, scenic, archaeological, environmental, biological, cultural, scientific, educational, recreational, and economic resources that are uniquely located adjacent to areas of large population in southern California and southern Nevada.

The ISEGS site is located within areas in the CDCA that are designated Multiple Use Class L (Limited Use). According to BLM's CDCA, MUC L protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated MUC L are managed to provide lower-intensity, carefully controlled multiple use of resources while ensuring that sensitive values (cultural, scenic, biological resource) are not significantly diminished. The CDCA plan identifies the following guidelines (permitted uses) for MUC L lands:

- Solar facilities may be allowed after NEPA requirements are met;
- Transmission Facilities - New and existing transmission facilities may be allowed only within designated utility corridors;
- Distribution Facilities - New distribution facilities may be allowed and will be placed underground where feasible except where this would have greater impacts than a surface facility and within existing rights-of-way where available;
- Communication Sites - New sites may be allowed and existing facilities may be maintained following guidelines;
- Fire Management - Fire suppression in accordance with fire management plans;

- Vegetation Harvesting – Removal of vegetation may be allowed by permit;
- Livestock Grazing – Livestock grazing is allowed;
- Mineral Exploration and Development – Exploration/development of leasable, locatable, and saleable minerals may be allowed;
- Motorized –Vehicle Access/Transportation – Motorized vehicle access and transportation, including railroads and airports, may be allowed; and
- Recreation – Low to moderate use recreational activities may be allowed.

The Energy Production and Utility Corridors Element of the CDCA plan focuses on consistency with the CDCA plan and includes the following criteria:

- designation of proposed planning corridors;
- protection of air quality;
- impact on adjacent wilderness and sensitive resources;
- visual quality;
- fuel sources and delivery systems;
- cooling-water source(s);
- waste disposal;
- seismic hazards; and
- regional equity.

The Energy Production and Utility Corridors Element of the CDCA Plan includes the full implementation of a network of planning corridors to meet the projected utility needs to the year 2000, the identification of environmental constraints and siting procedures, and the identification of potential sites for geothermal development, wind energy parks, and power plants. Sixteen planning corridors were identified in the CDCA Plan. They are intended to include new electrical transmission lines of 161 kV or above, all pipelines with diameters greater than 12 inches, cables for interstate communications, and major aqueducts or canals for inter-basin transfers of water. The corridors vary in width from two to five miles. Approximately 50 percent of the land area for Ivanpah 1, 2 and 3 and the administrative complex are located within existing two-mile wide Utility Corridors designated in the CDCA Plan. The ISEGS would make significant portions of those designated two-mile wide right-of-way corridors unavailable for future linear right-of-way projects because buried or overhead utilities could not be constructed across heliostat fields without removing heliostats.

As stated in the CDCA, all land use actions and resource management activities on public lands within a MUC must meet the guidelines given for that Class. MUC Guidelines for transmission facilities sited on MUC L state that new electric transmission facilities (towers and cables 161 kV or above) are allowed within designated utility corridors only; existing electric facilities within designated utility corridors may be maintained, upgraded, and improved in accordance with existing rights-of-way or by amendments to right-of-way grants.

As stated earlier, solar facilities may be allowed after NEPA requirements are met and BLM would have to issue a right-of-way grant to allow the proposed use on federally managed lands. However, development of the proposed project would preclude multiple uses on 4,065 acres of public land designated MUC L.

The project's compliance with the CDCA Plan is further addressed in the **Biological, Cultural, and Visual Resources** sections of this document. The **Recreation** and **Livestock Grazing** sections will be published in the FSA/DEIS.

Northern and Eastern Mojave Desert Management Plan

The Proposed Northern and Eastern Mojave (NEMO) Desert Management Plan (July 2002) amends the BLM CDCA plan for the area identified as the Northern and Eastern Mojave Desert. The ISEGS site is located in the southeastern portion of the NEMO Planning Area Boundary. The NEMO plan addresses threatened and endangered species conservation and recovery and adoption of public land health standards, evaluation of segments for eligibility in the National Wild and Scenic river system, and changes resulting from the California Desert Protection Act passed in 1994. The NEMO plan also designates routes of travel in Desert Wildlife Management Areas consistent with Federal regulations. The NEMO plan was prepared within the context of BLM's multiple use management mission through a coordinated process involving numerous local, state, and federal agencies and special interest groups.

The project's compliance with NEMO is addressed in the **Biological** and **Cultural Resources** sections of this document. The project's compliance with NEMO also will be addressed in the **Recreation** and **Livestock Grazing** sections, which will be published at a later date.

BLM Clark Mountain Allotment Grazing Lease

The ISEGS site is located within the existing BLM Clark Mountain Allotment Grazing Lease (Clark Mountain, allocation #09003). The ISEGS 7,040-acre BLM (11 square miles) study area boundary area is part of a larger 97,560-acre (150 square miles) grazing lease. The approximate 4,065-acre ISEGS site boundary is 6.4 square miles out of the 150-square-mile grazing lease equivalent to approximately 3.5 percent of the area of the grazing lease. This 10-year lease expires in 2012. The NEMO plan identifies the different grazing allotments. As part of the BLM grazing lease program, allotments are used to manage cattle grazing to ensure that there is adequate perennial forage while protecting environmental resources through the containment of cattle movement using fences and water developments.

Pursuant to 43 CFR 4100, Section 4110.4-2 (b) when public lands are disposed of or devoted to a public purpose that precludes livestock grazing, the permittee shall be given two years prior notification before their grazing permit or grazing lease may be canceled. It is also possible for the grazing lessee to waive notice. BLM may issue a decision with regard to cancelling a portion of the grazing preference as part of the ISEGS Record of Decision (Ivanpah 2008). The **Livestock Grazing** section will be published at a later date.

San Bernardino County

As a response to recent applications for energy facilities on land in San Bernardino County managed by the BLM, San Bernardino County and the BLM have entered into a Memorandum of Understanding (MOU) (BLM Agreement No. 08-223). The purpose of the MOU is to establish an efficient and cooperative process for conducting environmental reviews of proposed projects located on BLM lands situated in San Bernardino County. Under the terms of the MOU, the BLM acts as the NEPA lead agency and the county acts as the CEQA lead agency. In cases where a project is a thermal energy project (50 MW or greater) the Energy Commission acts as the CEQA lead agency and the county acts as a cooperating agency. Because of the NEPA and CEQA requirements for the ISEGS project, Energy Commission staff has included a review of the applicable San Bernardino County land use LORS.

The ISEGS project would be located within San Bernardino County's Desert Region of the General Plan. The Desert Planning Region includes a significant portion of the Mojave Desert and contains 93 percent of land in the county. The San Bernardino County General Plan identifies the community's land use, transportation, environmental, economic, and social goals and policies as they relate to land use and development, forms the basis for local government decision-making, provides residents with opportunities to participate in the planning and decision-making processes of their community, and informs residents, developers, decision-makers, and other cities and counties of the rules that guide development within the community.

San Bernardino County has incorporated a one map approach to the general plan land use designations and zoning districts that allows the use of a single map showing both general plan land use designations and zoning classifications and assures consistency between both. These combined classifications are referred to as Land Use Zoning Designations in the General Plan and Land Use Zoning Districts in the County Development Code. The San Bernardino Development Code implements the San Bernardino General Plan by classifying and regulating the uses of land and structures within unincorporated San Bernardino County, preserving and protecting the county's important agricultural, cultural, natural, open space and scenic resources, and protecting and promoting the public health, safety, and general welfare of residents and businesses in the county.

The Development Code provides standards and guidelines for the orderly growth and development of the county and its distinct communities, conserves and protects important agriculture, cultural, natural, open space and scenic resources, creates a comprehensive and stable pattern of land uses upon which to plan transportation, water supply, sewerage, energy, drainage/flood control and other public facilities and utilities, encourages appropriate uses of land to avoid undue concentration of population, and ensures compatibility between different types of development and land use. The Development Code identifies the ISEGS site as Resource Conservation (RC). Resource Conservation comprises the majority of the designated land uses in the county and covers over 1 million acres, or about 1,500 square miles of land. Most of the land within this designation is publicly owned (federal and state) and includes national parks, military bases, conservation areas, and lands owned by other federal and state agencies.

The RC land use zoning district provides sites for open space, and recreational, commercial and industrial activities including the following: residential uses, agricultural activities, mining, resource protection, offices, cemeteries, kennels, public safety, single-family homes on very large parcels, broadcasting facilities, electric power generation, transportation facilities, wind energy facilities, wireless communication facilities, similar and temporary structures, and special events. All of these uses are either allowed or subject to permit approval from the county. Prohibited uses in this district include: indoor commercial entertainment, golf courses, schools, except for trade schools, sports or entertainment assemblies, homeless shelters, bed and breakfast inns, and solid waste disposal facilities.

LAND USE Table 3
Applicable Federal and Local LORS Consistency

LORS	Goals/Objectives/Policy	Consistency Determination
California Desert Conservation Area Plan (CDCA)	The CDCA plan is the land use guide for management of public lands and resources within the CDCA. Public lands designated MUC L are managed to provide lower-intensity, carefully controlled multiple use of resources while ensuring that sensitive values (cultural, scenic, biological resource) are not significantly diminished.	**Undetermined**. Cultural and Biological Resources staff have not determined whether the project is consistent with the CDCA plan. Development of the project would preclude multiple uses on 4,065 acres of public land designated MUC L; BLM would have to amend the CDCA and issue a right-of-way grant to allow the use of federally managed land.
Northern and Eastern Desert Mohave Desert Management Plan (NEMO)	The NEMO provides a comprehensive framework for recovery of several threatened and endangered species in the CDCA planning area, resource management policies including provisions for new development and modifications to grazing leases, and designates routes of travel in Desert Wildlife Management Areas (DWMA) consistent with Federal regulations.	**Undetermined**. Cultural, Biological, and Recreation Resources staff have not determined whether the project is consistent with the NEMO plan. The NEMO did not designate ISEGS project lands or lands surrounding the project as critical habitat (e.g. DWMA) for any species. Development of the project would preclude multiple uses on 4,065 acres of public land designated MUC L; BLM would have to amend the CDCA and issue a right-of-way grant to allow the use of federally managed land.
San Bernardino County General Plan Conservation Element	GOAL CO-8: The County will minimize energy consumption and promote safe energy extraction, uses and systems to benefit local regional and global environmental goals. CO 8.1: Maximize the beneficial effects and minimize the adverse effects associated with the siting of major energy facilities. The County will site energy facilities equitably in order to minimize net energy use and consumption of natural resources, and avoid inappropriately burdening certain	**Consistent.** Development of the project would result in an alternative (solar) source of energy that would serve peak demand and thereby comply with these goals and policies. The project would help the state meet its goals for renewable electricity generation. **Consistent**. The project would avoid burdening communities and would reduce natural gas consumption through use of renewable power.

	communities. Energy planning should conserve energy and reduce peak load demands, reduce natural resource consumption, minimize environmental impacts, and treat local communities fairly in providing energy efficiency programs and locating energy facilities	
	CO 8.3: Assist in efforts to develop alternative energy technologies that have minimum adverse effect on the environment, and explore and promote newer opportunities for the use of alternative energy sources.	**Consistent**. The project would assist the county in promoting an alternative energy project.
	CO 9.2: The County will work with utilities and generators to maximize the benefits and minimize the impacts associated with siting major energy facilities. It will be the goal of the County to site generation facilities in proximity to end-users in order to minimize net energy use and natural resource consumption, and avoid inappropriately burdening certain communities.	**Consistent**. Development of the project would result in an alternative (solar) source of energy, located outside existing communities that would minimize the use of non-renewable natural resources.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

The following letters (Sierra Club's California/Nevada Regional Conservation Desert Committee January 7, 2007 letter; US Department of the Interior National Park Service's March 11, 2008 letter; and National Parks Conservation Association April 28, 2008 letter) were received in response to the Notice of Intent (NOI) to prepare an Environmental Impact Statement/Final Staff Assessment (EIS/FSA) for the ISEGS. Land Use staff have addressed the comments on land use in the **Cumulative Impacts** section and the **Land Use LORS Table 3**.

CUMULATIVE IMPACTS

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).
There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the maps and tables in the **Cumulative Impacts** section of this document.

- Cumulative Impacts Figure 1, Regional Renewable Applications

- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the California Desert District
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts related to land use could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts would occur locally if ISEGS project impacts combined with impacts of projects located within the Ivanpah Valley. Cumulative impacts could also occur as a result of development of some of the many proposed solar and wind development projects that have been or are expected to be under consideration by the BLM and the Energy Commission in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona. Local cumulative impacts would occur if ISEGS project impacts combined with impacts of projects located within the Ivanpah Valley. Due to the extent of other projects in this area, there exists the potential for local cumulative impacts. The Ivanpah region itself is currently experiencing rapid development, both in California and in Nevada, which will likely result in new residential, commercial, and industrial land uses (see **Cumulative Impacts Figure 3** and **Table 2** (existing and future foreseeable projects). New development affects existing land uses (i.e., open space, recreation, low-density uses) within the project vicinity.

Regional cumulative impacts could occur as a result of implementation of the ISEGS project in conjunction with future solar and wind development projects that are currently proposed on over one million acres of the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona. Therefore, cumulative impacts are also evaluated for the desert areas of southeastern California, southern Nevada, and western Arizona, as shown on Cumulative Impacts Figure 1 (Regional Renewable Applications).

Cumulative Impact Analysis

Local Projects

The ISEGS project would not physically divide an established community or contribute to the cumulative division of a community. ISEGS would be located within the BLM Utility Corridor BB. To protect the public interest, BLM must optimize the use of the utility corridor to best accommodate multiple existing and future projects, minimize adverse environmental impacts, and minimize duplication or proliferation of similar

facilities. BLM recognized the potential for construction of power plants in the area and therefore designated Corridor BB based on the potential need for significant bulk power transmission lines to import generation from Nevada and Arizona (CDCA). In granting a right-of-way, BLM must consider the principle of “limited use” in the management, use, development, and protection of public lands within the CDCA. The "California Desert Conservation Area Plan" defines the principle of "limited use" in terms of protecting sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

The ISEGS project would cross or be adjacent to other existing utilities and linear facilities. The establishment of the ISEGS project along with other future foreseeable projects such as the OptiSolar photovoltaic project could conflict with other uses in the designated Utility Corridor BB along the north side of the Interstate 15, adjacent to the California/Nevada border. However, BLM is responsible for ensuring that a newly proposed facility does not adversely affect the integrity or ability to operate existing facilities and other authorized lands uses on public lands. As such, potential cumulative impacts would be lessened using standard construction methods that BLM will include as part of its right-of-way grant.

Development of the ISEGS project would preclude and in some cases, unduly restrict existing and future uses such as livestock grazing, open space, mineral exploration, motorized vehicle access, and active and passive recreation on 4,065 acres of public land designated MUC L. Land use impacts of the ISEGS project, when combined with impacts of the OptiSolar photovoltaic project, the Southern Nevada Supplemental Airport and two proposed wind energy developments would result in significant unavoidable land use impacts within the Ivanpah Valley. Please refer to **Cumulative Impacts Tables 2** (Existing Development in the Ivanpah Valley) and **3** (Future Foreseeable Projects in the Ivanpah Valley Area) for a list of existing and future local projects.

Regional Projects

Although it is likely that not all of the future solar and wind development projects that are currently proposed on over one million acres in California, Nevada, and Arizona will be constructed, it is reasonable to assume that many of them will. Construction and operation of these projects would preclude the use of hundreds of thousands of acres of land throughout these areas from any other kind of use such as recreation, open space, wildlife habitat, and grazing on public land, and agriculture, or residential development on private land. Land use impacts of the ISEGS project, when combined with impacts of the future solar and wind development projects currently proposed within southeastern California, southern Nevada, and western Arizona would result in significant and unavoidable cumulative impacts.

Cumulative Impact Conclusion

Impacts of the ISEGS project would combine with impacts of past, present, and reasonably foreseeable projects to result in a significant contribution to local cumulative impacts related to land use. When combined with impacts of the future solar and wind

development projects that are currently proposed on over one million acres of land within southeastern California, southern Nevada, and western Arizona, regional impacts of the ISEGS project to land use would be cumulatively considerable and unavoidable.

COMPLIANCE WITH LORS

In accordance with Title 43, Code of Federal Regulations §1610.5-3, all actions on public lands must be in conformance with applicable BLM land use plans. Any proposals or actions determined not to be in conformance with these plans would require the analysis of a land use plan amendment. Because the existing BLM CDCA Plan does not allow the construction of new power plant projects within Multiple Use Class L (Limited Use), BLM would have to amend the CDCA plan prior to approving any right-of-way grant for a solar power project on public land. The amendment decision would be part of the BLM Record of Decision for the issuance of a right-of-way grant and would occur after the Final Environmental Impact Statement.

Recreational Resources section will be published at a later date and will discuss whether the project is consistent with the NEMO plan. Until all staff have concluded their analyses, land use staff cannot state that the proposed project is in conformance with the CDCA plan of 1980, as amended, the NEMO plan, or Title 43, Code of Federal Regulations §1610.5-3.

CONCLUSIONS

Staff cannot conclude that the proposed project is in conformance with the CDCA plan of 1980, as amended, the NEMO plan, or with Title 43, Code of Federal Regulations §1610.5-3. Staff also determines that the ISEGS project would contribute to local and regional significant and unavoidable cumulative land use impacts. Should the Energy Commission approve the project, staff proposes the following condition of certification.

PROPOSED CONDITIONS OF CERTIFICATION

LAND-1 The project owner shall obtain a right-of-way grant from the Bureau of Land Management (BLM).

Verification: At least 30 days prior to the start of construction, the project owner shall provide the CPM with proof of completion of the BLM right-of-way grant.

REFERENCES

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CH2ML2008d – CH2ML HILL/ J. Carrier (tn: 45321). Attachment DR 57-1, Preliminary Draft Drainage, Erosion, and Sediment Control Plan. Dated on 2/11/2008. Submitted to CEC / Docket Unit on 2/11/2008.

CH2ML2008e – CH2ML HILL/ J. Carrier (tn: 45322). Attachment DR 93-1B, Final Interconnection System Impact Study for DPT. Dated on 2/11/2008. Submitted to CEC / Docket Unit on 2/11/2008.

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CH2ML2008g – CH2ML HILL/ J. Carrier (tn: 46239). Data Responses Set 1D. Dated on 5/09/2008. Submitted to CEC / Docket Unit on 5/09/2008.

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ESH2007e – Elisson, Shneider & Harris LLP/ J. Harris (tn: 43912). Applicant's Response to Issues Identification Report. Dated on 12/31/2007. Submitted to CEC / Docket Unit on 12/31/2007.

ESH2008d – Elison, Shneider & Harris LLP / J. Harris (tn: 46408). Applicant's Status Report #2. Dated on 5/16/2008. Submitted to CEC / Docket Unit on 5/16/2008.

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NOISE AND VIBRATION

Steve Baker

SUMMARY OF CONCLUSIONS

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

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 at which it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts. In some cases, vibration may be produced as a result of power plant construction practices, such as blasting or pile driving. The groundborne energy of vibration has the potential to cause structural damage and annoyance.

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

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

NOISE Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal (OSHA): 29 U.S.C. § 651 et seq.	Protects workers from the effects of occupational noise exposure
State (Cal/OSHA): Cal. Code Regs., tit. 8, §§ 5095–5099	Protects workers from the effects of occupational noise exposure
Local San Bernardino County General Plan Noise Element	Establishes noise limits as specified in the Development Code (below)

Applicable Law	Description
San Bernardino County Development Code, Ch. 83.01	Establishes property line noise limits for various receiving uses. Exempts construction noise during certain hours. Establishes vibration limits.

FEDERAL

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

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

The only guidance available for evaluation of power plant vibration is guidelines published by the Federal Transit Administration (FTA) for assessing the impacts of groundborne vibration associated with construction of rail projects. These guidelines have been applied by other jurisdictions to assess groundborne vibration of other types of projects. The FTA-recommended vibration standards are expressed in terms of the "vibration level," which is calculated from the peak particle velocity measured from groundborne vibration. The FTA measure of the threshold of perception is 65 VdB,[1] 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 California Occupational Safety and Health Administration (Cal/OSHA) has promulgated Occupational Noise Exposure Regulations (Cal. Code Regs., tit. 8, §§ 5095–5099) that set employee noise exposure limits. These standards are equivalent to the federal OSHA standards (see the **Worker Safety and Fire Protection** section of this document, and **NOISE Appendix A, Table A4**).

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

LOCAL

San Bernardino County General Plan Noise Element

The San Bernardino County General Plan Noise Element establishes noise performance standards for stationary sources. These limits are those specified in the San Bernardino County Development Code (below).

San Bernardino County Development Code

Chapter 83.01 of the San Bernardino County Development Code sets noise performance standards for noise from stationary noise sources measured at the boundaries of noise-sensitive land uses. These limits are reproduced here as **NOISE Table 2**.

NOISE Table 2: Noise Standards for Stationary Noise Sources

Noise Level (dBA L_{eq})		
Receiving Land Use Category	7:00 a.m. to 10:00 p.m.	**10:00 p.m. to 7:00 a.m.**
Residential	55	45
Professional Services	55	55
Other Commercial	60	60
Industrial	70	70

Source: COSB 2007b, Ch. 83.01, Table 83-2

Construction noise is exempt from these limits between the hours of 7:00 a.m. and 7:00 p.m. except Sundays and federal holidays (COSB 2007b, § 83.01.080[g][3]).

Vibration is limited to that which cannot be felt without the aid of instruments at or beyond the lot line, and that which does not produce a particle velocity greater than or equal to 0.2 inches per second at the lot line (COSB 2007b, § 83.01.090[a]). Construction vibration is exempt from this limit between the hours of 7:00 a.m. and 7:00 p.m. except Sundays and federal holidays (COSB 2007b, § 83.01.090[c][2]).

Note that, since the project will be built on federally owned land, these San Bernardino County LORS do not apply. They are listed here solely as guidelines.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

California Environmental Quality Act

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

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

2. exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

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

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

The California Energy Commission (Energy Commission) staff, in applying item 3 above to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by 5 dBA or more at the nearest sensitive receptor, including those receptors that are considered minority population.

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

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

1. the resulting combined noise level;[2]

2. the duration and frequency of the noise;

3. the number of people affected;

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

5. public concern or controversy as demonstrated at workshops or hearings or by correspondence.

Noise due to construction activities is usually considered to be insignificant in terms of CEQA compliance if:

- the construction activity is temporary;
- use of heavy equipment and noisy activities is limited to daytime hours; and

[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.

- all industry-standard noise abatement measures are implemented for noise-producing equipment.

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

SETTING

The ISEGS would be constructed on 4,065 acres of federally owned land administered by the Bureau of Land Management in San Bernardino County. The site lies approximately 4.5 miles southwest of Primm, Nevada and 3.1 miles west of the Nevada border, in an area designated compatible with solar energy development in the California Desert Conservation Area Plan. The Primm Valley Golf Club lies approximately 0.5 mile northeast of the eastern boundary of Ivanpah 1. Construction would take place in three phases: 100-MW Ivanpah 1 and shared facilities for maintenance would occupy 914 acres of the southern portion of the site; 100-MW Ivanpah 2 would occupy another 921 acres north of Ivanpah 1; and 200-MW Ivanpah 3 would occupy 1,843 acres of the northern portion of the site. All three phases would share an administration building, an operation and maintenance building, substation, and detention ponds which would be located in between Ivanaph 1 and 2, requiring an additional area of approximately 66 acres. Another 316 acres is needed for construction staging activities. Established dirt roads account for an additional 5 acres. (BSE 2007a, AFC §§ 1.1, 1.2, 1.3, 1.5, 2.1, 2.2.1, 2.5.2, 5.6.3.1, 5.7.1; CH2ML2008g).

The project vicinity consists of BLM-managed open space (BSE 2007a, AFC § 5.7.4). The nearest human occupancy is the Primm Valley Golf Club.

Ambient Noise Monitoring

Ambient noise monitoring was not required for the ISEGS project, since Energy Commission regulations require such monitoring only when facilities where quiet is an important attribute of the environment would be impacted by the project (20 CCR, Chapter 5, Article 6, Appendix B, § [g][4][A]). The community of Primm, Nevada, 4.5 miles distant, is too far from ISEGS to be significantly impacted by project noise. The Primm Valley Golf Club golf course is considered a less noise-sensitive land use.

DIRECT IMPACTS AND MITIGATION

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

Construction Impacts and Mitigation

Construction noise is usually considered a temporary phenomenon. Construction of the ISEGS is expected to last a total of 48 months (BSE 2007a, AFC § 1.4). While this is considerably longer than is typical for a power plant, construction noise would not likely cause annoyance; see below.

Compliance with Laws, Ordinances, Regulations, and Standards

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 San Bernardino County Development Code exempts all construction noise from numerical noise limits between 7:00 a.m. and 7:00 p.m. Monday through Saturday (see **NOISE Table 2**, above). Even though this LORS does not apply to construction on federal land, the applicant commits to complying with this restriction (BSE 2007a, AFC § 5.7.7.3). Staff proposes Condition of Certification **NOISE-6**, below, to ensure that noisy construction would be limited to these hours.

CEQA Impacts

Power Plant Site

To evaluate construction noise impacts, staff typically compares the projected noise levels to the ambient. Since construction noise typically varies continually with time, it is most appropriately measured by, and compared to, the L_{eq} (energy average) metric. In the case of ISEGS, however, since the nearest potential sensitive noise receptors are so distant, such comparison is not required.

Construction noise may be expected to reach levels 34 dBA L_{eq} in Primm (BSE 2007a, Table 5.7-6). Such a noise level would generally be unnoticeable in a typical community environment and would represent an insignificant impact. Further, the projected levels are conservative, based on surveys of construction equipment taken 30 years ago. Modern construction equipment is quieter, so actual noise levels should be less than predicted. Since noisy construction work would be restricted to daytime hours, staff believes it would be unnoticeable in Primm.

Construction noise could reach levels of 50 dBA L_{eq} at the golf course (BSE 2007a, Table 5.7-6 and staff calculations). Such levels would not likely be annoying to golfers; therefore, no significant adverse impact would be expected.

In the event that actual construction noise should annoy anyone, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2**, which would establish a notification process to make people aware of the project, and a noise complaint process that would require the applicant to resolve any problems caused by noise from the project.

Linear Facilities

Linear facilities would include 5.3 miles of natural gas pipeline, a pipeline to supply well water, and electrical transmission lines interconnecting to the new Southern California Edison Ivanpah substation. With the exception of 0.5 mile of gas pipeline and 570 feet of water line, all linears would lie within the project site, so their construction noise impacts would be similar to those of the power plant itself (BSE 2007a, AFC §§ 1.2, 1.5, 2.1, 2.2.2, 2.2.6, 2.2.7, 4.1, 5.7.1). Limiting noisy construction to daytime hours should provide adequate mitigation of impacts. To ensure compliance with this restriction, staff proposes Condition of Certification **NOISE-6**, below.

Pile Driving

The applicant has not yet determined whether pile driving would be required, but predicts that the noise from pile driving could be expected to reach nearly 50 dBA at Primm, a distance of 4.5 miles (BSE 2007a, AFC Table 5.7-6). This level would likely not prove annoying during the daytime. Pile driving noise could also approach 58 dBA at the golf course. Again, this level would likely not prove annoying to golfers. To ensure that pile driving noise does not cause annoyance, staff proposed Condition of Certification **NOISE-6**, below, to limit pile driving to the hours between 7:00 a.m. and 7:00 p.m.

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, is 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 95 dBA at the Primm Valley Golf Course and roughly 76 dBA at Primm, Nevada. With a silencer installed on the steam blow piping, noise levels are commonly attenuated to 89 dBA at 50 feet; this would yield approximately 55 dBA at the golf course and 36 dBA at Primm.

No LORS would prohibit the noise from an unsilenced high pressure steam blow, but the San Bernardino County Development Code, were it applicable, would limit such noisy construction work to the hours between 7:00 a.m. and 7:00 p.m. This level of noise, however, would be extremely annoying at the golf course and would likely be extremely annoying in Primm. A silenced blow would not likely be annoying at the golf course and would likely be unnoticeable in Primm.

A newer, 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 or compressed air over a continuous period of approximately 36 hours. Resulting noise levels reach about 80 dBA at 100 feet; such a process would yield noise levels at the golf course of approximately 52 dBA and 33 dBA at Primm.

Nighttime noise from a low pressure continuous steam blow at Primm would not likely disturb people trying to sleep and would not constitute a significant impact. Nighttime noise at the golf course is irrelevant and thus could not cause a significant impact.

In order to ensure that steam blow noise would not produce significant adverse impacts, staff has proposed Condition of Certification **NOISE-7** below.

Vibration

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

Worker Effects

The applicant has acknowledged the need to protect construction workers from noise hazards and has recognized those applicable LORS that would protect construction workers (BSE 2007a, AFC § 5.7.5.2.1). To ensure that construction workers would, in fact, be adequately protected, staff has proposed Condition of Certification **NOISE-3**, below.

Operation Impacts and Mitigation

The primary noise sources of the ISEGS include the steam turbine generators, boiler feed pumps, transformers, the auxiliary boilers, and the air-cooled condenser fans (BSE 2007a, AFC Table 5.7-7). Staff compares the projected noise with applicable LORS. In addition, staff evaluates any increase in noise levels at sensitive receptors due to the project in order to identify any significant adverse impacts.

The applicant proposes to mitigate power plant noise by specifying and purchasing major plant equipment that conforms to OSHA guidelines. That is, noise levels from such equipment would not exceed 85 to 90 dBA at a distance of 3 feet in order to protect workers' hearing. With such mitigation, the applicant predicts that noise from the operating power plant would not exceed 30 dBA in Primm and 55 dBA at the golf course (BSE 2007a, AFC § 5.7.5.3.2; Table 5.7-7).

Compliance with LORS

Project operating noise in Primm is predicted not to exceed 30 dBA L_{eq}. This figure is considerably quieter than required by the San Bernardino County LORS, which would limit project noise in Primm to 55 dBA during the daytime and 45 dBA at night (see **NOISE Table 2**, above). Even though these limits do not apply since the project would be built on federally owned land, staff proposes Condition of Certification **NOISE-4**, below, to ensure compliance.

Plant operating noise is likewise predicted not to exceed 55 dBA at the golf course. As discussed above, no numerical LORS limits apply. Nevertheless, this noise level can be best compared to the San Bernardino County Development Code limit for "Other

Commercial" land uses, or 60 dBA day or night (see **NOISE Table 2**, above). Staff's proposed Condition of Certification **NOISE-4**, below, would ensure compliance.

CEQA Impacts

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

In many cases, a power plant is intended to operate around the clock for much of the year. The applicant explains, however, that the ISEGS would operate only during the daytime hours, typically 14 hours per day, when sufficient solar insolation is available (BSE 2007a, AFC §§ 1.2, 2.1, 2.2.2, 2.2.16, 5.7.5.3). Staff typically evaluates project noise emissions by comparing them to the nighttime ambient background level; this assumes the potential for annoyance due to power plant noise is greatest at night when residents are trying to sleep. Nighttime ambient noise levels are typically lower than the daytime levels; differences of 5 to 10 dBA are common. Staff believes it is prudent to average the lowest nighttime hourly background noise level values to arrive at a reasonable baseline for comparison with the project's predicted noise level.

As discussed above, since the ISEGS is not expected to impact any sensitive noise receptors, an ambient noise survey was neither required nor conducted. Therefore, the usual method of evaluating noise impacts must be modified. As discussed above, the project is expected to produce noise levels in Primm, the nearest sensitive noise receptor, of 30 dBA L_{eq}. This level is below what one would expect in any urban daytime environment, no matter how small the town (Primm's population is 436) (BSE 2007a, AFC § 5.7.4). Since the project would not operate at night, it could not produce noise impacts in Primm during the nighttime. To ensure this predicted noise level would not be exceeded, staff proposes Condition of Certification **NOISE-4**, below.

Tonal Noises

One possible source of annoyance would be strong tonal noises. Tonal noises are individual sounds (such as pure tones) that, while not louder than permissible levels, stand out in sound quality. The applicant plans to avoid the creation of annoying tonal (pure-tone) noises by balancing the noise emissions of various power plant features during plant design (BSE 2007a, AFC § 5.7.5.3.3). To ensure that tonal noises would not cause annoyance, staff proposes Condition of Certification **NOISE-4**, below.

Linear Facilities

All water and gas piping lie underground and would be silent during operation. Noise effects from the electrical interconnection line typically do not extend beyond the right-of-way easement of the line and would thus be inaudible to any receptors (BSE 2007a, AFC § 5.7.5.3.5).

Vibration

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

The operating components of the ISEGS plant would consist of high-speed steam turbine generators and various pumps and fans. All of these pieces of equipment must be carefully balanced in order to operate; permanent vibration sensors would be attached to the turbines and generators. Based on experience with numerous previous projects employing similar equipment, Energy Commission staff believes that groundborne vibration from the ISEGS would be undetectable by any likely receptor. Although the San Bernardino County Development Code's limit on vibration is not applicable to this project on federal land, the ISEGS would be in compliance.

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

Worker Effects

The applicant has acknowledged the need to protect plant operating and maintenance workers from noise hazards and has committed to comply with applicable LORS (BSE 2007a, AFC § 5.7.5.3.1). 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. To ensure that plant operation and maintenance workers would, in fact, be adequately protected, Energy Commission staff has proposed Condition of Certification **NOISE-5**, below.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code of Regulations, Title 14, section 15130). NEPA states that "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).

There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables which are contained in the **Cumulative Scenario** section of this document.

- Cumulative Impacts Figure 1, Regional Renewable Applications
- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD

- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts to noise could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts can occur if implementation of the ISEGS project could combine with those of other local or regional projects. Cumulative noise impacts could occur only locally because the ISEGS project impacts cannot combine with impacts of projects beyond this region. The geographic area impacted by cumulative noise impacts is generally limited to areas within approximately one-quarter mile of the ISEGS project. This area is appropriate because noise impacts would generally be localized, mainly within approximately 500 feet from any noise source; however it is possible that noise from different sources within one-quarter mile of each other could combine to create a significant impact to receptors at any point between the projects. At distances greater than one-quarter mile, steady construction noise from the project would generally dissipate into quiet background noise levels.

Cumulative Impact Analysis

Only one of the reasonably foreseeable projects identified in Table [_] and Figure [_] would be located near enough to the ISEGS project to pose a potential for cumulative noise impacts. The OptiSolar photovoltaic project is proposed to be located directly adjacent to the ISEGS site. The nearest sensitive receptor to the ISEGS project is the Primm Valley Golf Course, located approximately 0.5 mile northeast of the site, and one mile from the OptiSolar photovoltaic project. As discussed above, noise generated during construction of the ISEGS projects could reach levels of 50 to 55 dBA L_{eq} at the Primm Valley Golf Course, but such levels are not likely to be annoying to golfers. Noise from the OptiSolar photovoltaic project could combine with noise generated by the ISEGS project. Because doubling the distance from a noise source reduces the sound pressure level by 6 dB, noise from construction of the OptiSolar project would be expected to be roughly 6 dB quieter at the golf course than noise from ISEGS. Combined construction noise from the two projects would thus reach levels of 51 to 56 dB at the golf course, an unnoticeable increase over noise from one project alone. Noise impacts of the ISEGS project would thus not combine with impacts of past, present, and reasonably foreseeable projects to result in a significant contribution to local or regional cumulative impacts related to noise.

FACILITY CLOSURE

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

Since this noise would be similar to that caused by the original construction, it can be treated similarly. That is, noisy work could be performed during daytime hours, with machinery and equipment properly equipped with mufflers. Any noise LORS that were in existence at that time would apply. Applicable conditions of certification included in the Energy Commission decision would also apply unless modified.

CONCLUSIONS AND RECOMMENDATIONS

The ISEGS, if built and operated in conformance with the conditions of certification proposed below, would comply with all applicable noise and vibration LORS for both operation and construction and would produce no significant adverse noise impacts on people within the affected area, directly, indirectly, or cumulatively.

PROPOSED CONDITIONS OF CERTIFICATION

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

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

NOISE COMPLAINT PROCESS

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

- Use the Noise Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to the CPM, to document and respond to each noise complaint;
- Attempt to contact the person(s) making the noise complaint within 24 hours;
- Conduct an investigation to determine the source of noise related to the complaint;

- Take all feasible measures to reduce the noise at its source if the noise is project related; and
- Submit a report documenting the complaint and the actions taken. The report shall include: a complaint summary, including final results of noise reduction efforts, and if obtainable, a signed statement by the complainant stating that the noise problem is resolved to the complainant's satisfaction.

Verification: Within 5 days of receiving a noise complaint, the project owner shall file a copy of the Noise Complaint Resolution Form with the CPM, documenting the resolution of the complaint. If mitigation is required to resolve a complaint, and the complaint is not resolved within a 3-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is implemented.

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

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

NOISE RESTRICTIONS

NOISE-4 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that operation of the project will not cause noise complaints from residents of Primm, Nevada, or from the operator of the Primm Valley Golf Course. If project-related noise complaints are received from residents of Primm, the project owner shall perform a noise survey to demonstrate that noise levels due to plant operation do not exceed an average of 45 dBA L_{eq} measured at the nearest residence of the community of Primm, Nevada. If project-related noise complaints are received from the operator of the Primm Valley Golf Course, the project owner shall perform a noise survey to demonstrate that noise levels due to plant operation do not exceed an average of 55 dBA L_{eq} measured at the nearest boundary of the golf course. No new pure-tone components may 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. 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 location. The character of the plant noise shall be evaluated at the affected residential locations to determine the presence of pure tones or other dominant sources of plant noise.

Verification: The survey shall take place within 30 days of the receipt of the noise complaint. 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.

NOISE-5 Following each phase (Ivanpah 1, Ivanpah 2, and Ivanpah 3) of the project's first achieving a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct an occupational noise survey to identify the noise hazardous areas in the facility.

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

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

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

CONSTRUCTION TIME RESTRICTIONS

NOISE-6 Heavy equipment operation and noisy construction work relating to any project features shall be restricted to the times of day delineated below:

Weekdays and Saturdays	7:00 a.m. to 7:00 p.m.

No noisy construction work shall be performed on Sundays or federal holidays. Haul trucks and other engine-powered equipment shall be equipped with mufflers that meet all applicable regulations. 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 high-pressure steam blow is employed, the project owner shall equip steam blow piping with a temporary silencer that quiets the noise of steam blows to no greater than 89 dBA measured at a distance of 50 feet. The project owner shall conduct steam blows only during the hours of 7:00 a.m. to 7:00 p.m.

If a low-pressure continuous steam blow is employed, the project owner shall limit the noise of steam blows to no greater than 80 dBA measured at a distance of 100 feet.

Verification: At least 15 days prior to the first high pressure steam blow, the project owner shall submit to the CPM drawings or other information describing the temporary steam blow silencer and the noise levels expected and a description of the steam blow schedule.

At least 15 days prior to any low-pressure continuous steam blow, the project owner shall submit to the CPM drawings or other information describing the process, including the noise levels expected and the projected time schedule for execution of the process.

EXHIBIT 1 - NOISE COMPLAINT RESOLUTION FORM

Ivanpah Solar Electric Generating System
(07-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 3 feet from noise source _____ dBA Date: _____

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

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

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

Description of corrective measures taken:

Complainant's signature: _____ Date: _____

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

This information is certified to be correct:

Plant Manager's signature: _____

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

REFERENCES

BSE2007a – Bright Source Energy/ Solar Partners I, LLC/ J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Dated on 08/28/2007. Submitted to CEC/Docket Unit on 8/31/2007.

CH2ML2008g – CH2ML HILL/ J. Carrier (tn: 46239). Data Responses Set 1D. Dated on 5/09/2008. Submitted to CEC / Docket Unit on 5/09/2008.

COSB (County of San Bernardino). 2007a. County of San Bernardino General Plan, 2007.

COSB (County of San Bernardino). 2007b. County of San Bernardino Development Code, April 12, 2007.

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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, those higher levels nevertheless are considered to be levels of noise adverse to public health.

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

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

NOISE Table A1 Definition of Some Technical Terms Related to Noise	
Terms	**Definitions**
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this testimony are A-weighted.
L_{10}, L_{50}, & L_{90}	The A-weighted noise levels that are exceeded 10%, 50%, and 90% of the time, respectively, during the measurement period. L_{90} is generally taken as the background noise level.
Equivalent Noise Level, L_{eq}	The energy average A-weighted noise level during the noise level measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 4.8 decibels to levels in the evening from 7:00 p.m. to 10:00 p.m., and after addition of 10 decibels to sound levels in the night between 10:00 p.m. and 7:00 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 10:00 p.m. and 7:00 a.m.
Ambient Noise Level	The composite of noise from all sources, near and far. The normal or existing level of environmental noise at a given location.
Intrusive Noise	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Pure Tone	A pure tone is defined by the Model Community Noise Control Ordinance as existing if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or by 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.

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

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

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

Subjective Response to Noise

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

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

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

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

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

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

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

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

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

Combination of Sound Levels

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

NOISE Table A3
Addition of Decibel Values

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

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

Sound and Distance

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

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

Worker Protection

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

NOISE Table A4
OSHA Worker Noise Exposure Standards

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

Source: 29 CFR §1910.95.

PUBLIC HEALTH

Alvin J. Greenberg, Ph.D.

SUMMARY OF CONCLUSIONS

Staff has analyzed potential public health risks associated with construction and operation of the Ivanpah Solar Electric Generating System (ISEGS) project and does not expect 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 ISEGS uses a highly conservative 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 ISEGS would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area.

INTRODUCTION

The purpose of this Preliminary Staff Assessment (PSA) is to determine if emissions of toxic air contaminants (TACs) from the proposed ISEGS 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.

California Energy Commission (Energy Commission) staff addresses potential impacts of regulated or criteria air pollutants in the **Air Quality** section of this PSA, and 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. Pollutants released from the project in wastewater streams to the public sewer system are discussed in the **Soil and Water Resources** section. Plant releases in the form of hazardous and nonhazardous wastes are described in the **Waste Management** section.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

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

Applicable Law	Description
Federal	
Clean Air Act section 112 (Title 42, U.S. Code section 7412)	This act requires new sources that emit more than 10 tons per year of any specified Hazardous Air Pollutant (HAP) or more than 25 tons per year of any combination of HAPs to apply Maximum Achievable Control Technology.
State	
California Health and Safety Code section 25249.5 et seq.	These sections establish thresholds of exposure to carcinogenic substances above which Prop 65

(Proposition 65)	exposure warnings are required.
California Health and Safety Code section 41700	This section states that “no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property.”
California Public Resource Code section 25523(a); Title 20 California Code of Regulations (CCR) section 1752.5, 2300–2309 and Division 2 Chapter 5, Article 1, Appendix B, Part (1); California Clean Air Act, Health and Safety Code section 39650, et seq.	These regulations require a quantitative health risk assessment for new or modified sources, including power plants that emit one or more toxic air contaminants (TACs).
Local	
Mojave Desert Air Quality Management District Regulation XIII Rule 1320	This rule requires a review of new or modified projects that emit toxic air contaminants and the preparation of a health risk assessment. A permit would not be issued if the risk were greater than 10 in 1 million or if the hazard index were greater than 1.0. It also requires the use of best available control of toxics.

SETTING

This section describes the environment in the vicinity of the proposed project site from the public health perspective. Characteristics 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, affect public exposure to project emissions. Additional factors affecting potential public health impacts include existing air quality and environmental site contamination. The area surrounding the project is rural and sparsely populated, primarily dedicated to agricultural uses.

SITE AND VICINITY DESCRIPTION

Land in the vicinity of the proposed project is designated for Class L Limited Use and Class M Moderate Use, which include a variety of industrial uses as well as agricultural and recreational uses (BSE 2007a section 5.6.3.2 and Table 5.6-4). The natural gas pipeline proposed for construction for this project would be approximately 5.3 miles long, running from the Kern River Gas Transmission Company (KRGT) pipeline through

Ivanpah 3 and 2 and ending at Ivanpah 1 (BSE 2007a section 2.2.6). The nearest residence is located approximately 5 miles from the site in the community of Primm, Nevada. According to the Application for Certification (AFC), there are no sensitive receptors within 6 miles of the project site (BSE 2007 section 5.9.3). However, staff learned of a house trailer used as a residence that is located near the southeast quadrant of the Interstate 15/Yates Well Road interchange.

The ISEGS would have three stacks, one for each plant (Ivanpah 1, 2, and 3). The stack heights would be 39.62 meters (130 feet) (BSE 2007a Table 5.1D-2). The location of elevated terrain (above the stack height) is important in assessing potential exposure, as an emission plume may impact high elevations before impacting lower elevations. The site elevation ranges from 2,880 to 3,030 feet above sea level, and the topography in the immediate vicinity is generally flat. Terrain above stack height includes a volcanic rock structure rising to 3,160 feet above sea level approximately 0.8 miles east of the project site, and at 4 miles from the project site terrain in all directions (except southeast) rises to about 6,000 feet (BSE 2007a section 5.1.3.1).

METEOROLOGY

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

The Ivanpah Basin of the Mojave Desert is characterized by a desert climate. Summers are hot and dry and winters are moderate with an average annual rainfall of 2–5 inches. Winds generally flow west to east across the region (BSE 2007a section 5.1.3.2)

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. By examining average toxic concentration levels from representative air monitoring sites 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 is about 1 in 3, or 333,000 in 1 million.

There are no monitoring stations in the San Bernardino County; therefore staff was unable to determine background concentrations for the ISEGS site. The applicant noted that air quality data from the South Coast Air Basin (upwind from the project area)

between the years 1990 and 2005 show a steady reduction in TAC emissions (BSE 2007a section 5.9.3).

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 during the past few years in all areas of the state and the nation. For example, in the San Francisco Bay Area, cancer risk was 342 in 1 million based on 1992 data, 315 in 1 million based on 1994 data, and 303 in 1 million based on 1995 data. In 2002, the most recent year for which data is available, the average inhalation cancer risk decreased to 162 in 1 million (BAAQMD 2004b, p. 12).

EXISTING PUBLIC HEALTH CONCERNS

When evaluating a new project, staff conducts a detailed 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. Assessing existing health concerns in the project area will provide staff with a basis on which to evaluate the significance of any additional health impacts from the proposed ISEGS project and evaluate any proposed mitigation. No existing health issues have been reported within a 6-mile radius of the project.

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 ISEGS could emit to the environment;
- estimate worst-case concentrations of project emissions in the environment using dispersion modeling;
- estimate amounts of pollutants that people could be exposed to through inhalation, ingestion, and dermal contact; and

- characterize potential health risks by comparing worst-case exposure to safe standards based on known health effects.

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

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

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

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

The risk assessment process 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 percent to 100 percent of a lifetime, or from 8 to 70 years (OEHHA 2003, p. 6-5). Chronic health effects include diseases such as reduced lung function and heart disease.

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

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

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

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

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

Significance Criteria

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

As described earlier, noncriteria pollutants 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 noncancer health effects by calculating a *hazard index*. A hazard index is a ratio comparing exposure from facility emissions to the reference (safe) exposure level. A ratio of less than 1.0 signifies that the worst-case exposure is below the safe level. The hazard index for every toxic substance that has the same type of health effect is added to yield a Total Hazard Index. The Total Hazard Index is calculated separately for acute and chronic effects. A Total Hazard Index of less than 1.0 indicates that cumulative worst-case exposures are less than the reference exposure levels. Under these conditions, health protection from the project is likely to be achieved, even for sensitive members of the population. In such a case, staff presumes that there would be no significant noncancer project-related public health impacts.

Cancer Risk

Staff relied upon regulations implementing the provisions of Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986, (Health & Safety Code, §§25249.5 et seq.) for guidance to determine a cancer risk significance level. Title 22, California Code of Regulations section 12703(b) states that “the risk level which represents no significant risk shall be one which is calculated to result in one excess case of cancer in an exposed population of 100,000, assuming lifetime exposure.” This level of risk is equivalent to a cancer risk of 10 in 1 million, which is also written as 10×10^{-6}. An important distinction is that the Proposition 65 significance level applies separately to each cancer-causing substance, whereas staff determines significance based on the total risk from all cancer-causing chemicals. Thus, the manner in which the significance level is applied by staff is more conservative (health-protective) than that applied by Proposition 65. The significant risk level of 10 in 1 million is consistent with the level of significance adopted by many air districts. In general, these air districts would not approve a project with a cancer risk exceeding 10 in 1 million. The Mojave Desert Air Quality Management District (MDAQMD) also uses 10 in 1 million as the level of “Significant Health Risk” (MDAQMD 2006).

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

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, 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.

Site disturbances occur during 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. A Phase I Environmental Site Assessment conducted for this site in 2007 identified 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. In fact, the report concluded that the project site has never been used for commercial or industrial activities (BSE 2007a, Appendix 5.14A). In the event that any unexpected contamination is encountered during construction, proposed Conditions of Certification **Waste-1** and **Waste-2** (which require a registered professional engineer or geologist to be available during soil excavation and grading to ensure proper handling and disposal of contaminated soil) would ensure that contaminated soil does not affect the public. See the **Waste Management** section of this document for a more detailed analysis of this topic.

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 coughing, labored breathing, chest tightness, wheezing, and eye and nasal irritation. Long-term effects can include increased coughing, chronic bronchitis, reductions in lung function, and inflammation of the lung. Epidemiological studies also strongly suggest a causal relationship between occupational diesel exhaust exposure and lung cancer.

Based on a number of health effects studies, the Scientific Review Panel on Toxic Air Contaminants recommended a chronic reference exposure level (see discussion of reference exposure levels in Method of Analysis section above) for diesel exhaust particulate matter of 5 micrograms of diesel particulate matter per cubic meter of air ($\mu g/m^3$) and a cancer unit risk factor of $3x10^{-4}$ $(\mu g/m^3)^{-1}$ (SRP 1998, p. 6). The Scientific Review Panel did not recommend a value for an acute Reference Exposure Level 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 the panel's recommendations regarding health effect levels.

Construction of the three phases of ISEGS is anticipated to take place over a period of 48 months, with each phase taking about 24 months to complete and with 12 months of overlap between the construction of Ivanpah 1 and 2 and between the construction of Ivanpah 2 and 3 (BSE 2007a section 2.2.15). As noted earlier, assessment of chronic (long-term) health effects assumes continuous exposure to toxic substances over a significantly longer time period, typically from 8 to 70 years.

Appendix 5.1F of the AFC (BSE 2007a) presents diesel exhaust emission factors and daily emissions from construction equipment. The applicant estimated worst-case emissions of 267.38 pounds per day of particulate matter 10 (PM10) and 57.56 pounds per day of PM2.5 during construction. Modeling of construction activities including impacts of fugitive dust over a 12-month period (using ISCST3; Industrial Source Complex Short-term, version 3) resulted in a predicted annual average concentration of 0.7 $\mu g/m^3$ of PM10 and 0.2 $\mu g/m^3$ of PM2.5 at any location. Annual background concentrations of PM10 and PM2.5 measured in the vicinity of the ISEGS site are 25.4 $\mu g/m^3$ and 10.6 $\mu g/m^3$ respectively (BSE 2007a Table 5.1F-4). The maximum carcinogenic risk from exposure to diesel emissions during 32 months of construction (not including 15 months of vegetation removal and using average annual emissions estimated for the peak period of construction) was modeled using the ARB/OEHHA Hotspots Analysis and Reporting Program (HARP). The expected cancer risk calculated with the assumptions detailed in section F-5.4 of the AFC would be between 0.3 and 0.5 in 1 million in the immediate vicinity of the project site (BSE 2007a Appendix 5.1F). The applicant has stated that the estimated cancer risk is over-predicted due to the conservative nature of the model used.

The estimated maximum 24-hour emissions of PM10 exceed the federal Prevention of Significant Deterioration (PSD) level of significance. However, the applicant stated that background concentrations already exceed the PSD significance level and that these levels were established for emissions associated with a facility's routine operations and therefore are not appropriate for determining the significance of emissions over a short period of construction.

Mitigation measures are proposed by both the applicant and Energy Commission staff to reduce the maximum calculated PM10 emissions. These include the use of extensive fugitive dust control measures. The fugitive dust control measures are assumed to result in 90 percent reductions of emissions. The applicant has stated that the ISEGS project will incorporate all feasible mitigation measures to reduce PM10 (BSE 2007a section F-4.5.3 of Appendix 5.1F)

In order to further mitigate potential impacts from particulate emissions during the operation of diesel-powered construction equipment, Energy Commission 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 percent. Such filters will reduce diesel emissions during construction and reduce any potential for significant health impacts.

OPERATION IMPACTS AND MITIGATION

Emissions Sources

The emissions sources at the proposed ISEGS include three partial-load steam boilers, three emergency diesel fire pumps, and three emergency diesel generators (one per plant). As noted earlier, the first step in a health risk assessment is to identify potentially toxic compounds that may be emitted from the facility. Since the facility uses dry cooling, there are no emissions of metals or volatile organic compounds from cooling tower mist or drift. Also, there is no hazard posed by the potential presence of Legionella bacteria.

Tables 5.9-2, 5.1-B6, and 5.1-B7 of the AFC list noncriteria pollutants that may be emitted from ISEGS boilers as combustion byproducts, along with their anticipated amounts (emission factors). Toxic Air Contaminant emission factors were obtained from the Environmental Protection Agency (EPA) AP-42 database of emission factors. Table 5.9-3 of the AFC lists toxicity values used to characterize cancer and noncancer health impacts from project pollutants. The toxicity values include Reference Exposure Levels, which are used to calculate short-term and long-term noncancer health effects, and cancer unit risks, which are used to calculate the lifetime risk of developing cancer, as published in the OEHHA Guidelines (OEHHA 2003). **PUBLIC HEALTH Table 2** lists the toxic emissions potentially emitted by the ISEGS and shows how each contributes to the health risk analysis.

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)
Benzene			✔	✔	✔
Diesel Exhaust			✔	✔	
Ethylbenzene				✔	
Formaldehyde			✔	✔	✔
Hexane				✔	
Napthalene		✔	✔	✔	
Polynuclear Aromatic Hydrocarbons (PAHs)	✔	✔	✔	✔	
Toluene				✔	✔

Source: OEHHA 2003, Appendix L and BSE 2007a, Table 5.9-3

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. 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). Ambient concentrations were used in conjunction with Reference Exposure Levels and cancer unit risk factors to estimate health effects that 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 screening health risk assessment for the project including emissions from all sources resulted in a maximum acute Hazard Index (HI) of 0.013 and a maximum chronic HI of 0.00001 (BSE 2007a Table 5.9-4). As **PUBLIC HEALTH Table 3** shows, both acute and chronic hazard indices are less than 1.0, indicating that no short- or long-term adverse health effects are expected.

PUBLIC HEALTH Table 3
Operation Hazard/Risk at Point of Maximum Impact: Applicant Assessment

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
Acute Noncancer	0.013	1.0	No
Chronic Noncancer	0.00001	1.0	No
Individual Cancer	0.065 in a million	10.0 in a million	No

Source: BSE 2007a Table 5.1E-1
0.065×10^{-6} = 0.065 in 1 million

As shown in **PUBLIC HEALTH Table 3**, total worst-case individual cancer risk was calculated by the applicant to be 0.065 in 1 million at the location of maximum impact.

Staff conducted an independent analysis of cancer risks and acute and chronic hazards due to emissions from the three solar concentrating thermal power plants which make up the Ivanpah solar project (Ivanpah 1, 2, and 3). Each of the three thermal power plants includes three emitting units: a natural gas-fired boiler, a diesel fuel-fired emergency engine, and a diesel fuel-fired emergency firewater pump engine, for a total of nine emitting sources at the proposed facility.

Staff's quantitative analysis of facility operations included the following:

- emissions from the concurrent operation of all three natural gas boilers, the three emergency diesel generators, and from the three diesel fire pump engines.
- use of a coarse receptor grid of -6000 to 6000 meters east and -6000 to 6000 m north, at 500 meter increments.
- exposure pathways including inhalation, dermal absorption, soil ingestion, and mother's milk.

Atmospheric dispersion modeling was conducted using the ARB/OEHHA Hotspots Analysis and Reporting Program (HARP), Version 1.3. Staff was unable to incorporate the local meteorological data provided by the applicant and used the ARB-approved screening meteorology file that is included with the HARP model. This file includes a full range of meteorological conditions, including all stability classes and wind speeds, and provides a conservative analysis of potential impacts. Local topography and receptor and source elevations were included in this analysis by incorporating demographic files of the local area in the modeling. Site-specific and building-specific input parameters used in the HARP model were obtained from the AFC and modeling files provided by the applicant.

The emission factors used in staff's analysis of cancer risk and hazard were obtained from the AFC and are listed in **PUBLIC HEALTH Table 4**. Cancer risk was determined under the Derived(OEHHA) and Derived(Adjusted) risk assessment methods. The following receptor locations were quantitatively evaluated in staff's analysis:

- point of maximum impact (PMI), approximately 500 meters (1,640 feet) south of the southern boundary of Ivanpah 1 (70-year residential scenario)
- location of the nearest residence specified in the AFC, approximately 5.6 miles (9.1 km) northeast of the center of the project (70-year residential scenario)
- location of the nearest residence identified during a site visit by staff (at a mobile home located to the southeast of the intersection of Interstate 15 and Yates Well Road), approximately 3.1 miles (5.0 km) southeast of the center of the project (70-year residential scenario)
- clubhouse at Primm Valley Golf Club, approximately 2.5 miles (4.0 km) east of the center of the project (recreational scenario assuming exposure of 5 hours/day, 2 days/week, 52 weeks/year for 70 years)
- clubhouse at Primm Valley Golf Club (occupational scenario assuming exposure of 8 hours/day, 50 weeks/year for 35 years)

Results of staff's analysis are summarized in **PUBLIC HEALTH Table 5** and are compared to the results presented in the AFC. Substance-specific risks are presented in **PUBLIC HEALTH Table 6** for the point of maximum impact and in **PUBLIC HEALTH Table** 7 for the nearest residence.

PUBLIC HEALTH Table 4
Emission Factors Used in the Cancer Risk and Hazard Analyses

	Annual Average Emissions lbs/year			Maximum 1-Hour Emissions lbs/hour		
Substance	Boiler	Emergency Generator	Emergency Fire Pump	Boiler	Emergency Generator	Emergency Fire Pump
IVANPAH 1 & 2						
Hexane	4.73E+01			4.05E-01		
PAHs	2.63E-03			2.25E-05		
Toluene	8.96E-02			7.64E-04	9.67E-04	6.17E-05
Naphthalene	1.60E-02			1.37E-04		
Benzene	5.52E-02			4.72E-04	2.20E-03	1.40E-04
Formaldehyde	1.97E+00			1.69E-02	2.78E-03	1.78E-04
Xylene					6.72E-04	4.30E-05
Diesel PM		1.49E+01	2.38E+00			
Acrolein					2.18E-04	1.40E-05
1,3-Butadiene					9.20E-05	5.90E-06
IVANPAH 3						
Hexane	1.89E+02			8.10E-01		
PAHs	1.05E-02			4.50E-05		
Toluene	3.57E-01			1.53E-03	9.67E-04	6.17E-05
Naphthalene	6.41E-02			2.74E-04		
Benzene	2.21E-01			9.44E-04	2.20E-03	1.40E-04
Formaldehyde	7.85E+00			3.37E-02	2.78E-03	1.78E-04
Xylene					6.72E-04	4.30E-05
Diesel PM		1.49E+01	2.38E+00			
Acrolein					2.18E-04	1.40E-05
1,3-Butadiene					9.20E-05	5.90E-06

Source: AFC Table 5.1-B6

PUBLIC HEALTH Table 5

Results of Staff's Analysis and the Applicant's Analysis for Cancer Risk and Chronic Hazard

	Staff's Analysis			Applicant's Analysis		
Risk Methodology	Cancer Risk (per million)	Chronic HI	Acute HI	Cancer Risk (per million)	Chronic HI	Acute HI
PMI Derived(OEHHA)	2.9	0.0014	0.057	0.084	0.00001	0.013
Nearest residence[2] Derived(OEHHA)	0.16	0.000084	0.0025	-	-	-
Second nearest residence[3] Derived(OEHHA)	0.12	0.000066	0.0032	-	-	-
Clubhouse, recreational, Derived(OEHHA)	0.0089	-	-	-	-	-
Clubhouse, occupational	0.017	-	-	-	-	-

HI = Hazard Index

[2] Location of the nearest residence identified during a site visit by staff (at a trailer located to the southeast of the intersection of Interstate 15 and Yates Well Road), 70-year residential scenario.

[3] Location of the nearest residence specified in the AFC, 70-year residential scenario.

PUBLIC HEALTH Table 6
Results of Staff's Analysis: Contribution to Total Cancer Risk by Individual Substances at the Point of Maximum Impact (PMI)

IVANPAH 1

Substance	Boiler	Emerg. Gen.	Fire Pump
PAHs-w/o	5.2E-09		
Naphthalene	3.6E-11		
Benzene	1.0E-10		
Formaldehyde	7.8E-10		
DieselExhPM		2.4E-06	3.1E-07
TOTAL	6.1E-09	2.4E-06	3.1E-07

IVANPAH 2

Substance	Boiler	Emerg. Gen.	Fire Pump
PAHs-w/o	7.7E-10		
Naphthalene	5.3E-12		
Benzene	1.5E-11		
Formaldehyde	1.1E-10		
DieselExhPM		1.1E-07	1.7E-08
TOTAL	9.0E-10	1.1E-07	1.7E-08

IVANPAH 3

Substance	Boiler	Emerg. Gen.	Fire Pump
PAHs-w/o	1.4E-09		
Naphthalene	9.6E-12		
Benzene	2.7E-11		
Formaldehyde	2.1E-10		
DieselExhPM		3.4E-08	5.4E-09
TOTAL	1.6E-09	3.4E-08	5.4E-09

IVANPAH 1, 2 & 3

Substance	TOTAL DUE TO 3 SOURCES AT 3 UNITS
PAHs-w/o	7.3E-09
Naphthalene	5.1E-11
Benzene	1.5E-10
Formaldehyde	1.1E-09
DieselExhPM	2.9E-06
TOTAL	2.9E-06

PUBLIC HEALTH Table 7
Results of Staff's Analysis: Contribution to Total Cancer Risk by Individual Substances at Nearest Residence

IVANPAH 1

Substance	Boiler	Emerg. Gen.	Fire Pump
PAHs-w/o	6.1E-10		
Naphthalene	4.2E-12		
Benzene	1.2E-11		
Formaldehyde	9.1E-11		
DieselExhPM		9.0E-08	1.4E-08
TOTAL	7.2E-10	9.0E-08	1.4E-08

IVANPAH 2

Substance	Boiler	Emerg. Gen.	Fire Pump
PAHs-w/o	2.7E-10		
Naphthalene	1.8E-12		
Benzene	5.3E-12		
Formaldehyde	4.0E-11		
DieselExhPM		2.9E-08	4.3E-09
TOTAL	3.1E-10	2.9E-08	4.3E-09

IVANPAH 3

Substance	Boiler	Emerg. Gen.	Fire Pump
PAHs-w/o	7.7E-10		
Naphthalene	5.4E-12		
Benzene	1.5E-11		
Formaldehyde	1.2E-10		
DieselExhPM		1.4E-08	2.1E-09
TOTAL	9.1E-10	1.4E-08	2.1E-09

IVANPAH 1, 2 & 3

Substance	TOTAL DUE TO 3 SOURCES AT 3 UNITS
PAHs-w/o	1.7E-09
Naphthalene	1.1E-11
Benzene	3.3E-11
Formaldehyde	2.5E-10
DieselExhPM	1.5E-07
TOTAL	1.6E-07

ALTERNATIVES

Staff has reviewed two potential alternative sites from the perspective of public health impacts due to emissions of toxic air contaminants from all the sources identified above. The two alternative locations—Broadwell Dry Lake and an open area near the hamlet of Siberia—are in isolated desert areas with no known dense population centers or residences within miles of the alternative sites. These two alternatives are similar to the site chosen by the applicant. While the meteorological conditions and topography at the two alternative sites are not exactly the same as at the applicant's proposed site, they are similar enough so that staff is confident that the results of air dispersion modeling and a human health risk assessment for these two alternative sites would be similar to that found for the proposed site. Because the cancer risk and hazard indices are very much below the level of significance at the point of maximum impact, staff believes that regardless of the stretch of desert in which this solar generating facility is located, the project would not pose a significant risk to public health. Therefore, staff concludes that there is no preferable alternative location for public health.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130).

There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables. Which are contained in the **Cumulative Scenario** section of this document.

- Cumulative Impacts Figure 1, Regional Renewable Applications
- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts related to public health could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts can occur if implementation of the ISEGS project could combine with those of other local or regional projects. Cumulative impacts would occur locally if

ISEGS project impacts combined with impacts of projects located within the Ivanpah Valley. Cumulative impacts could also occur as a result of development of some of the many proposed solar and wind development projects that have been or are expected to be under consideration by the BLM and the Energy Commission in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

For purposes of the cumulative analysis, the emissions from construction or operation of the ISEGS project could potentially combine with emissions from past, present and reasonably foreseeable projects to result in adverse health effects to the public. Cumulative impacts to public health could occur as a result of implementation of the ISEGS project on both a local and regional level. The geographic extent for the analysis of local cumulative impacts associated with the ISEGS project includes the Mojave Desert Air Basin (MDAB) and the Ivanpah Valley Air Basin (IVAB). The shared nature of air resources warrants consideration of emissions occurring outside of the local air basin (MDAB).

Cumulative Impact Analysis

Cumulative impacts of the proposed project and other projects within a 6-mile radius were not evaluated in the AFC. The applicant has provided a protocol for conducting an air quality cumulative impact assessment and stated that this assessment will be completed and submitted to staff when information from the MDAQMD on planned facilities is received (BSE 2007a Appendix 5.1H). The applicant does not propose to conduct a separate cumulative assessment for toxic air contaminants.

Local Projects

The maximum cancer risk for emissions from ISEGS (calculated by staff) is 2.9 in one million located at an isolated area in the adjacent desert with no buildings or residences nearby. The maximum impact location occurs where pollutant concentrations from ISEGS with all combustion sources operating at the same time 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 the ISEGS to be either individually or cumulatively significant.

Regional Projects

The nature of public health impacts—acute or long term exposure of people 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, southern Nevada, and western Arizona, 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 acute or 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.

Cumulative Impact Conclusion

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

COMPLIANCE WITH LORS

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

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

RESPONSE TO AGENCY AND PUBLIC COMMENTS

None Received.

CONCLUSIONS

Staff has analyzed potential public health risks associated with construction and operation of the ISEGS 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 ISEGS uses a highly conservative 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 ISEGS would not contribute significantly or cumulatively to morbidity or mortality in any age or ethnic group residing in the project area.

PROPOSED CONDITIONS OF CERTIFICATION

None.

REFERENCES

BAAQMD (Bay Area Air Quality Management District). 2004b. Toxic Air Contaminant Control Program Annual Report 2002. Volume I. June.

BSE2007a – Bright Source Energy/ Solar Partners I, LLC/ J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Dated 8/28/2007. Submitted to CEC/Docket Unit on.

California Air Resources Board. 2002. California Air Quality Data, <http://www.arb.ca.gov/aqd/aqd.htm>.

CAPCOA (California Air Pollution Control Officers Association).1993. CAPCOA Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines. Prepared by the Toxics Committee. October.

MDAQMD (Mojave Desert Air Quality Management District). 2006. Rule 1320, New Source Review for Toxic Air Contaminants <http://www.mdaqmd.ca.gov/rules_plans/documents/1320_000.pdf>.

OEHHA (Office of Environmental Health Hazard Assessment). 2003. *Air Toxics Hot Spots Program Risk Assessment Guidelines*. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August.

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

SOCIOECONOMICS

Negar Vahidi and Scott Debauche

SUMMARY OF CONCLUSIONS

Staff concludes that the two 100-megawatt (MW) (nominal) solar electric generating plants, known as Ivanpah 1 and 2, and the one 200-MW (nominal) plant, known as Ivanpah 3, referred to collectively as the Ivanpah Solar Electric Generating System (ISEGS), would not result in significant adverse direct or indirect socioeconomics impacts. In addition, the ISEGS would not contribute to a cumulative socioeconomic impact on the area's population, employment, housing, police, schools, or hospitals because the proposed project's construction and operation workforce currently resides in the regional or local labor market area and construction would be short term. Gross public benefits from the proposed project include capital costs, construction and operation payroll, and property and sales taxes. Furthermore, the construction and operation of the proposed ISEGS would not result in any disproportionate impacts to low-income or minority populations.

INTRODUCTION

Staff's socioeconomics impact analysis evaluates project-induced changes on existing population and employment patterns, community services, and related community issues such as environmental justice. A discussion of the estimated beneficial economic impacts of the construction and operation of the proposed ISEGS and other related economic impacts are provided.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

SOCIOECONOMICS Table 1 contains all applicable socioeconomics laws, ordinances, regulations, and standards (LORS) applicable to the proposed ISEGS. The proposed project is subject to federal socioeconomics LORS (including the National Environmental Policy Act) because it would be located on federal lands administered by the United States Bureau of Land Management (BLM).

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

Applicable Law	**Description**
Federal	
Executive Order 12898 (*Federal Register*, Vol. 59, No. 32, February 11, 1994)	Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," focuses federal attention on the environment and human health conditions of minority communities and calls on agencies to achieve environmental justice as part of this mission. The order requires the U.S. Environmental Protection Agency (EPA) and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high

Applicable Law	Description
	and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.
National Environmental Policy Act (NEPA) 42 United States Code (USC) 4321 et seq.	Under NEPA, an environmental impact statement must discuss social and economic effects if they are related to the natural or physical effects and the definition of “effects” includes economic and social factors. Consequently, a federal environmental document must include an analysis of the proposed project's economic, social, and demographic effects related to effects on the natural or physical environment in the affected area, but does not allow for economic, social, and demographic effects to be analyzed in isolation from the physical environment.
State	
California Environmental Quality Act (CEQA) Title 14 of the California Code of Regulations, Chapter 3, Guidelines for Implementation of the California Environmental Quality Act, Article 9(a), section 15131	Socioeconomic impacts are limited to those that could be considered direct effects on the environment, such as changes to population and housing, and that are separate from strictly economic impacts, such as a loss of revenue.
California Education Code, section 17620	The governing board of any school district is authorized to levy a fee, charge, dedication, or other requirement for the purpose of funding the construction or reconstruction of school facilities.
California Government Code, sections 65996–65997	These sections include provisions for school district levies against development projects. As amended by Senate Bill 50 (Greene, Chapter 407, section 23, Statutes of 1998), these sections state that, except for fees established under Education Code 17620, state and local public agencies may not impose fees, charges, or other financial requirements to offset the cost of school facilities.
California Revenue and Taxation Code, sections 721–725: California Board of Equalization (BOE) – Property Tax Rule 905 (BOE authority to assess electrical generating facilities is found in Article XIII, section 19, of California's Constitution)	Property Tax Rule 905 states that “the Board shall annually assess every electric generation facility with generating capacity of 50 MW or more...” It also states that for purposes of this rule, “electric generation facility” does not include a qualifying small power production facility or qualifying cogeneration facility within the meaning of section 201 and section 210 of Title II of the Public Utility Regulatory Policies Act of 1978. According to this act, (16 USC, section 796 [17] [A]), a “small power production facility is defined as ’A facility which is eligible solar, wind, waste, or geothermal facility...[that] has a power production capacity, which together with any other facilities located at the same site, is

Applicable Law	Description
	not greater than 80 MW.'"
Local	
San Bernardino County General Plan	San Bernardino County General Plan's (2007) Economic Development Element calls for a vibrant and thriving local economy that spans a variety of industries, services, and other sectors while recognizing the distinctions between the growth stages of the Valley, Mountain, and Desert Planning Regions in encouraging industrial, office, and professional development and local-serving employment. The Economic Development Background report (2005) states that the Desert Planning Region (which includes the proposed ISEGS site) is just entering Stage 2 of the three-stage pattern of development. Stage 2 is where an area is capable of attracting blue collar and entry-level white collar workers and companies that take advantage of undeveloped industrial space.

SETTING

PROJECT LOCATION

The applicant is developing three solar energy plants to be located in the Ivanpah Basin of San Bernardino County, California, 4.5 miles southwest of Primm, Nevada just west of the Ivanpah Dry Lake and 0.5 miles west of the Primm Valley Golf Club. The applicant proposes to develop the ISEGS project in three phases which are designed to generate a total of 400 megawatts (MW) of electricity. The first two phases of the project (i.e., Ivanpah 1 and 2) are designed to provide 100 MW each of electricity and the third phase, Ivanpah 3, is designed to provide 200 MW of electricity. The 100 MW phases, Ivanpah 1 and 2, would each occupy approximately 914 acres and 921 acres respectively; the 200 MW phase, Ivanpah 3, would occupy approximately 1,843 acres. All three phases would be developed on contiguous property, sharing an administration building, an operation and maintenance building and a substation. In addition, the administration building/warehouse, a substation, and detention ponds would be located in between Ivanaph 1 and 2 requiring approximately 66 acres. An additional area of approximately 316 acres is needed for construction activities. Established dirt roads account for an additional 5 acres. ISEGS total project footprint amounts to approximately 4,065 acres (approximately 6.4 square miles).

Research shows that workers may commute as much as two hours each direction from their communities rather than relocate (EPRI 1982). Therefore, for purposes of this analysis, the socioeconomics study area is San Bernardino County in California and Clark County in Nevada. San Bernardino County is bordered on the north by Inyo County, on the south by Riverside County, on the west by Los Angeles, Kern, and Orange Counties; on the east by Clark County, Nevada, and also by portions of Mojave and La Paz Counties in Arizona. There are 24 incorporated cities in San Bernardino County, including Fontana, Ontario, Rancho Cucamonga, and San Bernardino. There are five incorporated cities in Clark County, Nevada, including Las Vegas.

DEMOGRAPHIC CHARACTERISTICS

Within the study area, San Bernardino County, California, and Clark County, Nevada, are considered areas that may be affected by potential population in-migration resulting from the proposed ISEGS. In order to characterize the population profile of the study area, current and forecasted population trends for the study area are summarized in **SOCIOECONOMICS Table 2**. Between the period of 2000 and 2010, the total population increase in San Bernardino County, California, is expected to be approximately 25 percent, while the population increase in Clark County, Nevada, within the same time period is expected to be approximately 64 percent.

SOCIOECONOMICS Table 2
Population Profile of the Study Area, Year 2000–2030

	Year			
Area	**2000 Population**	**2010 Projected Population**	**2020 Projected Population**	**2030 Projected Population**
San Bernardino County, CA	1,709,434	2,133,377	2,456,089	2,762,307
Clark County, NV	1,375,765	2,258,748	2,946,350	3,358,456

Source: US Census 2008; CDOF 2008a; Clark County 2008a.

DEMOGRAPHIC SCREENING

Staff's demographic screening is designed to determine the existence of a minority or below-poverty-level population or both within a six-mile area of the proposed project site.

The demographic screening process is conducted based on information contained in two documents: *Environmental Justice: Guidance Under the National Environmental Policy Act* (Council on Environmental Quality, 1997) and *Final Guidance for Incorporating Environmental Justice Concerns in EPA's in NEPA's Compliance Analyses National* (Council on Environmental Quality, 1998). The screening process relies on Year 2000 U.S. Census data to determine levels of minority and below-poverty-level populations.

Minority Population

According to *Environmental Justice: Guidance Under the National Environmental Policy Act*, minority individuals are defined as members of the following groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

A minority population, for the purposes of environmental justice, is identified when the minority population of the potentially affected area is (1) greater than 50 percent; (2) meaningfully greater than the percentage of the minority population in the general population or other appropriate unit of geographical analysis; or (3) when one or more U.S. Census blocks in the potentially affected area have a minority population of greater than 50 percent.

For the proposed ISEGS Project, the total population within the six-mile radius of the proposed site is 36 persons, and the total minority population is 10 persons or 27.8 percent of the total population (see **SOCIOECONOMICS FIGURE 1**)[3]. The City of Primm, Nevada is entirely contained within the six-mile radius of the proposed ISEGS site but is not included in **SOCIOECONOMICS FIGURE 1**. The City was not considered a Census Designated Place at the time of the Year 2000 Census (US Census, 2008). Therefore, no Year 2000 Census Data is available for the City of Primm. As shown in **SOCIOECONOMICS FIGURE 1**, no census blocks within a six-mile radius of the proposed ISEGS site contain minority populations greater than 50 percent.

Below-Poverty-Level Population

Staff has also identified the current below-poverty-level population based on Year 2000 U.S. Census block data within a six-mile radius of the project site. The below-poverty-level population within a six-mile radius of the proposed ISEGS Project consists of no people or 0.0 percent of the total population in that area.

EMPLOYMENT CHARACTERISTICS

Labor force characteristics for the study area, which includes San Bernardino County, California (Year 2006 data), and Clark County, Nevada (Year 2005 data), are described in **SOCIOECONOMICS Table 3**. San Bernardino County is part of the Riverside-San Bernardino-Ontario Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau. In 2006, total employment in the Riverside-San Bernardino-Ontario MSA was 1,084,800. As shown in **SOCIOECONOMICS Table 3**, construction, manufacturing, retail trade, and services were the largest employment sectors. Clark County is part of the Las Vegas-Paradise MSA. In 2005, total employment in the Las Vegas-Paradise MSA was 871,600, with the largest employment sectors being construction and services.

SOCIOECONOMICS Table 3
Labor Force Characteristics, San Bernardino County, California (Year 2006) and Clark County, Nevada (Year 2005)

Industry	Riverside-San Bernardino-Ontario MSA 2006 Labor Force Characteristics	Las Vegas-Paradise MSA 2005 Labor Force Characteristics
Agriculture	17,200	N/A
Natural Resources, Mining	1,400	400
Construction	129,500	101,500
Manufacturing	124,000	25,000
Wholesale Trade	53,800	22,200
Retail Trade	171,500	94,000
Transportation, Warehousing, and Utilities	63,800	32,400
Information	15,200	10,400
Financial Activities	51,800	48,800
Services	436,200	449,400

[3] **SOCIOECONOMICS FIGURE 1** includes only US Census Blocks that contain over 50 percent of the Blocks' geographic area within a six-mile radius of the proposed ISEGS site.

Industry	Riverside-San Bernardino-Ontario MSA 2006 Labor Force Characteristics	Las Vegas-Paradise MSA 2005 Labor Force Characteristics
Government	18,800	87,500
Total Employed	1,084,800	871,600
Unemployment	41,800 (4.7%)	33,000 (3.7%)

Source: CEDD 2008a; CEDD 2008b; NDETR 2008a.

HOUSING

Current housing conditions within the study area are shown in **SOCIOECONOMICS Table 4.** There were 1,402,485 total housing units in the study area in 2006, with 110,011 of these units vacant, creating a study area vacancy rate of 7.8 percent.

SOCIOECONOMICS Table 4
Housing Units in the Study Area, Year 2006

	Total Units	Single-Family	Multi-Family	Mobile Homes	Percent Vacant
San Bernardino County, CA	740,817	433,317	227,040	30,460	32,596 (4.4%)
Clark County, NV	661,668	492,519	125,594	43,555	77,415 (11.7%)
Total	1,402,485	925,836	352,634	74,015	110,011 (7.8%)

Source: CDOF 2008b; Clark County 2008a.

FISCAL REVENUE

The two key taxing agencies in the study area are San Bernardino County, California, and Clark County, Nevada. As comparable fiscal data for Clark County, Nevada, is unavailable, fiscal data for the City of Las Vegas (the primary Metropolitan Service Area within Clark County, Nevada) is presented. **SOCIOECONOMICS Table 5** shows the revenues and expenditures for both San Bernardino County and the City of Las Vegas for fiscal year 2006. As shown, both San Bernardino County and the City of Las Vegas generated more revenue than expenditures in fiscal year 2006.

SOCIOECONOMIC Table 5
Fiscal Revenue and Expenditures for San Bernardino County, California, and the City of Las Vegas, Nevada, Year 2006

	San Bernardino County*	City of Las Vegas*
Expenditures For Countywide Operations		
Admin/Exec	$462,158	$164,150
Contingencies	$59,124	N/A
Financial Administration	$6,916	$1,019
Debt Service	$21,137	$38,461
Economical Development Agency	$3,845	$22,205
Fiscal Group	$55,580	N/A
Human Services	$837,760	N/A
Law & Justice	$65,595	$26,169
Public and Support Services	$99,187	514,121
Total Expenses	$2,157,013	$917,834
Revenues		
Property Taxes	$415,936	$108,092
Sales and Other Taxes	$207,443	$7,954

	San Bernardino County*	City of Las Vegas*
Intergovernmental Revenue	$1,622,031	$442,187
Charges for Current Services	$568,348	$181,211
Other Revenue	$130,465	N/A
Operating Transfers In	$275,104	N/A
Fund Balance/Net Assets	$329,871	N/A
General Fund Unreserved Fund Balance	$100,699	N/A
Use of Reserves	$6,064	N/A
Contribution to Reserves	($35,453)	N/A
Total Other Financing	$676,285	N/A
Total Revenues and Financing Sources	$3,620,501	$1,442,055

Source: San Bernardino County 2008; City of Las Vegas 2008.
* $ Thousands
N/A – Data Not Available

PUBLIC SERVICES

Physical impacts to public services and facilities are usually associated with population in-migration and growth in an area, which increase the demand for a particular service, leading to the need for expanded or new facilities. Therefore, public services data is provided below for both San Bernardino County and Clark County.

Police Protection

The proposed ISEGS site is located within the jurisdiction of the San Bernardino County Sheriff's Department, which is headquartered at 655 East 3rd Street in San Bernardino. The nearest sheriff's office to the proposed ISEGS site is the Barstow Station in the city of Barstow located at 225 East Mountain View Road (SBCo Sheriff 2008). The California Highway Patrol (CHP) is the primary law enforcement agency for California highways and roads (CHP 2008). CHP services include law enforcement, traffic control, accident investigation, and the management of hazardous materials incidents.

Within Clark County, police protection services are provided by the Las Vegas Metropolitan Police Department (LVMPD). The LVMPD is a joint city/county police force providing law enforcement services for all of Clark County, including the City of Las Vegas, with over 2,600 sworn officers (LVMPD 2008)

Schools

The proposed ISEGS site is located within the Baker Valley Unified School District (BVUSD). Clark County School District (CCSD) provides school services to the Nevada portion of the study area. Current school enrollment figures within the study area for the 2006–2007 school year are shown in **SOCIOECONOMICS Table 6.** As shown, the BVUSD has a small student enrollment, while the CCSD serves a large number of students.

SOCIOECONOMICS Table 6
Enrollment Figures for the BVUSD and the CCSD, Year 2006–2007

Student Level	Baker Valley Unified School District	Clark County School District
Kindergarten	21	23,931
Elementary School (1st through 5th Grade)	82	145,207

Student Level	Baker Valley Unified School District	Clark County School District
Middle School (6th through 8th Grade)	42	73,862
High School (9th through 12th Grade)	26	84,681
Total	*201*	*303,750*

Source: ED-Data 2008; NDE 2008.

Hospitals

The closest hospital with an emergency room to the proposed ISEGS site is the Saint Rose Hospital - Siena Campus in Henderson, Nevada (within Clark County) located at 3001 St. Rose Parkway, approximately 40 miles east of the proposed ISEGS site. This facility is a 214-bed hospital and has over 2,600 employees with approximately 1,142 physicians in the area with staffing privileges at Saint Rose (SRDH 2008). The emergency room at Saint Rose Hospital is designated as a Level II trauma center that provides immediate, specialized care to accident victims and victims of sudden illness. Specialty services at the hospital include intensive care unit, emergency/trauma, labor and delivery, cardiac care, orthopedics, surgery, and transplant.

ASSESSMENT OF IMPACTS

Staff reviewed the socioeconomics section of the applicant's Ivanpah Solar Electric Generating System Application for Certification (AFC) and the socioeconomic data provided and referenced from various governmental agencies and trade associations and conducted its own independent analysis to form the following socioeconomics analysis and conclusions.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

NEPA provides no specific thresholds of significance for socioeconomics impact assessment. Significance varies, depending on the setting of the proposed action (40 CFR 1508.27[a]), but 40 CFR 1508.8 states that indirect effects may include those that are growth inducing and others related to induced changes in the pattern of land use, population density, or growth rate. With respect to the California Environmental Quality Act (CEQA), socioeconomic impacts are limited to those that could be considered direct effects on the environment, such as changes to population and housing, and that are separate from strictly economic impacts, such as a loss of revenue.
Based on a review of recent environmental assessment documents prepared for the BLM and the CEQA Guidelines, Appendix G, staff has determined the list of thresholds below to be appropriate for analysis of socioeconomics impacts under both NEPA and CEQA. A project may have a significant effect on socioeconomics if the project would:

- induce substantial population growth in an area, either directly or indirectly;
- displace substantial numbers of people and/or existing housing, necessitating the construction of replacement housing elsewhere;
- cause a substantial change in revenue for local businesses or government agencies; or

- adversely impact acceptable levels of service for law enforcement, schools, and hospitals.

Typically, substantial long-term employment of people from regions outside the study area would have the potential to result in significant adverse socioeconomic impacts due to a change in the local housing demand and supply and an increase in population resulting in increased demands to public services. In addition to direct population, employment, and housing impacts based on the above criteria, the following socioeconomic analysis looks at beneficial impacts on local finances from property and sales taxes as well as potential adverse impacts on public services. In order to determine if a project would have any significant impacts, staff analyzes whether the current status of these community services and capacities can absorb the project-related impacts in each of these areas. A project's property taxes, sales tax, local school impact fees, or development fees can help local governments augment public services required to meet project needs. If the project's impacts could appreciably strain or degrade these services, staff considers this to be a significant adverse impact.

For environmental justice, staff uses a threshold of greater than 50 percent for minority and low-income populations as a subset of the total population within a six-mile radius of the proposed ISEGS site.

The analysis of subject areas such as capacities of fire service providers, utilities, water use, and wastewater disposal are identified in the **Worker Safety and Fire Protection**, **Soil and Water Resources**, and **Waste Management** sections of the Staff Assessment.

DIRECT/INDIRECT/INDUCED IMPACTS

Population and Employment

Construction

It is anticipated that the construction period for the proposed ISEGS would occur from first quarter 2009 through fourth quarter 2012. There will be an average of approximately 474 daily construction workers, with a peak daily workforce of 959, depending on the month and the work required. Laborers would consist of craftspeople and supervisory, support, and construction management personnel on site during construction. According to AFC section 2.0 (Project Description), the peak construction labor force of 959 total daily construction workers would occur during the 32nd month of construction. This maximum employment number is used to analyze worst-case construction population and employment impacts.

Research shows that construction workers would commute as much as two hours each direction from their communities rather than relocate (EPRI 1982). Staff reviewed the socioeconomics data for counties within the two-hour commute range, which is within the study area and includes San Bernardino County and Clark County. **SOCIOECONOMICS Table 3** indicates that a total of 231,000 construction workers are available within the study area. An assumed maximum need of 959 construction workers represents 0.4 percent of the total construction workforce within the study area.

Because the number of construction workers required represents such a small portion of the local available labor force, it is assumed that no population in-migration would occur as a result of project-related construction activities. Therefore, no significant impacts would occur to existing population levels or employment distribution within the study area from the proposed ISEGS construction.

Operation

Research shows that operational workers would commute as much as one hour to a power plant site from their homes rather than relocate (EPRI 1982). This one-hour commute range is within the study area and includes San Bernardino County and Clark County. According to AFC section 2.0, the proposed ISEGS is expected to employ a total of 90 permanent full-time employees (management, engineering, and administrative staff; skilled workers; and operators). According to AFC section 5.10 (Socioeconomics), it is anticipated that most of the operational workforce will be drawn from the City of Las Vegas within Clark County, Nevada, as well as parts of surrounding rural areas in San Bernardino County, California.

As stated in **SOCIOECONOMICS Table 3**, a total of 90 workers would account for a negligible amount of the total San Bernardino County and Clark County total labor force. As all workers would reside within the study area, no impacts to existing population levels would occur. Because the number of operational workers required represents such a small portion of the local available labor force, no significant impacts to the study area population or employment base would result from proposed project operation.

Housing

The proposed ISEGS site would be located within vacant BLM land and contains no housing. As such, no housing would be displaced. As presented in **SOCIOECONOMICS Table 4,** there were 1,402,485 total housing units within the study area, with 110,011 vacant units, resulting in a 7.8 percent vacancy rate. As discussed above, during project construction and operation, all workers would reside within commuting distance of the proposed ISEGS site, and therefore would not need to move into the area. Therefore, no construction or operation-related impacts are expected on the local housing supply availability or demand.

Fiscal and Economic Effects

Property Taxes

The proposed ISEGS would generate property tax revenue to San Bernardino County, California. The California State Board of Equalization (BOE) has jurisdiction over the valuation of a power-generating facility of 50 MW or more for property tax purposes except for a qualifying small power production facility or qualifying cogeneration facility such as a solar, wind, waste, or geothermal facility that together with any other facilities located at the same site, is not greater than 80 MW. For power-generating facilities determined to be under the jurisdiction of the state of California for property tax assessment purposes, the BOE determines the assessed value of the property, which is then used by the relevant county to assess and collect the appropriate amount of property taxes. In this case, the San Bernardino County assessor would assess and collect the appropriate amount of taxes. According to AFC section 5.10, under current

law with exemptions for portions of the proposed ISEGS, property taxes are estimated at approximately $2.2 million per year. According to AFC section 5.10, once property taxes are assessed, tax monies would be allocated as follows:

- 39.66 percent to local schools;
- 31.74 percent to the local Educational Revenue Augmentation Fund;
- 20.96 percent to the San Bernardino County General Fund;
- 3.80 percent to Special Districts;
- 2.02 percent to the County Library; and
- the remaining 1.78 percent to flood control.

The additional property tax revenues generated by the proposed ISEGS would have a beneficial impact to San Bernardino County by increasing the amount of public funds available for community projects and spending by the county.

Sales Tax

The proposed ISEGS's annual operations and maintenance (O&M) budget is expected to be approximately $350,500 (in 2007 dollars), of which it is assumed that $27,000 would be spent locally within San Bernardino County, California, and the remaining $323,500 within Clark County Nevada. The additional sales tax revenues generated by the proposed ISEGS would have a beneficial impact to both the San Bernardino and Clark Counties' local economies.

Employment

Operation of the proposed ISEGS would generate a beneficial impact by creating employment opportunities for local workers through local expenditures for materials, such as office supplies and services. According to AFC section 5.10, the proposed ISEGS would provide a total of approximately $5.4 million (in 2007 dollars) in operational payroll, at an average salary of $60,000 per year (including benefits) for the estimated 90 full-time employees. The additional revenues generated by employment and spending of the ISEGS would have a beneficial impact to both the San Bernardino and Clark County areas. However, the addition of 90 full-time jobs would not significantly reduce unemployment rates within the study area as presented in **SOCIOECONOMICS Table 3**, as the contribution of 90 full-time jobs would account for only 0.1 percent of the total unemployed workers (74,800) within the study area.

Public Services

Physical impacts to public services and facilities are usually associated with population in-migration and growth in an area, which increase the demand for a particular service and lead to the need for expanded or new facilities. An increase in population in any given area may result in the need to develop new or alter existing public services and associated facilities to accommodate increased demand. The **SOCIOECONOMICS** analysis focuses on the proposed project's impacts to public services such as law enforcement, schools, and hospitals. The analysis of proposed ISEGS impacts to fire protection service levels is discussed within the **Worker Safety and Fire Protection** section of the Staff Assessment.

Law Enforcement

The required construction and operational labor force would reside within the study area. Therefore, no population increase would occur as a result of the proposed project, thereby eliminating the need for an increase in law enforcement services or facilities in the study area. In addition, according to AFC section 5.10, the San Bernardino County Sheriff's Department, which has primary responsibility for policing the proposed ISEGS site, did not express any concerns about the need for increased services as a result of the proposed ISEGS. Therefore, construction and operation activities at the proposed ISEGS would not significantly impact the existing service levels of the San Bernardino County Sheriff's Department or the Los Vegas Municipal Police Department.

Schools

The proposed ISEGS is expected to employ a total of 90 full-time employees from within the San Bernardino County and Clark County labor forces. Because all construction and operational employees are expected to already reside within the study area, the proposed ISEGS would not result in any direct population growth to the area that could generate a need for expanded school facilities within the CCSD or BVUSD enrollment areas. No impacts to schools would occur.

Any development (industrial or residential) within the BVUSD boundaries is currently charged a one-time assessment fee of $0.33 per square foot of principal building area. The only project structure that would qualify as a principal building area would be the administration/storage building, which is the only habitable structure. The administration/storage building (the only structure that could be defined as an occupied structure) is 9,682 square feet in size. Therefore, the proposed ISEGS would pay a one-time fee of $3,195 in school impact fees to the BVUSD. This is considered a beneficial socioeconomics impact of the proposed project.

Hospitals

The proposed ISEGS would not directly or indirectly induce substantial population growth in the area. The proposed ISEGS site is served by the Saint Rose Hospital - Siena Campus. As all construction and operational employees are expected to already reside within the study area, no additional constraints or physical impacts would occur to the healthcare services or facilities provided by the Saint Rose Hospital - Siena Campus. Therefore, construction and operation of the proposed ISEGS would have no impacts to hospital facilities.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).

There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables (see Section 4**,** Cumulative Scenario):

- Cumulative Impacts Figure 1, Regional Renewable Applications
- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts related to socioeconomics could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts can occur if implementation of the ISEGS project could combine with those of other local or regional projects. Cumulative impacts would occur locally if ISEGS project impacts combined with impacts of projects located within the Ivanpah Valley. Cumulative impacts could also occur as a result of regional development of some of the many proposed solar and wind development projects that have been or are expected to be under consideration by the BLM and the Energy Commission in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

The geographic extent of cumulative impacts related to socioeconomics includes San Bernardino County, California and Clark County, Nevada and the cities contained therein. This geographic extent is appropriate because local jurisdictions or districts provide socioeconomic factors, such as public services, and the labor force and housing market potentially impacted is expected to come primarily from within these counties.

Cumulative Impact Analysis

Local Projects

Despite the potential for construction schedule overlaps with known projects within the proposed ISEGS study area, no adverse cumulative socioeconomic effects are anticipated from either the construction or operation of the proposed ISEGS. As discussed above, an assumed maximum peak labor force of 959 construction workers represents 0.4 percent of the total construction workforce within the study area. Operation of the proposed ISEGS would require only 90 full-time, permanent employees, which represents a small portion of the available local labor force. Therefore, because the proposed ISEGS requires such a small number of workers

relative to the amount of available workers for both construction and operation, its cumulative contribution to socioeconomic impacts resulting from an influx of non-local workers and their dependents would not be cumulatively considerable and therefore, less than significant.

As shown in Cumulative Impacts Figure 3 (Ivanpah Valley Existing and Future/Foreseeable Projects), as identified in Cumulative Impacts Tables 2 (Existing Development in the Ivanpah Valley) and 3 (Future Foreseeable Projects in the Ivanpah Valley Area), no identified existing or foreseeable local projects are residential in nature. However, those existing and foreseeable local projects would create job stimulus within the local area that could increase population. Large development projects such as the Primm Outlet Mall, Colosseum Mine, and the Ivanpah Airport would likely result in an increase in population and require the need for new housing and expanded public service facilities. However, as the ISEGS project would not result in any project specific socioeconomic impacts it would have no cumulative contribution to any potential local socioeconomic impacts. In addition, the long-term payment of taxes and fees and distribution of operations and maintenance (O&M) and payroll dollars is expected to have a significant cumulative benefit to San Bernardino County, California, and Clark County, Nevada, by increasing the amount of public funds available to the counties for community projects. The cumulative benefits would be increased when combined with the revenues accrued as a result of current and future reasonably foreseeable development projects as a result of the proposed ISEGS.

Regional Projects

Regional impacts would occur if impacts from the ISEGS combined with impacts of the future solar and wind development projects that are currently proposed southeastern California, southern Nevada, and western Arizona. Similar to the ISEGS project, these projects would be located in relatively isolated areas of the desert. These projects are identified in Cumulative Impacts Figure 2 (Regional Renewable Applications), as identified in Cumulative Impacts Tables 1 (Renewable Energy Projects in the CDD). Large scale renewable energy projects, such as Renewenergy, LLC, 11,187 acres near Eastern Imperial County and 17,320 acres near Homer Mountain, and Oak Creek Energy, 25,600 acres near South Ludlow will require a large construction workforce and lengthy construction duration. Construction workers would likely commute from larger urban centers in surrounding communities during construction activities. Solar energy generation and wind energy generation facilities do not require large numbers of operational staff, therefore it is very unlikely that these projects would induce substantial growth in any of the communities in which they are proposed to be constructed. As such, these projects would be extremely unlikely to generate the need for new housing or substantially affect revenues of local businesses or agencies. In fact, construction of these facilities would likely result in increased revenues to local businesses during construction. Therefore, while large scale regional renewable energy projects will occur within the ISEGS geographic area for socioeconomic effects, as the ISEGS project would not result in any project specific socioeconomic impacts it would not cumulatively contribute or combine with those of the future solar and wind development projects proposed to be constructed in desert areas of southeastern California, southern Nevada, and western Arizona to result in cumulatively considerable socioeconomic impacts.

NOTEWORTHY PUBLIC BENEFITS

Important public benefits discussed under the fiscal and non-fiscal effects section are O&M capital expenditures, construction payroll, and annual property and sales taxes.

CONCLUSIONS

No significant adverse socioeconomics impacts would occur as result of the construction or operation of the proposed ISEGS. Staff believes the proposed ISEGS would not cause a significant adverse direct, indirect, or cumulative impact on population, employment, housing, public finance, local economies, or public services. The proposed ISEGS would benefit the two-county study area (San Bernardino County, California, and Clark County, Nevada) and the local project vicinity in terms of an increase in local expenditures, payrolls, and taxation during construction and operation of the facility. These activities would have a positive effect on the local and regional economy. Socioeconomic impacts of the ISEGS project would not combine with impacts of any past, present, or reasonably foreseeable local or regional (future solar and wind development projects that are currently proposed southeastern California, southern Nevada, and western Arizona) projects to result in cumulatively considerable local or regional impacts.

PROPOSED CONDITION OF CERTIFICATION

No conditions of certification are required for socioeconomic resources as no significant adverse socioeconomics impacts would occur as a result of the proposed ISEGS.

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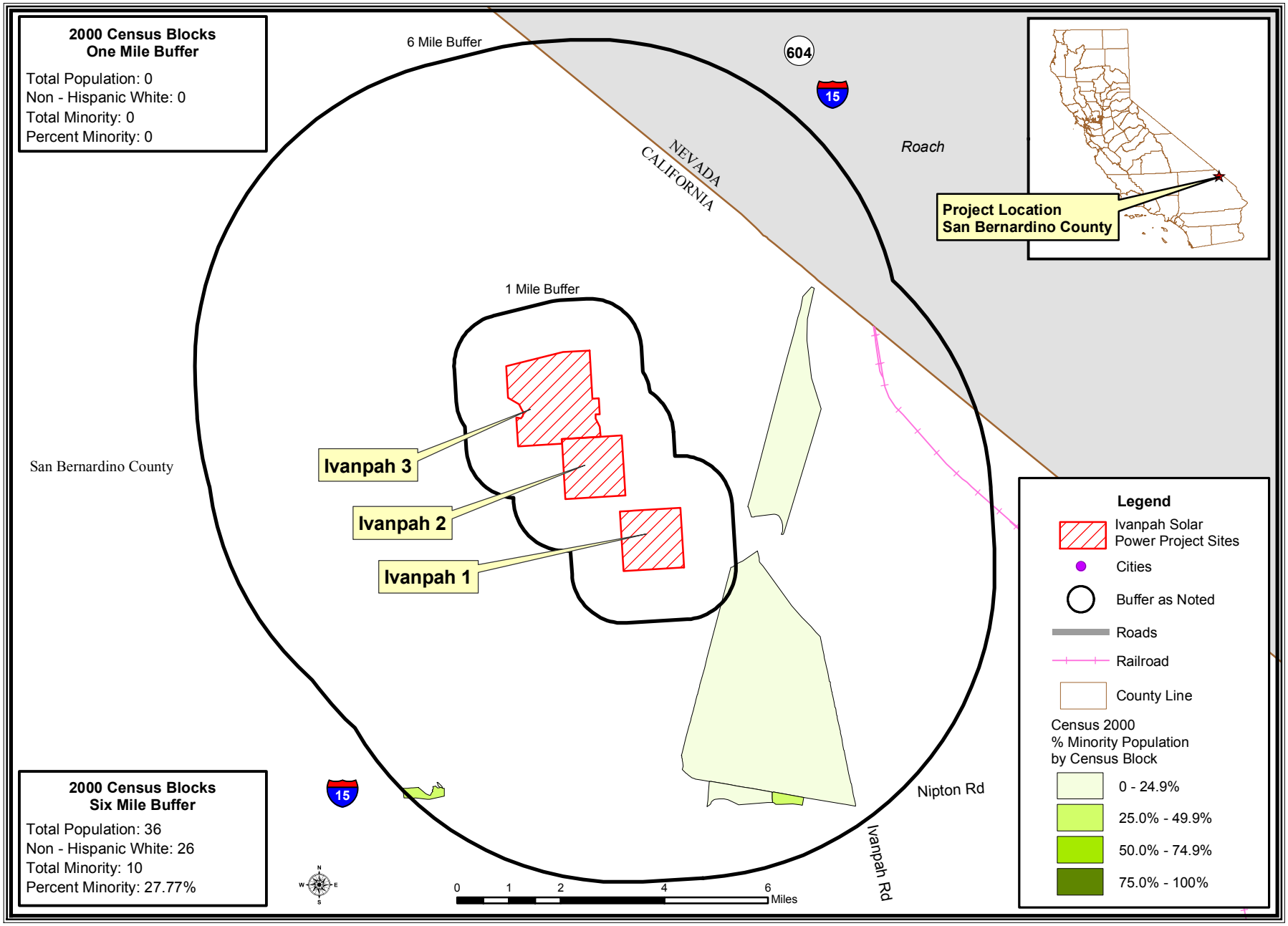
SOCIOECONOMICS - FIGURE 1

Ivanpah Solar Power Project - Census 2000 Minority Population by Census Block - One and Six Mile Buffer



DECEMBER 2008

SOCIOECONOMICS

CALIFORNIA ENERGY COMMISSION, ENERGY FACILITIES SITING DIVISION, DECEMBER 2008

SOURCE: California Energy Commission Statewide Power Plant Maps 2007 - Census 2000 PL 94-171 Data - Matrix PL2

SOIL AND WATER RESOURCES

Christopher Dennis, P.G.

SUMMARY OF CONCLUSIONS

Staff has not identified any unmitigable potentially significant impacts to Soil and Water Resources for the proposed Ivanpah Solar Electric Generating System (ISEGS) Power Plant and believes the project will comply with all applicable laws, ordinances, regulations and standards (LORS) provided the proposed conditions of certification are implemented. However, staff has identified several issues that could lead to potentially significant impacts. These issues must be addressed prior to completion of the FSA (FSA). These issues include:

- Evaluation of the conceptual revisions made to the grading plans, the Drainage, Erosion, and Sediment Control Plan (DESCP), and construction and operational Storm Water Pollution Prevention Plans (SWPPPs) proposed by the applicant during the August 5, 2008 workshop conducted between the Bureau of Land Management (BLM) and the applicant. Staff requires submittal of these plans in order to complete the analysis of the potential erosion, storm water, pollution, and flood related impacts. Staff will require sufficient time to review these plans to prepare the FSA;
- Evaluation of potential direct and cumulative water and sedimentation impacts to the Ivanpah Dry Lake (playa) after receipt of the Sedimentation Report;
- Identification of the source and quantity of potable water that would be supplied by the construction contractors during construction of the project;
- Evaluation of the potential water quality impacts due to project pumping;
- Evaluation of the increased water use related to the increase in the mirror surface area and need for additional mirror washing; and
- Evaluation of potential water quality impacts due to project groundwater pumping.

Staff concludes the following:

1. The project would be a solar powered project, supplemented during early morning start-up and during times of cloud cover with a natural gas-fired steam boiler. Fresh water would not be used for power plant cooling. All water use would be for heliostat (mirror) washing, boiler makeup, sanitation, and human consumption.

2. The potable water source to be supplied by the construction contractors during construction of the ISEGS project has not been identified, and therefore, not evaluated by staff.

3. Potential impacts to water levels in the Ivanpah Valley Groundwater Basin (IVGB) and to other groundwater users due to the project's pumping of groundwater would be less than significant and are not cumulatively considerable.

4. The applicant has not adequately modeled potential impacts to water quality due to pumping induced migration of low quality playa groundwater towards higher quality groundwater. Therefore, staff cannot reach a conclusion regarding the potential project-related water quality impacts.

5. Altering, filling, or rerouting the existing ephemeral streams could change the flow and character of the runoff water reaching the Ivanpah playa. However, staff has not received a Sedimentation Report or revised grading plans, DESCP, or SWPPPs, and therefore, cannot evaluate the potential project-related impacts to the Ivanpah playa.

6. The proposed project construction is within an area where no floodplain studies have been conducted.

7. The proposed project would be outside the reach of tsunami or seiche.

8. The proposed project would mitigate impacts on freshwater quality by reducing return flows from reclaimed water and reduce pumping of freshwater for landscape irrigation.

9. The proposed project would use a zero liquid discharge system (ZLD) which would maximize reuse of process water and conserve freshwater.

10. The proposed project could be constructed and operated consistent with all applicable federal, state, and local LORS.

Staff has proposed mitigation measures to reduce identified impacts to levels that are less than significant. The mitigation measures, as well as specifications for LORS conformance, are included as conditions of certification.

INTRODUCTION

This section analyzes potential impacts to soil and water resources from the construction or operation of the ISEGS project. Where the potential for impacts is identified, staff has proposed mitigation measures to reduce the significance of the impact and, as appropriate, has recommended conditions of certification.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

The following federal, state, and local environmental LORS have been established for the ISEGS project and similar facilities to ensure the best and appropriate use and management of both soil and water resources. The requirements of these LORS are specifically intended to protect human health and the environment. The potential for project compliance with these LORS is a major component of staff's determination regarding the significance and acceptability of the ISEGS project with respect to the use and management of soil and water resources.

SOIL & WATER Table 1
Laws, Ordinances, Regulations, and Standards

Federal LORS	
Clean Water Act (33 U.S.C. Section 1257 et seq.)	The Clean Water Act (33 USC § 1257 et seq.) requires states to set standards to protect water quality, which includes regulation of storm water and wastewater discharges during construction and operation of a facility. California established its regulations to comply with the Clean Water Act under the Porter-Cologne Water Quality Control Act of 1967. The Clean Water Act also establishes protection of navigable waters through Section 401. Section 401 certification through the Army Corps of Engineers and Regional Water Quality Control Board (RWQCB) is required if there are potential impacts to surface waters of the State and/or Waters of the United States, such as perennial and ephemeral drainages, streams, washes, ponds, pools, and wetlands. Section 401 requires impacts to these waters to be quantified and mitigated.
Resource Conservation and Recovery Act, 40 CFR Part 260 et seq.	The Resource Conservation Recovery Act (RCRA) of 1976 seeks to prevent surface and groundwater contamination, sets guidelines for determining hazardous wastes, and identifies proper methods for handling and disposing of those wastes.
State LORS	
California Constitution, Article X, Section 2	This section requires that the water resources of the State be put to beneficial use to the fullest extent possible and states that the waste, unreasonable use or unreasonable method of use of water is prohibited.
SWRCB WQO 99-08	The SWRCB regulates storm water discharges associated with construction projects affecting areas greater than or equal to 1 acre to protect state waters. Under Order 99-08, the SWRCB has issued a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges associated with construction activity for which applicants can qualify if they meet the criteria and upon preparing and implementing an acceptable SWPPP and notifying the SWRCB with a Notice of Intent.
California Code of Regulations, Title 17	Title 17, Division 1, Chapter 5, addresses the requirements for backflow prevention and cross connections of potable and non-potable water lines.
California Code of Regulations, Title 22	Title 22, Division 4, Chapter 15 specifies Primary and Secondary Drinking Water Standards in terms of Maximum Contaminant Levels (MCLs). These MCLs include total dissolved solids (TDS) ranging from a recommended level of 500 milligrams per liter (mg/l), an upper level of 1,000 mg/l and a short term level of 1,500 mg/l. Other water quality MCLs are also specified, in addition to MCLS specified for heavy metals and chemical compounds.
California Code of Regulations, Title 23	Title 23, Division 3, Chapter 15 applies to waste discharges to land and requires the Regional Board issue Waste Discharge Requirements specifying conditions for protection of water quality as applicable.
California Water Code Section 13260	Requires filing, with the appropriate Regional Water Quality Control Board (RWQCB), a report of waste discharge that could affect the water quality of the state unless the requirement is waived pursuant to Water Code section 13269.
Local LORS	
County of San Bernardino General Plan and Development Code	Grading would be subject to terms of San Bernardino County's General Plan and Development Code. Because the proposed site is located on federal land, county regulations are not directly applicable to the project. However, once the project has been approved by BLM, BLM has the option to request assistance from San Bernardino County to determine and implement specific grading and soil erosion standards. If a county grading permit is required, the grading plan would need to be completed in compliance with San Bernardino County's General Plan and Development Code.

California Safe Drinking Water Act and San Bernardino County Code Title 3, Division 3, Chapter 6, Public Water Supply Systems	Requires public water systems to obtain a Domestic Water Supply Permit. The California Safe Drinking Water Act requires public water systems to obtain a Domestic Water Supply Permit. Public water systems are defined as a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out the year. California Department of Public Health (CDPH) administers the Domestic Water Supply Permit program, and has delegated issuance of Domestic Water Supply Permits for smaller public water systems in San Bernardino County to the County. Under the San Bernardino County Code Title 3, 5.15-6 Division 3, Chapter 6, Public Water Supply Systems, the County Department of Environmental Services monitors and enforces all applicable laws and orders for public water systems with less than 200 service connections. The proposed project would likely be considered a non-transient, non-community water system.
San Bernardino County Ordinance 3872	To help preserve water resources in unregulated portions of the desert while not precluding its use, the County enacted Ordinance 3872. This ordinance requires a permit to locate, construct, operate, or maintain a new groundwater well within the unincorporated, unadjudicated desert region of San Bernardino County. CEQA compliance must be completed prior to issuance of a permit. The ordinance states that it does not apply to "groundwater wells located on Federal lands unless otherwise specified by inter-agency agreement." The BLM and County entered into a Memorandum of understanding (MOU) that provides that the BLM will require conformance with Ordinance No. 3872 for all projects proposing to use groundwater from beneath public lands. The MOU provides that the County and BLM will work cooperatively together to ensure conformance with applicable LORs by project developers on BLM land.
San Bernardino County Development Code Section 82.13.080, Soil Erosion and Sediment Control Plans/Permits	Section 82.13.080 establishes regulations and procedures to control human existing and potential induced accelerated erosion. Elements of this ordinance include project planning, preparation of Soil Erosion and Sediment Control Plans, runoff control, land clearing, and winter operations.
State Policies and Guidance	
The Porter-Cologne Water Quality Control Act of 1967, Water Code Sec 13000 et seq.	Requires the SWRCB and the nine RWQCBs to adopt water quality criteria to protect state waters. Those regulations require that the RWQCBs issue Waste Discharge Requirements specifying conditions for protection of water quality as applicable.
State Water Resources Control Board (SWRCB) Res. 77-1	SWRCB Resolution 77-1 encourages and promotes recycled water use for non-potable purposes and use of recycled water to supplement existing surface and groundwater supplies.
SWRCB Resolutions 75-58	The principal policy of the SWRCB that addresses the specific siting of energy facilities is the Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling (adopted by the Board on June 19, 1976, by Resolution 75-58). This policy states that use of fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound.
CWC Section 13523	Requires that a RWQCB, shall prescribe water reuse requirements for water, which is to be used or proposed to be used as recycled water after consultation with and upon receipt of recommendations from the State Department of Public Health, and if it determines such action to be necessary to protect the public health, safety, or welfare.
The California Safe Drinking Water and Toxic Enforcement Act	The California Health & Safety Code Section 25249.5 et seq. prohibits actions contaminating drinking water with chemicals known to cause cancer or possessing reproductive toxicity. The RWQCB administers the requirements of the Act.
Integrated Energy Policy	In the 2003 Integrated Energy Policy Report (IEPR), consistent with SWRCB Policy

Report (Public Resources Code, Div. 15, Section 25300 et seq)	75-58 and the Warren-Alquist Act, the Energy Commission adopted a policy stating they will approve the use of fresh water for cooling purposes by power plants only where alternative water supply sources and alternative cooling technologies are shown to be "environmentally undesirable" or "economically unsound."

SETTING

The ISEGS project would be located in the Ivanpah Valley in the eastern Mojave Desert, on land administered by the BLM (**Soil & Water Figure 1)**. This part of the Mojave Desert is in an unincorporated part of San Bernardino County, California, near the California/Nevada border and the community of Primm, Nevada. Water resources in this area are extremely limited and vegetation sparse. Due to these limitations, there is need for a higher degree of water use management and additional protections against accelerated soil erosion.

REGIONAL SETTING

The Ivanpah Valley extends across the California state line, into Nevada. It is part of a larger hydrologic system that includes the adjacent Jean Lake Valley (BSE2007a). The source of water to the Ivanpah Valley is from precipitation in the surrounding mountains where surface runoff flows along ephemeral streams and washes, discharges to, and infiltrates the alluvium-filled valley. The Ivanpah Valley is topographically closed. Excess surface flow drains to the Ivanpah, Roach, and Jean Dry Lakes where it evaporates leaving behind a hard lakebed (desert playa). The Ivanpah playa is now a world-class wind surfing location.

IVANPAH VALLEY

The IVGB is the primary natural water supply for the valley region. The Clark Mountains on the northwest, Ivanpah Range on the west, and the New York Mountains on the southeast bound the basin. Several northwest-trending faults transect the basin: the State Line, Ivanpah, and Clark Mountain faults (DWR2003). Groundwater occurs in the Quaternary alluvium, which has a maximum thickness of at least 8,000 feet (ENSR2007). Groundwater flow is generally towards the northeast, and may be impeded by the northwest trending faults (DWR2003). At the proposed project location, groundwater appears to vary from approximately 215 to 715 feet below grade with depth to groundwater increasing upslope on the alluvial fan (Broadbent2002).

Precipitation supplies water to the basin. There is no underflow water supply to the IVGB (Glancy1968). The IVGB recharge from precipitation occurs from percolation of mountain runoff through the alluvial deposits of the Wheaton Wash and at the base of the mountains (DWR2003). Recharge from precipitation in the valley floor is considered minimal because direct recharge from rainfall in the valley floor is significantly less than the potential rate of evapotranspiration and potential for soil moisture retention. When runoff does reach the dry lakes, infiltration to groundwater is negligible with most of the water removed by evaporation (Glancy1968). Discharge of groundwater is mainly through pumping and underflow towards the City of Las Vegas (Glancy1968). The total storage capacity of the IVGB is approximately 3.09 million acre-feet on the California

side of the valley (DWR2003) and an estimated 1.97 million acre-feet on the Nevada side of the basin.

Groundwater in the IVGB appears to be generally unconfined, with several local semi-confined areas such as in the vicinity of Jean Dry Lake (URS1990). Transmissivity of the IVGB aquifer based on estimates from well tests ranges from 2,300 to 100,000 gallons per day per foot (gpd/ft), with the higher transmissivity values in the southern (California) portion of the basin (URS1990). On average, transmissivity across the IVGB appears to be on the order of 20,000 gpd/ft (URS1990).

The Ivanpah and Roach playas seasonally may contain surface water, but there are no perennial surface flows in the project area. Washes from the alluvial fans eventually drain as sheet flow into the playas during infrequent periods of heavy rain. Surface desiccation cracks are present in the playas, and large desiccation cracks may be located below the surface that cause sinkholes to develop. Seasonal springs are present along the base of the Clark Mountains up slope from the proposed project site. These springs occur in the consolidated rock areas and are estimated to be less than 5 gallons per minute (gpm) with inadequate discharge to sustain surface flow for any significant distance (Glancy1968).

The natural groundwater quality is characterized as predominately sodium and calcium cations with a bicarbonate anion (DWR2003). In the vicinity of the Ivanpah playa, the groundwater is saltier, and is characterized as sodium chloride (DWR2003). For domestic and irrigation purposes, the groundwater is characterized as marginal to inferior due to elevated concentrations of fluoride and sodium (DWR2003). Total dissolved solids (TDS) in the IVGB ranges 300 to 500 milligrams per liter (mg/l), but can get as high as 7,702 and 27,501 mg/l in the vicinity of Ivanpah playa and in the northern part of the basin (DWR2003). TDS at the project site is estimated to be 369 to 600 mg/l, based on water samples taken at Colosseum wells # 1 and #2 near the proposed project site (Braodbent2002).

Molycorp Mine, operated by Chevron Mining Inc., is a lanthanide mining and milling operation which discharged wastewater between 1980 to 1987 through a pipeline to ‘old’ evaporation ponds and discharged wastewater between 1988 to 1998 to ‘new’ evaporation ponds in the southern part of the Ivanpah playa (RWQCB2008b). RWQCB Cleanup and Abatement Order No. 6-98-20 requires abatement of a groundwater plume beneath the old evaporation ponds. The plume contains TDS, nitrate, strontium, barium, and radium in concentrations above the California Maximum Contaminant levels (MCLs) (RWQCB2008b). Nitrate levels above the MCLs are present in the groundwater beneath the new evaporation ponds (RWQCB2008o). Sediments at both ponds contain lanthanides and radionuclides (RWQCB2008o). These discharge ponds result in most of the non-natural contamination in the IVGB.

The Primm wastewater treatment plant (WWTP) is approximately 6 miles east northeast of the project site on the Nevada side of the valley. The WWTP processes wastewater from three casino properties, fast food outlets, a shopping mall, convenience stores, gas

stations, a fire station, RV park, and an employee apartment complex (Nevada2008). The WWTP is capable of producing up to 1.0 million gallons per day (gpd) of recycled water, but its actual operational discharge is about half this volume (NDEP2008). Up to 30,000 gpd of this recycled water is used for process cooling at the Reliant Bighorn (Nevada Energy) power plant in Nevada, approximately 1.8 miles northeast of the WWTP (BWPC2008). The Reliant power plant is a 600-megawatt (MW) capacity, air-cooled, natural gas fired cogeneration facility that processes all non-sanitary wastewater through a ZLD (Reliant2008).

PROJECT, SITE, AND VICINITY SETTING

The ISEGS project would be a 400-MW solar electric generating system that would be constructed in three phases: two 100-MW power plants (known as Ivanpah 1 and Ivanpah 2) and a 200-MW power plant (Ivanpah 3). Ivanpah 1 and 2 would each consist of approximately 110,000 heliostats (mirrors), double mounted on 55,000 poles, in a single array around a centralized solar power tower. Ivanpah 3 would consist of approximately 208,000 heliostats, double mounted on 104,000 poles, in five separate arrays. Each of the five arrays would be centralized around a separate solar power tower. Construction of the ISEGS power plants would involve approximately 4,065 acres (6.4 square miles). Ivanpah 1 would require approximately 914 acres. Ivanpah 2 will require approximately 921 acres, and Ivanpah 3 approximately 1,843 acres. In addition, the administration building, warehouse, a substation, and detention ponds would be located in between Ivanpah 1 and 2 requiring approximately 66 acres. As currently proposed, approximately 156,875 cubic yards of soil would be cut, moved, and reused at the site, and approximately 412,600 cubic yards of vegetation would be cut, mulched, and used in erosion control. Detailed grading plans submitted June 5, 2008, were conceptually revised during a workshop between the applicant and BLM on August 5, 2008. The conceptual grading revisions affect the construction and industrial SWPPP and construction DESCP. Revisions to these plans must be submitted for analysis before the FSA can be completed.

Each power plant would include a small natural gas fired startup boiler to provide heated water for plant startup and during times of cloud cover. An air-cooled condenser would be used on each turbine. This design would help preserve the limited supply of freshwater in this desert region, with water consumption primarily for washing mirrors.

Soils

The ISEGS project and all linear facilities would be constructed over recent quaternary alluvium. The Natural Resources Conservation Service classifies soils at the project sites as Arizo loamy sand and Popups sandy loam (NRCS2008). The soils are classified as clayey, silty sands (SC-SM) and silty, sandy gravels (GM) according to the Unified Soils Classification System (USCS). The Arizo loamy sand is excessively well drained and the Popups sandy loan is well drained.

Storm Water

There are numerous ephemeral washes that cut through the project site. A total of 1,689 ephemeral washes were mapped in the project area (CH2MHill-DR19-1-2008). These washes, categorized on the basis of width, are presented in the table below.

SOIL & WATER Table 2
Summary of Ephemeral Wash Sizes at the Project Site

Wash Category	Number of Washes Mapped							
	Ivanpah 1	Ivanpah 2	Ivanpah 3	Natural Gas Pipeline Corridor	Colosseum Road	Substation	Facilities and Storage Building	Total
Washes ≥ 10 feet	7	27	41	7	2	0	3	87
Washes 5 - 10 feet	77	134	140	5	5	5	0	365
Washes 1 - 5 feet	398	342	395	23	25	44	10	1237

Source: BSE2007a.

The size of the washes appears to increase topographically upgradient, with the greatest number of washes greater than10 feet wide and 5 to 10 feet wide occurring in Ivanpah 3. This indicates that the highest flows should be expected in Ivanpah 3.

These washes may be considered non-jurisdictional features under Section 404 of the Clean Water Act (CEC2008c). In February 2008, the project applicant submitted a request for a jurisdictional determination to the U.S. Army Corps of Engineers (USACE). In a telephone conversation on June 24, 2008, the USACE stated that a preliminary determination found that the onsite ephemeral washes that are tributary to the Ivanpah playa would be non-jurisdictional features under section 404. For a further discussion on the jurisdictional determination, please refer to the **Biological Resources** section of this PSA.

The existing storm water flow across the proposed project site is generally towards the east (the Ivanpah playa). Storm water flow occurs as sheet flow and along the multiple drainage channels across the site. During times of major storm events, the ephemeral washes can flow for periods of a few hours to 24-hours with the possibility of flash floods. The proposed project site is located in Federal Emergency Management Agency (FEMA) Zone D. FEMA Zone D is classified as areas with possible flood hazards. However, a flood hazard analysis has not yet been conducted by FEMA for this area.

Storm water would be managed in accordance with project-specific grading plans, SWPPPs, a Drainage Erosion and Sediment Control Plan (DESCP), and in accordance with San Bernardino County's storm water management requirements (San Bernardino County Development Code section 82.13.080). These plans would establish methods of when and how to control and manage storm water flow as it reaches, flows across, and

then leaves the proposed project. Draft plans, dated June 5, 2008, have been prepared for construction of the project. However, the applicant has been working with the BLM to substantially revising conceptual elements of these plans. Staff requires submittal of these revised plans for analysis before the FSA can be completed. Final plans would be required as a condition of certification before the project construction can begin.

The power plant would be constructed on cut-and fill material with storm water intercepted by upgradient cascading retention ponds. These retention basins would be discharged with non-point source flows that would be equal to or less than the pre-developed peak flows. The retention basins would also capture debris and sediment that washes down the alluvial fan, and therefore, periodically require cleaning to remove the debris and sediment filling the basin. As a result of this debris and sediment capture, there will be a net deficit of sediment transported and deposited downgradient of the project. The northwest portion of Ivanpah playa, adjacent to the proposed project, would likely be impacted by this decrease in sediment deposition. The sediment flux in the playa is a function of transport and deposition from ephemeral washes and wind born erosion, but the annual sediment balance is not known. The project applicant is preparing a sedimentation report that will evaluate the impact of the proposed project storm water controls on this downstream sedimentation. A sedimentation report must be submitted for analysis before the FSA can be completed.

Contaminated Soil and Groundwater

A Phase I environmental report did not identify areas of suspected environmental pollution in the vicinity of the proposed project site (CH2MHILL2007a). Based on a review of records, site reconnaissance, and interviews, the Phase I ESA revealed no evidence of Recognized Environmental Conditions (RECs) in connection with the proposed project. In accordance with the ASTM Standard “nonscope considerations,” this Phase I ESA did not include the following items: lead in drinking water, radon, wetlands, regulatory compliance, cultural and historic resources, industrial hygiene, health and safety, ecological resources, endangered species, indoor air quality, or high-voltage power lines.

Between 4 to 6 miles away from the proposed project site in the southern part of the Ivanpah playa are the ‘old’ and ‘new’ Molycorp Mine wastewater discharge ponds. A groundwater plume associated with these ponds contains elevated TDS, nitrate, strontium, barium, and radium concentrations and is currently being remediated under a RWQCB Cleanup and Abatement Order (RWQCB199a; RWQCBV1999b). In addition, between 1 to 2 miles from the proposed project site is the Ivanpah playa beneath which groundwater TDS is elevated beyond California acceptable drinking water standards. Please refer to the **Public Health** and **Waste Management** sections of this document for additional soil and groundwater contamination analysis.

Project Water Supply

All water for the power plants would be drawn from one of two wells located east of Ivanpah 2. One well would be used as the primary water supply with the other well used

as a backup for redundancy. Water pumped from the well would be stored in a Raw Water and Fire Water Tank. From this tank, the water would be separated out for potable uses and for use as power plant process water.

To help preserve water resources in unregulated portions of the desert while not precluding its use, the San Bernardino County enacted Ordinance 3872. This ordinance requires a permit from the county and CEQA compliance before a new groundwater well can be installed within unincorporated or unadjudicated desert land within the county. This ordinance only applies on non-BLM managed land or when specified by an inter-agency agreement, such as the Memorandum of Understanding (MOU) between San Bernardino County and the BLM. This MOU requires compliance with Ordinance 3872 for groundwater wells proposed on BLM land in San Bernardino County. There are no other groundwater management laws or plans that would impede the proposed project's use of groundwater.

Potable Water

During project construction, potable water will be provided by construction contractors from an unknown source (CH2MHL2008o). This source specifically will not be from the proposed onsite wells. The project construction workforce size would be on average 474 persons and 959 persons during peak times (CH2MHILL2007a). During plant operation, groundwater from onsite wells would be used to meet the project's workforce potable water needs. The estimated annual potable water demand during plant operation would be approximately 3 acre-feet for all three project phases.

Construction Water Use

Groundwater from onsite wells would also be used to meet the project's construction water demands. Construction of Ivanpah 1 and 2 is expected to require 27 months to complete (CH2MHL2008o). Ivanpah 3 would take 22 months to complete. **Soil & Water Table 3** below presents a summary of the combined proposed water use during all three phases of construction. Daily groundwater use would be primarily for dust suppression and vehicle washing. During pipeline hydrotesting, up to 47,000 gallons of water could be used (CH2MHL2008o). Wastewater from this testing would either be trucked to a treatment and disposal facility or percolated onsite depending on the results of analysis of the water.

SOIL & WATER Table 3
Proposed Annual Construction Water Demands

Proposed Project Phase	Average Daily Use (gallons)	Maximum Daily Use (gallons)	Water Supply Source	Delivery Method
Ivanpah 1	99,333	146,333 (includes pipeline hydrotesting)	Groundwater	New Onsite Wells
Ivanpah 2	99,333	99,333		
Ivanpah 3	194,000	194,000		

Notes:
1. Source: CH2MHL2008o.
2. Grading for each phase expected to take 5 months.

Grading for each phase is expected to take five months. During grading of the second and third phases of the project, dust would be generated that may result in the need for more frequent washing of the existing heliostats (BSE2007a). This heliostat washing could result in an additional 50 acre-feet per year (AFY) of groundwater use.

Operations Water Use

The project also proposes to use groundwater during project operations. The AFC shows maximum estimated consumptive use is approximately 18 AFY for each of the 100-MW power projects and 36 AFY for the 200-MW power plant. **Soil & Water Table 4** below summarizes the volume of water the project proposes to use for power plant process and potable water needs. The table shows the applicant's estimated maximum annual use is 76.4 AFY. The applicant also indicates the maximum annual water use is not expected to exceed 100 AFY. (BSE2007a). In Data Response Set 2, the applicant doubled the number of mirrors on each heliostat and changed the mirror array fields from what was originally proposed in the AFC, increasing the proposed mirror surface area by 61.4 percent. However, the applicant has not revised the estimated annual water use to address the need for additional mirror washing.

SOIL & WATER Table 4
Proposed Annual Operational Water Demands
Project Water Sources and Use[1]

Water Use	Water Source	Approximate Daily Average (gpm)[2]	Approximate Annual (AF)[3]
100-MW Heliostat Process & Washing	Groundwater Wells	12.5	18
100-MW Heliostat Process & Washing	Groundwater Wells	12.5	18
200-MW Heliostat Process & Washing	Groundwater Wells	23	37.5
Potable Water Service for Employee Use	Groundwater Wells	1.8	2.9
Total Plant Operational Water Demand (all 3 phases combined)		**49.8**	**76.4**

Source: BSE2007a.
Notes:
1. Based on 3,640 hours of operation per year (10 hours per day, 7 days per week).
2. gpm = gallons per minute
3. AF = acre-feet

Groundwater would be consumed only by potable water discharged through the treatment system and by the steam boiler as boiler blowdown (AFC2007a). Water from the boiler makeup water storage tank would provide high quality water for mirror washing. Approximately 60 cubic meters per night (16,000 gallons) of water would be used for mirror washing. The mirrors would be washed using a pressure washer or other method to minimize the amount of water use. No water would leave the power plant sites as a result of these washing activities. **Soil and Water Table 5** presented below shows the volume of water that is expected to be used during each wash cycle and the expected depth to which that water would penetrate the soil.

SOIL & WATER Table 5
Volume of Mirror Wash Water Used and Depth of Wash Water Soil Penetration

Location	Number of Heliostats	Plant Area (acres)	Wash Water Volume (gallons per wash-cycle)	Wash Water Volume (acre-inch per wash-cycle)	Wash Water Soil Penetration (inches per wash-cycle)
Ivanpah 1	55,000	914	137,500	5.06	0.006
Ivanpah 2	55,000	921	137,500	5.06	0.005
Ivanpah 3	104,000	1,843	260,000	9.57	0.005
Total	214,000	3,677	535,000	19.7	0.005

Source: Data Response Set 1B.
Note: Wash cycle is defined as the 2-week interval during which each heliostat within a unit will be washed one time.

Due to the high evaporation rates and minimal amount of water used, it is likely that wash water will evaporate at or just below the ground surface. The expected physical and chemical composition of the water reaching the ground surface is presented in **Soil and Water Table 6** below.

SOIL & WATER Table 6
Estimated Mirror Wash Water Quality and 50-Year Buildup in the Soil

Parameter	Concentration	Estimated 50-Year Buildup (pounds per acre)
Hardness as $CaCO_3$	0.005 mg/l	0.008
Copper	0.01 mg/l	0.016
Iron	0.03 mg/l	0.047
Silica	0.3 mg/l	0.474
Conductivity	<1µS/cm	---
pH	8.5	---

Source: Data Response Set 1B.
Notes: mg/l = milligrams per liter
µS/cm = microsiemens per centimeter

Maintaining the heliostat fields would involve the following:

- Mirror Washing. The AFC States that the heliostat washing would be continuous with every heliostat washed once every 2 weeks. The applicant estimates that 100 heliostats can be washed per hour with 4 trucks working 10 hours per night at about 0.4 mile per hour (mph).
- Mirror breakage, repair, and security. An estimated breakage rate of 0.1 mirrors per year is stated in the AFC. Broken mirrors would be replaced annually by one repair truck. Other repairs would be performed daily by one truck. Security checks would be performed daily by one truck.
- New Plant Growth. Native plants would be allowed to grow so long as their growth did not interfere with the heliostat operation or their maintenance. An herbicide would be used to eradicate noxious weeds and nonnative species.
- Dust Suppression. Dust suppression would not be used during plant operation. The vehicles conducting the heliostat washing would be moving at less than 5 mph.

Wastewater

Sanitary (septic)

The water from the groundwater wells would be purified for use as drinking water, showers, and sanitary needs such as toilets. The resulting wastewater would be treated onsite by a small wastewater plant located near each power block and the administration building (BSE2007a). This treated water would then be used for landscape irrigation and would meet the Title 22 and RWQCB recycled water standards

and requirements for irrigation of non-edible landscapes. The residual sludge would be removed by a disposal service. No wastewater would leave the site.

Process Wastewater and Reuse (ZLD)

The process water would be pumped to a deionizing treatment plant and stored in a boiler makeup storage tank as part of the project's ZLD system. There would be no reject water from the deionization treatment plant (BSE2007a). Water from the boiler makeup storage tank would be delivered to the boilers and converted into steam for the power plant's steam turbine. The steam would then be condensed back into water and returned to the boiler. Water from the storage tank would also be used to fill watering trucks for nightly mirror washing. No wastewater would be generated by this process.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section provides an evaluation of the expected direct, indirect, and cumulative impacts to soil and water resources that would be caused by construction, operation, and maintenance of the project. Staff's analysis of potential impacts consists of a brief description of the potential effect, an analysis of the relevant facts, and application of the threshold criteria for significance to the facts. If mitigation is warranted, staff provides a summary of the applicant's proposed mitigation and a discussion of the adequacy of the proposed mitigation. If necessary, staff presents additional or alternative mitigation measures and refers to specific conditions of certification related to a potential impact and the required mitigation measures. Mitigation is designed to reduce the effects of potentially significant project impacts to less than significant.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Impacts leading to soil erosion or depletion or degradation of water resources are among those staff believes could be most potentially significant associated with the proposed project. The thresholds of significance for soil and water resources are discussed below.

Soil Resources

Staff evaluated the potential impacts to soil resources including the effects of construction and operation activities that could result in erosion of soils, the deposition of sediments into surface waters, or the contamination of either groundwater or surface water. There are extensive regulatory programs in effect designed to prevent or minimize these types of impacts. Our experience with these programs has demonstrated that they are effective. Therefore, absent unusual circumstances, we conclude that an applicant's ability to identify and implement BMPs to prevent erosion or contamination is sufficient to ensure that these impacts would be less than significant. Soils can be adequately protected by development and implementation of a grading plans, DESCP, and SWPPP. Staff's overall evaluation is that the project can be built and operated in accordance with LORS that prevent erosion, sedimentation, flood, surface or groundwater quality, water supply, or wastewater discharge standards. The

LORS and policies presented in **Soil & Water Table 1** were used to determine the threshold of significance of project impacts for this preliminary assessment.

Water Resources

Staff also evaluated the potential of the project's proposed water use to cause a significant depletion or degradation of groundwater resources. Staff considered compliance with the LORS and policies presented in **Soil & Water Table 1** and whether there would be a significant CEQA impact. Compliance with LORS and policies includes the Energy Commission's and State Water Resources Control Board's policy against using freshwater for power plant cooling unless other sources or other methods of cooling would be environmentally undesirable or economically unsound.

To evaluate if significant CEQA impacts to soil or water resources would occur, the following specific criteria were used.

- Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding or substantial erosion or siltation on- or off-site?
- Would the project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?
- Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?
- Would the project violate any water quality standards or waste discharge requirements?
- Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?
- Would the project contribute to any lowering of water levels in the groundwater wells of other water users? These water users can be private or public.
- Would the project contribute to any lowering of the groundwater levels such that protected species or habitats are affected?
- Would the project cause substantial degradation to surface water or groundwater quality?

DIRECT/INDIRECT IMPACTS AND MITIGATION

The direct and indirect impact and mitigation discussion presented below is divided into a discussion of impacts related to construction and a discussion of impacts related to operation. For each potential impact evaluation, staff briefly describes the potential effect and applies the threshold criteria for significance to the facts. If mitigation is

warranted, staff provides a summary of the applicant's proposed mitigation and a discussion of the adequacy of the proposed mitigation. In the absence of an applicant-proposed mitigation or if mitigation proposed by the applicant is inadequate, staff mitigation measures are recommended. Staff also provides specific conditions of certification related to a potential impact and the required mitigation measures.

Construction Impacts and Mitigation

Construction of ISEGS would include soil excavation, grading, installation of utility connections, and the use of groundwater. Groundwater would primarily be used for dust suppression and hydrotesting of the natural gas pipeline. Potential impacts to soils related to increased erosion or release of hazardous materials are possible during construction. Potential storm water impacts could result if increased runoff flow rates and volume discharges from the site were to increase flooding downstream. The Ivanpah playa could be impacted by discharge of eroded sediments from the site. Water quality could be impacted by discharge of hazardous materials released during construction or migration of existing hazardous materials present in the subsurface soil and groundwater. Project water demand could affect quantity of available groundwater. Potential construction related impacts to soil, storm water, and water quality or quantity, including the applicant's proposed mitigation measures and staff's proposed mitigation measures are discussed below.

Soil Erosion Potential by Water and Wind

Construction of Ivanpah 1 and 2 would be completed over a 27-month period and Ivanpah 3 would be completed over 22 months (BSE2007a). The total earth movement would be significant, with over 156,875 cubic yards of cut and fill and approximately 412,600 cubic yards of mulched vegetation (BSE2007a). The mulched vegetation will be reused for erosion control. The earth and vegetation work would primarily be for the powerblock, underground utilities, roadways, and heliostat fields. The predominant surface soil types at the proposed ISEGS site are clayey, silty sand (Popups soil) and silty, sandy gravel (Arizo soil) (NRCS2008). The Popups and Arizo soils are well drained with a low to medium runoff potential.

Construction activities can lead to adverse impacts to soil resources including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water dependant habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters or sewer systems.

The magnitude, extent, and duration of those impacts would depend on several factors, including the proximity of the ISEGS site to surface water, the soil types affected, and the method, duration, and time of year of construction activities. Prolonged periods of precipitation, or high intensity and short duration runoff events coupled with earth disturbance activities can result in accelerated onsite erosion. In addition, high winds during grading and excavation activities can result in wind borne erosion leading to increased particulate emissions that adversely impact air quality. The implementation of

appropriate erosion control measures would help conserve soil resources, maintain water quality, prevent accelerated soil loss, and protect air quality. Conditions of certification in the **Air Quality** section of this PSA provide mitigation that would prevent significant impacts from fugitive dust and soil erosion by requiring offsite access road paving before construction and dust control to disturbed lands during construction.

The erosion and sedimentation control measures include but are not limited to: wetting the roads in active construction and laydown areas; controlling speed on unpaved surfaces; placing gravel in entrance ways; use of straw bales, silt fences, and earthen berms to control runoff; restoration of native plant communities by natural revegetation, seeding and transplanting, and application of soil bonding and weighting agents. Watering for fugitive particulate matter emission control during soil handling, bulldozing and grading is expected to maintain soil moisture (BSE2007a). The project would be trying to preserve as much of the natural vegetation cover as possible.

Soil losses would develop during construction and grading activities and there would be ongoing soil loss after the project is constructed. The linear lines would result in soil disturbance by vehicles and other equipment used to install the lines. Use of construction BMPs in these areas are expected to control soil losses during construction and to mitigate potential impacts to air and surface water resources. Soil loss and erosion due to project activities could be significant and would need to be mitigated. Staff recommends Conditions of Certification **SOIL&WATER-1**, **-2**, and **-3** to ensure BMPs are in place to mitigate soil erosion by wind and water. Pending staff's receipt and review of revised grading plans, SWPPPS, and the DESCP, additional conditions of certification may be necessary in order to avoid potential erosional impacts to the soil.

The applicant would be implementing *Low Impact Development* principles into the project design to maintain natural drainage features and patterns to the extent feasible. After construction is complete, long-term erosion control measures would be implemented which would reduce the expected erosion at the site to a level less than would occur under natural conditions. As illustrated in **Soil and Water Table 7**, employing BMPs will significantly reduce the volume of sediment loss by wind and water.

SOIL AND WATER RESOURCES Table 7
Potential Soil Loss by Water and Wind Erosion Over the Life of the Project
(Estimated Using the Revised Universal Soil Loss Equation)

Project Location	Ground Disturbance (acres)[1]	Soil Loss By Wind & Water Erosion		Soil Loss if 'No Project' (tons)
		Without BMPs (tons)	With BMPs (tons)	
Ivanpah 1	690	372	8.3	0.02
Ivanpah 2	690	373	8.3	0.02
Ivanpah 3	1,335	868	20	0.08
Substation, Storage, and Administration Buildings	25	3.7	0.56	0.0006
Laydown Area	120	81	2.2	0.002
Roads	7.4	2.3	0.03	0.0006
Transmission Lines	5.1	0.0002	0.000004	0
Water Line	2.7	0.35	0.003	0.0001
Gas Line	7.3	1.1	0.02	0.0002
TOTAL	**2,883**	**1,702**	**39**	**0.12**

Source: CH2MHL2008o.
Notes:
BMPs = Best Management Practices.
1 – The total area of proposed ground disturbance has increased since the applicant submitted the AFC. However, the soil loss by wind and water have not been recalculated by the applicant.

The ISEGS site would be located in an undeveloped area. Brush would be cleared prior to grading. The storm water runoff percolates either into the soil or into flows overland offsite. Several project features would contribute to the potential for significant water erosion effects, including the high volume of earth displacement, the long duration for construction, and soil properties. Construction of the ISEGS project would change the natural drainages, remove natural vegetation and soil structure, and add impervious areas to the site, causing an increase in storm water runoff. The potential storm water capture area for the project is twenty one square miles for Ivanpah 1, six square miles for Ivanpah 2, and twelve square miles for Ivanpah 3 (CH2MHL2008o).

The applicant has prepared draft grading plans, Storm Water Pollution Prevention Plan, and a Drainage Erosion and Sedimentation Control Plan. These plans show that drainage and erosion will be controlled using measures that would create a a separate drainage system for the power plant. During grading, exposed soil would be stabilized by maintaining sufficient water content to make it resistant to weathering and erosion by wind. Substantial conceptual revisions were proposed and it was agreed during an August 5, 2008 meeting between the applicant and BLM, that these plans would be revised and resubmitted for review. These revisions have not be submitted for review . Staff will need these revised plans to complete an analysis of potential stormwater impacts prior to completion of the FSA.

Potentially significant water quality impacts could occur during construction, excavation, and grading activities if contaminated or hazardous soil or other materials used during construction were to contact storm water runoff and drain offsite. Water quality could also be impacted if the storm water drainage pattern concentrates runoff, in areas that are not properly protected with BMPs, and causes erosion of soils and sediment discharge offsite and possibly into the Ivanpah playa. If the storm water controls are too restrictive, there could be a reduction in the sediment supplied to the Ivanpah playa along the west side of the playa between Interstate 15 and the edge of the playa. The applicant is preparing a sedimentation report to evaluate these potential impacts. Staff requires submittal of the Sedimentation Report sufficiently early to allow staff time to review the repot before completion of the FSA.

Project Water Supply

The proposed ISEGS project would use groundwater during construction from wells constructed at the project site. The depth to groundwater at the project site is estimated to be between 215 to 715 feet below ground surface. Groundwater would not be encountered during grading activity. The volume of groundwater needed for construction is shown in **Soil and Water Table 3**. To meet the construction water demand, the applicant estimates that daily water demand during construction would average 99,333 gallons per day (gpd) for Ivanpah 1 and 2 and 194,000 gpd for Ivanpah 3 with up to an additional 47,000 gallons used during pipeline hydrotesting (CH2MHL2008o). Staff recommends Condition of Certification **SOIL&WATER-4** to ensure that onsite wells are constructed in accordance with state and local LORS. As shown in **Soil and Water Table 3**, groundwater is proposed to be drawn from onsite wells for construction at the rate of 99,333 to 194,000 gpd. Based on a 250-day work-year, this water use equates to 76 to 149 AFY. This water use is limited in duration and volume and is comparable to the water use proposed for plant operations. In addition, a portion of this water use would return to the groundwater basin as return flow. To ensure that the water use is kept to a minimum during construction, staff recommends Condition of Certification **SOIL&WATER-5** to ensure that no more than 194,000 gpd are used during construction. Staff believes the analysis of water use provided in the operation water use section below further addresses any potential impacts from use of groundwater for construction.

Potable water would be supplied by construction contractors from an unknown source (CH2MHL2008o). Portable facilities would be used for sanitary needs and operate without water. Because the potable water source is unknown, staff cannot evaluate the potential environmental impacts associated with using this water. Given the estimated number of employees and duration of construction there could be a significant impact if a local water supply is proposed.

Wastewater

Soil and Water Table 3 shows the volume of groundwater that would be needed for one-time hydrostatic testing of pipelines and pressure vessels during construction. This water would be reused to the extent possible and then discharged as wastewater. In addition, a small amount of groundwater would be needed for equipment washing. Improper handling or containment of construction wastewater could cause a broader dispersion of contaminants to soil or groundwater. The discharge of any non-hazardous wastewater during construction would be required to be in compliance with regulations for discharge. The equipment wash water would be transported to an appropriate treatment facility. The project hydrostatic test water would be reused to the extent possible and then discharged to the surface or trucked offsite to an appropriate treatment and disposal facility pending results of water testing for chemicals and metals. Staff concludes that no significant impact from wastewater would occur.

Operation Impacts and Mitigation

Operation of the ISEGS project could lead to potential impacts to soil, storm water runoff, water quality, and water supply. Soils may be potentially impacted through erosion or the release of hazardous materials used in the operation of the ISEGS project. Storm water runoff from the ISEGS site could result in potential impacts if increased runoff flow rates and volumes discharged from the ISEGS site increase downstream flooding. Water quality could be impacted by discharge of eroded sediments from the ISEGS site, discharge of hazardous materials released during operation, or migration of existing hazardous materials present in the subsurface soils and groundwater. Water supply for plant processes, cooling, fire protection and landscape irrigation could lead to potential quantity or quality impacts to groundwater resources. Potential impacts to soil, storm water, water quality, and water supply related to the operation of the ISEGS project, including the applicant's proposed mitigation measures and staff's proposed mitigation measures, are discussed below.

Soils

The applicant has proposed permanent erosion control measures to mitigate potential soil related impacts from the operation of the ISEGS project. During operations, the project powerblocks would be covered predominantly with gravel and landscaping, serving to prevent wind and water erosion, maintaining a high degree of the pre-project water infiltration capacity into the soil. The balance of the project powerblocks would be covered by foundations and paving. The heliostat field would preserve natural vegetation to the extent practicable and would grade and de-vegetate all other areas. However, staff is unable to complete their analysis of the potential impacts to soils until the revised grading plans, DESCP, and SWPPP are provided to staff for analysis.

Storm Water

The ISEGS site may be located within the 100-year floodplain as defined by Federal Emergency Management Agency (FEMA). The project site is too far inland to be affected by tsunami or seiche. The applicant has been active in developing and refining robust storm water control plans for all three phases of the project. As previously mentioned, staff h requires submittal of the revised grading plans, DESCP, and SWPPPs for their analysis of the potential storm water related impacts. Conditions of certification can be developed to mitigate any potential impacts once staff's analysis is complete.

Project Water Supply

The applicant has proposed to use groundwater pumped from onsite wells for all potable and plant operation needs. Pumped groundwater from onsite wells would be the primary water supply for all of the project's water demands. Staff analyzed the project's proposed use of groundwater water to determine if this water use would cause a substantial depletion or degradation of local or regional surface water or groundwater quality or supplies.

As discussed above, the applicant doubled the number of mirrors on each heliostat and changed the mirror array fields from what was originally proposed in the AFC. This increased the proposed mirror surface area by 61.4 percent. It appears the maximum water use estimate of 100 AFY is based on the original heliostat configuration and may not be sufficient to address the volume of water needed for mirror washing. Staff analysis of groundwater use is based on 100 AFY. If the proposed water use increases, additional analysis may be needed prior to completion of the FSA.

Regional Groundwater Supply

Summarized in **Soil and Water Table 8** below is the water balance for the IVGB. The water balance is the sum of gains and losses within the groundwater basin. Different parts of the basin experience these gains and losses differently. For example, the California side of the basin appears to experience a net gain in groundwater volume, while the Nevada side of the basin appears to experience a net loss. Even within the California side, there are localized gains (recharge) and losses (pumping) occurring. Underflow to the Las Vegas Valley results in an estimated loss of 6,200 AFY, resulting in a net balance on the Nevada side of the basin of-4,900 AFY and overall net deficit of -2,900 AFY.

SOIL & WATER Table 8
Existing Ivanpah Valley Groundwater Basin Water Budget

	GEOGRAPHIC AREA		
	Ivanpah Valley North (Nevada side)	Ivanpah Valley South (California side)	Total
INFLOWS (AFY)			
Precipitation	2,200	4,000	6,200
Project Returns	---	---	---
Molycorp Returns	---	---	---
Other Water-Use Returns	1,100	800	1,900
Total	3,300	4,800	8,100
OUTFLOWS (AFY)			
Project Pumping	---	100	100
Molycorp Pumping (expected)[1]	---	400	400
Other Pumping	2,000	2,300	4,300
Underflow to the Las Vegas Valley	6,200	---	6,200
Total	8,200	2,800	11,000
CHANGE IN STORAGE (AFY)	**-4,900**	**2,000**	**-2,900**

Source: BSE2007a.
Notes: Molycorp has not resumed operations and may not resume operations in the near future. The value of 400 AFY conservatively represents an expected annual volume of groundwater pumping should operations at Molycorp resume.

Groundwater declines relative to pre-development conditions in the Ivanpah groundwater basin are about 40 feet near Primm and 20 feet near the Primm golf course (Broadbent 2002) with an overall cumulative change in groundwater storage of 70,600 acre-feet between 1953 and 2005 (BSE2007a). This decline results in an average annual change in storage capacity of 1,300 AFY and a total decline in storage capacity of 1.4 percent over the 52-year period from 1953 to 2005. The project's annual groundwater use would represent 7.4 percent of this annual change in storage, and the project's total groundwater use of 5,000 AF (50 years x 100 AFY) would represent 0.01 percent of the total storage of the basin. The proposed volume of pumping for the project would result in an increase in the total pumping in the basin by 2.1 percent, and an increase of 0.9 percent of the total volume of water outflow from the basin.

There is relatively little development proposed in the Ivanpah basin over the life of the project that would significantly increase groundwater use (see discussion in the **Cumulative Impacts** section). Given the net positive groundwater balance in the southern portion of the IVGB and estimated basin storage changes for past and current pumping, staff believes the comparatively small amount of groundwater being used by the project would result in no significant impact to the groundwater supply. To ensure the ISEGS project does not consume more than 100 AFY, staff proposes Condition of

Certification **SOIL&WATER-5**, which would limit the amount of groundwater the project could use during operations to 100 AFY.

Local Groundwater Supply

Analysis of potential changes in groundwater levels from project pumping was necessary to evaluate whether there may be any impacts on other wells or water users. Drawdown or decrease in water levels due to groundwater pumping can result in significant impacts where it results in increased drawdown in nearby wells. These impacts can be both short term and long term. Interference or drawdown can result in increased pumping lifts and declines in well productivity. Mitigation of these impacts could require costly modifications including the cost of lowering pumps or the cost of deepening a well. Substantial increases in pumping lift can also cause significant increases in energy costs.

The magnitude of drawdown impact is controlled by five factors: (1) the rate of pumping; (2) the duration of pumping; (3) the depth of the well screens (water-intake depth of well); (4) aquifer parameters; and (5) aquifer boundary conditions. Aquifer parameters, such as specific yield and hydraulic conductivity, are controlled by layering and thickness of the water bearing materials such as gravel, sand, silt, and clay. The composition and flow characteristics of an aquifer can vary widely.

To accurately determine the impact of pumping specific to the project, calculations of drawdown must be based on the aquifer conditions within the vicinity of the pumping wells. The applicant developed a two-dimensional groundwater-flow model to evaluate the potential project-related pumping and recharge impacts. A summary of the parameters used in the model are presented in **Soil & Water Table 9** below.

SOIL & WATER Table 9
Groundwater Model Parameters and Corresponding Values

Parameter	Value
Horizontal Hydraulic Conductivity	2 feet per day
Vertical Hydraulic Conductivity	0.2 feet per day
Specific Storage	0.00001
Specific Yield	0.05
Aquifer Thickness	1,000 feet
Transmissivity	15,000 gallons per day per foot
Depth to Screen Top	300 feet
Depth to Screen Bottom	400 feet
Pumping Rate	100 acre-feet per year

Source: BSE2007a.

Based on the results of this groundwater model, groundwater elevation is estimated to decline over the project's 50-year life as follows:

- 2.1 feet at 0.5 mile from the project pumping well;

- 1.4 feet at 1 mile from the project pumping well; and
- 0.8 feet at 2 miles from the project pumping well (CH2ML2008g).

The nearest groundwater wells are the Colosseum wells used for the Primm Valley Golf Club, approximately one mile northeast of the proposed project wells (CH2ML2008g). These wells penetrate primarily sands and gravels to a depth of 600 to 700 feet below ground surface (bgs). The wells are screened beginning at about 300 to 350 feet bgs and extend to the total well depth. Based on what staff believes are reasonable aquifer parameters, the modeling results show that groundwater in the Colosseum wells would decline by an estimated 1.4 feet over the life of the project (BSE2007a). Staff believes this drawdown is minimal and would not result in a significant impact.

Water Quality

Water quality can be impacted by migration of low quality or contaminated water towards pumping wells and by sustained pumping of an overdrafted groundwater basin. TDS is a primary indicator of the natural quality of groundwater by providing a measure of the water's salinity and a measure for acceptance as a drinking water source. Chemical analysis by a state-certified laboratory can provide information on whether the groundwater is contaminated and by how much. Water with TDS concentrations greater than 2,000 mg/l is generally considered undrinkable. In California, the recommended Secondary MCL or 'Consumer Acceptance Contaminant Level' is 500 mg/L. While the upper and short term ranges can be 1,000 and 1,500 mg/L, respectively. The TDS concentrations in the IVGB range from 300 to 27,501mg/l (DWR2003).

TDS at the project site is estimated to be 369 to 600 mg/l (Broadbent2002). Past Molycorp Mining operations have resulted in elevated TDS, nitrate, strontium, barium, and radium levels in the groundwater at their discharge ponds in the Ivanpah lakebed (RWQCB2008b). Based on TDS measurements, Broadbent in 2002 found that pumping in the wells, used for the Primm Golf Course may induce the lower quality groundwater from the playa to move towards the pumping wells near the Ivanpah playa. The old and new Molycorp evaporation ponds are between 4 and 6 miles from the proposed project site (CH2ML2008a). In addition, sustained overdraft of a groundwater basin can lead to significant water quality impacts. This can occur due to encroachment of pumping on lower saline portions of an aquifer. Significant declines in water level of an unconfined aquifer can also induce flow from low quality perched groundwater zones or flows from more saline portions of the aquifer such as the beneath the Ivanpah playa.

The project applicant conducted groundwater modeling analysis to determine if pumping from the project wells would affect the groundwater gradient and velocity at the old and new Molycorp evaporation ponds (CH2ML2008a). The modeling estimated a project pumping induced groundwater gradient of less than 0.00003 ft/ft and induced velocity of less than 0.1 ft/yr at the old and new evaporation ponds. The predicted changes to the groundwater gradient and velocity are negligible. Therefore, no significant impacts to water quality or ongoing remediation affects are expected to occur related to the Molycorp evaporation ponds.

Staff understands (Broadbent 2002) that use of the wells at the Primm Golf Course has been reduced due to intrusion of brackish water that was not suitable for landscape irrigation. The cause of the intrusion was believed to be due to pumping induced migration of saltier groundwater underlying the playa to the east. Staff is concerned that although the magnitude of drawdown at the Colosseum wells is minimal, there is a potential for migration of brackish groundwater westward towards the Colosseum wells and project wells due to project and golf course pumping. Staff believes additional modeling should be conducted to evaluate potential water quality impacts.

Wastewater

The applicant proposes two separate wastewater-collection systems for the ISEGS project. The first is the process wastewater system which collects all wastewater generated from operation of the plant and delivers it to a ZLD system. The ZLD system would filter the wastewater for reuse by ISEGS , and concentrate solids into a salt cake for disposal to a landfill. Staff proposes Condition of Certification **SOIL&WATER-6** to ensure appropriate management of the ZLD system and appropriate disposal of the solid residue generated by the ZLD system.

The sanitary system would collect wastewater from sinks, toilets, and other sanitary facilities for discharge to an onsite treatment system (BSE2007a). This water would be treated and discharged to the surface through a landscape irrigation system. Staff proposes Condition of Certification **SOIL&WATER-7** to ensure that the sanitary waste system is installed and operated in accordance with Title 22 and the RWQCB requirements. The proposed sanitary system would mitigate impacts on freshwater quality by reducing return flows from reclaimed water and reduce pumping of freshwater for landscape irrigation.

No significant water or soil related impacts are expected to occur due to wastewater if the project owner meets proposed Conditions of Certification **SOIL&WATER-6** and **-7**. These conditions require the project to treat all process wastewater with a ZLD system in accordance with a ZLD management plan and comply with secondary discharge system LORS.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7).

There is the potential for future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables presented in the **Cumulative Impacts** section of this PSA:

- Cumulative Impacts Figure 1, Regional Renewable Applications
- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

Cumulative impacts can occur if implementation of the ISEGS project could combine with those of other local or regional projects. Cumulative impacts would occur locally if ISEGS project impacts combined with impacts of projects located within the Ivanpah Valley. Cumulative impacts could also occur as a result of development of some of the many proposed solar and wind development projects that have been or are expected to be under consideration by the BLM and the Energy Commission. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

Construction of the ISEGS project would disturb approximately 4,100 acres of land and the grading, filling, and rerouting of ephemeral streams that carry colloidal sediment to the Ivanpah playa. Smaller scale projects previously constructed that have resulted in impacts in this area include the existing Union Pacific railroad track, a power transmission line, Interstate Highway 15, the Bighorn power plant, Molycorp evaporation ponds, the Primm Golf Course, and commercial development in Primm. Reasonably foreseeable projects within the project vicinity that could result in additional impacts are listed in **Soil and Water Table 10** below. Construction of these projects could result in additional sediment reaching the dry lakebeds, changing the flat hard nature of the lakebeds. Therefore, because construction of the ISEGS and other reasonably foreseeable projects could substantially impact the playas, impacts of the ISEGS, when combined with those of past, present, and reasonably foreseeable projects would be significant without mitigation.

Construction and operation of the proposed project would result in both temporary and permanent changes at the project site. These changes could incrementally increase local soil erosion and storm water runoff. Potential project related soil or storm water cumulative impacts could be reduced to a level of insignificance through implementation of the applicant's proposed mitigation measures/BMPs and project DESCP; implementation of the SWPPPs for the Construction and Industrial Activities; National Pollutant Discharge Elimination System (NPDES) permits; and compliance with all applicable erosion and storm water management LORS.

Implementation of the multiple solar and wind projects proposed to be developed on over a million acres of land in southeastern California, southern Nevada, and western Arizona would result in extensive grading and removal of existing desert soils, resulting

in the potential for increased erosion and offsite sedimentation. Potential impacts related to the ISEGS project, when combined with potential impacts related to other proposed solar and wind development projects within southeastern California, southern Nevada, and western Arizona, would not result in significant and unavoidable cumulative impacts to soil resources if proper BMPS are employed on a project-by-project basis.

Construction of the ISEGS project would consume approximately 100 AFY of groundwater from the IVGB, 5,000 acre-feet over the life of the project. A summary of reasonably foreseeable projects and their potential water use are presented in **Soil and Water Table 10** below.

SOIL & WATER Table 10
Potential New Groundwater Users

Potential New Groundwater Users	Estimated Water Use	
	During Construction	**During Operation**
Desert Xpress Rail Line A proposed high-speed rail from Victorville to Las Vegas.	Unknown (one-time use)	Negligible
Interstate 15 Improvements Includes: (1) a proposed point-of-entry inspection station near the California-Nevada border; (2) a 12-mile-long northbound truck descending lane and pavement rehabilitation; and (3) re-grading of median slopes.	Unknown (one-time use)	<10 AFY
Las Vegas Valley Water District Pipeline Proposed construction and operation of a water supply pipeline from the existing 2420 Zone Bermuda Reservoir (located in southern Las Vegas) to Jean, Primm, the Southern Nevada Correctional Center, and the proposed Ivanpah Valley Airport.	Unknown (one-time use)	Negligible The use of imported surface water in the Ivanpah Basin would result in additional discharges of wastewater. At least a portion of this wastewater would likely infiltrate to the groundwater basin, increasing groundwater recharge in the basin.
Southern Nevada Supplemental Airport (Ivanpah Valley Airport) The proposed airport is anticipated to use water supplied by the Las Vegas Valley Water District pipeline for both construction and operation activities	None	None

Table Mountain Wind Energy Facility	Unknown (one-time use)	Negligible
SCE Transmission Line Upgrades	Unknown (one-time use	Negligible
Re-operation of the Molycorp Mine	Negligible	400 AFY
Primm Solar Generating Plant (a 250-MW solar trough plant)	Unknown (one-time use	Estimated 45 to 1,500 AFY
OptiSolar Photovoltaic Power Plant	Unknown (one-time use	Estimated 6 to 30 AFY

Sources: BSE2007a; BLM.

Water supply uses during construction would be limited in duration and quantity. The applicant estimates that daily water demand during construction would average 99,333 gpd for Ivanpah 1 and 2, and 194,000 gpd for Ivanpah 3, with up to an additional 47,000 gallons used to hydrotest the pipelines. During operation, the project would be using groundwater for potable and plant processes at the rate of approximately 100 AFY.

Over the next 50 years, the use of the IVGB groundwater is expected to increase and, along with that increased use, the overdraft in the sub-basin is expected to become greater. The project's pumping of groundwater alone would contribute to this overdraft, but currently amounts to only 2.1 percent of the existing cumulative pumping volume in the IVGB. This increase is nominal and not cumulatively considerable. Therefore, staff believes there would not be an adverse impact to the groundwater resources in the basin. As shown in **Soil and Water Table 10**, an additional 61 to 1,940 AFY of groundwater could be pumped from the IVGB, with some component of return flow. The project's contribution to this groundwater use would be minimal. Staff believes, therefore, that there would be no significant cumulative impacts to the groundwater resources.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

The agency and public comments shown in **Soil and Water Table 11** were received relating to soil and water resources and have been incorporated into this PSA section.

SOIL & WATER Table 11
Existing and Potential Groundwater Users

Agency or Public Commenting	Date	Comment
Lahontan Regional Water Quality Control Board	October 18, 2007	Identifies site-specific and general RWQCB requirements for the proposed project.
Lahontan Regional Water Quality Control Board	October 25, 2007	Outlines the RWQCB's requirements for the project's proposed discharge of secondarily treated water for landscape irrigation.
County of San Bernardino	October 30, 2007	Asks the Energy Commission to consider the groundwater quality and quantity impacts related to the proposed project.

COMPLIANCE WITH LORS

Staff has reviewed the LORS and policies presented in **Soil & Water Table 1**, finding this project's proposed groundwater use comply with these LORS and policies. Staff is waiting for revised grading plans, SWPPPs, and a DESCP in order to complete the evaluation of the project's proposed compliance with storm water pollution prevention and erosion control LORS and policies. A discussion of selected LORS is presented below.

CLEAN WATER ACT

Until staff receives revised grading plans, SWPPPs, DESCP, staff cannot evaluate if the ISEGS project would satisfy the requirements of the General NPDES permit for construction and industrial operation.

WARREN-ALQUIST ACT

The Warren-Alquist Act promotes all feasible means of water conservation. The proposed project would not be using freshwater for power plant cooling. The proposed power plant does include a gas-fired turbine, but this turbine in air-cooled. Therefore, the proposed project complies with the requirements of the Warren-Alquist Act.

SWRCB RESOLUTION 75-58 AND ENERGY COMMISSION'S 2003 INTEGRATED ENERGY POLICY REPORT

LORS and water policies applicable to this project stem from, among other things, Article X, section 2 of the California Constitution, which declares that "the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented…" In order to better define what "unreasonable use" means in terms of power plant cooling, the SWRCB issued Resolution 75-58, "Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling" (Resolution 75-58). It sets forth, in priority order,

a list of preferable water sources for power plant cooling as follows: (1) wastewater being discharged to the ocean, (2) ocean, (3) brackish water from natural sources or irrigation return flow, (4) inland wastewaters of low TDS, and (5) other inland waters.

The resolution also states that fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound. As discussed under the section above in the Warren-Alquist Act, the power plant will not be using groundwater for power plant cooling purposes. Therefore, SWRCB Resolution 75-78 and the Energy Commission's 2003 Integrated Policy report do not apply to the proposed project.

With respect to wastewater, the Energy Commission's 2003 IEPR specifies that "the Energy Commission will require zero liquid discharge technologies unless such technologies are shown to be 'environmentally undesirable' or 'economically unsound.'" The applicant has proposed use of a ZLD system in compliance with this policy. Staff supports the proposed ZLD system and believes that this proposal meets the intent of no liquid discharge offsite that otherwise could degrade the surface or groundwaters of the state.

STATE WATER RESOURCES CONTROL BOARD (SWRCB) RESOLUTION 77-1

SWRCB Resolution 77-1 encourages and promotes recycled water use for non-potable purposes and the use of water containing waste to supplement existing surface and subsurface supplies. In conformance with Resolution 77-1, the project proposes treating all sanitary wastewater to secondary levels and using this recycled water for landscape irrigation.

SAN BERNARDINO COUNTY ORDINANCE 3872

To help preserve water resources in unregulated portions of the desert while not precluding its use, the County enacted Ordinance 3872. This ordinance requires a permit to locate, construct, operate, or maintain a new groundwater well within the unincorporated, unadjudicated desert region of San Bernardino County. CEQA compliance must also be completed prior to issuance of a permit. The ordinance states that it does not apply to "groundwater wells located on Federal lands unless otherwise specified by inter-agency agreement." The BLM and County entered into a Memorandum of understanding (MOU) that provides that the BLM will require conformance with Ordinance No. 3872 for all projects proposing to use groundwater from beneath public lands. The MOU provides that the County and BLM will work cooperatively together to ensure conformance with applicable LORs by project developers on BLM land. As part of the permitting process, the County may require the project owner to prepare a groundwater monitoring plan in accordance with the County's "*Guidelines for Preparation of a Groundwater Monitoring Plan*" dated January 1998. Condition of Certification **SOIL&WATER-4** would require the applicant to obtain well permits for the proposed onsite wells in accordance with County of San Bernardino

requirements and to submit well completion reports to the Department of Water Resources (DWR) in accordance with the DWR well completion reporting requirements.

CONCLUSIONS

Staff has not identified any potentially significant impacts to Soil and Water Resources for the proposed ISEGS project that cannot be mitigated, and believes the project will comply with all applicable LORS provided the proposed conditions of certification are implemented. However, staff has identified several issues that require further analysis as they could indicate potentially significant impacts. These issues must be addressed prior to completion of the FSA. These issues include:

- Evaluation of the conceptual revisions made to the grading plans, the DESCP, and construction and operational SWPPPs proposed by the applicant during the August 5, 2008 workshop conducted between the BLM and the applicant. Staff requires submittal of these plans in order to complete the analysis of the potential erosion, storm water, pollution, and flood related impacts. Staff will require sufficient time to review the plans to prepare the FSA;
- Evaluation of potential direct and cumulative water and sedimentation impacts to the Ivanpah playa after receipt of the Sedimentation Report;
- Identification of the source and quantity of potable water that would be supplied by the construction contractors during construction of the project;
- Evaluation of the potential water quality impacts due to project pumping;
- Evaluation of the increased water use related to the increase in the mirror surface area and mirror washing; and
- Evaluation of potential water quality impacts due to project groundwater pumping.

Staff concludes the following:

1. The project would be a solar powered project, supplemented during early morning start-up and during times of cloud cover with a natural gas-fired steam boiler. Fresh water would not be used for power plant cooling. All water use would be for heliostat washing, boiler makeup, sanitation, and human consumption.

2. The potable water source to be supplied by the construction contractors during construction of the ISEGS project has not been identified, and therefore, not evaluated by staff.

3. Potential impacts to water levels in the Ivanpah Valley Groundwater Basin and to other groundwater users due to the project's pumping of groundwater would be less than significant and are not cumulatively considerable.

4. The applicant has not adequately modeled potential impacts to water quality due to pumping induced migration of low quality playa groundwater towards higher quality

groundwater. Therefore, staff cannot reach a conclusion regarding the potential project-related water quality impacts.

5. Altering, filling, or rerouting the existing ephemeral streams could change the flow and character of the runoff water reaching the Ivanpah playa. However, staff has not received a Sedimentation Report or revised grading plans, DESCP, or SWPPPs, and therefore, cannot evaluate the potential project-related impacts to the Ivanpah playa.

6. The proposed project construction is within an area where no floodplain studies have been conducted.

7. The proposed project would be outside the reach of tsunami or seiche.

8. The proposed project would mitigate impacts on freshwater quality by reducing return flows from reclaimed water and reduce pumping of freshwater for landscape irrigation.

9. The proposed project would use a zero liquid discharge system (ZLD) which would maximize reuse of process water and conserve freshwater.

10. The proposed project could be constructed and operated consistent with all applicable federal, state, and local LORS.

Where the potential for impacts has been identified, staff has proposed mitigation measures to reduce the impact to less than significant. The mitigation measures, as well as specifications for LORS conformance, are included as conditions of certification.

PROPOSED CONDITIONS OF CERTIFICATION

NPDES STORMWATER PERMIT – CONSTRUCTION ACTIVITY

SOIL&WATER-1: The project owner shall comply with the requirements of the general National Pollution Discharge Elimination System (NPDES) permit for discharge of stormwater associated with construction activity. The project owner shall develop, obtain compliance project manager (CPM) approval of, and implement a Storm Water Pollution Prevention Plan (SWPPP) for the construction of the ISEGS project phases, laydown area, and all linear facilities.

Verification: At least 60 days prior to site mobilization, the project owner shall submit to the CPM a copy of the final construction SWPPP for review and approval prior to site mobilization. The project owner shall retain a copy at the project site. The project owner shall submit copies to the CPM of all correspondence between the project owner and the Lahontan Region Regional Water Quality Control Board (RWQCB) regarding the NPDES permit for the discharge of stormwater associated with construction activity within 10 days of its receipt or submittal. Copies of correspondence shall include the

notice of intent sent to the State Water Resources Control Board (SWRCB), and the board's confirmation letter indicating receipt and acceptance of the notice of intent.

DRAINAGE EROSION AND SEDIMENTATION CONTROL PLAN

SOIL & WATER-2: Prior to site mobilization, the project owner shall obtain CPM approval for a Drainage Erosion and Sedimentation Control Plan (DESCP) for managing stormwater during project construction and operations as normally administered by the County of San Bernardino. The DESCP must ensure proper protection of water quality and soil resources, demonstrate no increase in off-site flooding potential, include provisions for sediment and stormwater retention from both the power block and heliostat fields to meet the County of San Bernardino requirements, address exposed soil treatments in the heliostat fields for both road and non-road surfaces, and identify all monitoring and maintenance activities. The DESCP shall contain elements (a) through (i) below outlining site management activities and erosion- and sediment-control BMPs to be implemented during site mobilization, excavation, construction, and post construction (operating) activities.

a. **Vicinity Map** – A map(s) at a minimum scale 1"=100' shall be provided indicating the location of all project elements (construction sites, laydown area, pipelines) with depictions of all significant geographic features including swales, storm drains, and sensitive areas.

b. **Site Delineation** – All areas subject to soil disturbance for the ISEGS project (project phases, laydown area, all linear facilities, landscaping areas, and any other project elements) shall be delineated showing boundary lines of all construction areas and the location of all existing and proposed structures, pipelines, roads, and drainage facilities.

c. **Watercourses and Critical Areas** – The DESCP shall show the location of all nearby watercourses including swales, storm drains, and drainage ditches. It shall indicate the proximity of those features to the ISEGS project construction, laydown, and landscape areas and all transmission and pipeline construction corridors.

d. **Drainage Map** – The DESCP shall provide a topographic site map(s) at a minimum scale of 1"=100' showing existing, interim, and proposed drainage swales and drainage systems and drainage-area boundaries. On the map, spot elevations are required where relatively flat conditions exist. The spot elevations and contours shall be extended off site for a minimum distance of 100 feet.

e. **Drainage of Project Site Narrative** – The DESCP shall include a narrative of the drainage measures necessary to protect the site and potentially affected soil and water resources within the drainage downstream of the site. The narrative shall include the summary pages from the hydraulic analysis prepared by a professional engineer and erosion control specialist. The narrative shall state the watershed size(s) in acres that was used in the calculation of drainage features. The

f. **Clearing and Grading Plans** – The DESCP shall provide a delineation of all areas to be cleared of vegetation and areas to be preserved. The plan shall provide elevations, slopes, locations, and extent of all proposed grading as shown by contours, cross sections, or other means. The locations of any disposal areas, fills, or other special features shall also be shown. Existing and proposed topography shall be illustrated by tying in proposed contours with existing topography.

g. **Clearing and Grading Narrative** – The DESCP shall include a table with the quantities of material excavated or filled for the site and all project elements (project site, laydown area, transmission and pipeline corridors, roadways, and bridges) whether such excavation or fill is temporary or permanent, and the amount of such material to be imported or exported.

h. **Best Management Practices Plan** – The DESCP shall identify on the topographic site map(s) the location of the site specific BMPs to be employed during each phase of construction (initial grading, project element excavation and construction, and final grading/stabilization). BMPs shall include measures designed to prevent wind and water erosion.

i. **Best Management Practices Narrative** – The DESCP shall show the location (as identified in (h) above), timing, and maintenance schedule of all erosion- and sediment-control BMPs to be used prior to initial grading, during all project element (site, pipelines) excavations and construction, final grading/stabilization, and operation. Separate BMP implementation schedules shall be provided for each project element for each phase of construction. The maintenance schedule shall include post-construction maintenance of structural-control BMPs, or a statement provided about when such information will be available.

Verification: No later than 90 days prior to start of site mobilization, the project owner shall submit a copy of the final DESCP to the County of San Bernardino and the Lahontan Regional Water Quality Control Board (RWQCB) for review and comment. No later than 60 days prior to start of site mobilization, the project owner shall submit the DESCP with the county's and RWQCB's comments to the CPM for review and approval. The CPM shall consider comments by the county and RWQCB before approval of the DESCP. The DESCP shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1**, and relevant portions of the DESCP shall clearly show approval by the chief building official. The DESCP shall be a separate plan from the SWPPP developed in conjunction with any NPDES permit for Construction Activity. The project owner shall provide in the monthly compliance report a narrative on the effectiveness of the drainage, erosion, and sediment-control measures and the results of monitoring and maintenance activities. Once operational, the project owner shall update and maintain the DESCP for the life of the project and

shall provide in the annual compliance report information on the results of monitoring and maintenance activities.

NPDES STORMWATER PERMIT – INDUSTRIAL ACTIVITY

SOIL&WATER-3: The project owner shall comply with the requirements of the general NPDES permit for discharges of storm water associated with industrial activity. The project owner shall develop, obtain CPM approval of, and implement an industrial SWPPP for the operation of the project.

Verification: At least 60 days prior to commercial operation, the project owner shall submit to the CPM a copy of the final industrial SWPPP for operation of the project for review and approval prior to commercial operation. The project owner shall retain a copy on site. The project owner shall submit copies to the CPM of all correspondence between the project owner and the RWQCB regarding the general NPDES permit for discharge of storm water associated with industrial activity within 10 days of its receipt or submittal. Copies of correspondence shall include the Notice of Intent sent by the project owner to the SWRCB.

PROJECT GROUNDWATER WELLS

SOIL&WATER-4: Pre-Well Installation. The project owner shall construct and operate up to two onsite groundwater wells that produce water from the Ivanpah Valley Groundwater Basin (IVGB). The project owner shall ensure that the wells are completed in accordance with all applicable state and local water well construction permits and requirements. Prior to initiation of well construction activities, the project owner shall submit a well construction packet to the County of San Bernardino, in accordance with the County of San Bernardino Code Title 2, Division 3, Chapter 6, containing all documentation, plans, and fees normally required for the county's well permit, with copies to the CPM. The project shall not construct a well or extract and use groundwater until the County of San Bernardino issues its written evaluation as to whether the proposed well construction and operation activities comply with all applicable county well requirements, and the CPM provides approval to construct the well.

Post-Well Installation. The project owner shall provide documentation to the CPM that the well has been properly completed. In accordance with California's Water Code section 13754, the driller of the well shall submit to the Department of Water Resources (DWR) a Well Completion Report for each well installed. The project owner shall ensure the Well Completion reports are submitted. The project owner shall ensure compliance with all county water well standards and requirements for the life of the wells and shall provide the CPM with two (2) copies of all monitoring or other reports required for compliance with the County of San Bernardino water well standards and operation requirements, as well as any changes made to the operation of the well.

Verification: The project owner shall do all of the following:

1. No later thanthirty (30) days prior to the construction of the onsite water supply wells, the project owner shall submit two (2) copies to the CPM of the water well construction packet submitted to the County of San Bernardino.

2. No later than fifteen (15) days prior to the construction of the onsite water supply wells, the project owner shall submit two (2) copies of the written concurrence document from the County of San Bernardino indicating that the proposed well construction activities comply with all county well requirements and meet the requirements established by the county's water well permit program.

3. No later than 60 days after installation of each well at the project site, the project owner shall ensure that the well driller submits a Well Completion Report to the DWR with a copy provided to the CPM. The project owner shall submit to the CPM together with the Well Completion Report a copy of well drilling logs, water quality analyses, and any inspection reports.

4. During well construction and for the operational life of the well, the project owner shall:
   - Submit copies to the CPM of any proposed well construction or operation changes.
   - Submit copies of any water well monitoring reports required by the County of San Bernardino to the CPM.
   - No later than fifteen (15) days after completion of the onsite water supply wells, the project owner shall submit documentation to the CPM and the RWQCB that well drilling activities were conducted in compliance with Title 23, California Code of Regulations, Chapter 15, Discharges of Hazardous Wastes to Land, (23 CCR, sections 2510 et seq.) requirements and that any onsite drilling sumps used for project drilling activities were removed in compliance with 23 CCR section 2511(c).

CONSTRUCTION AND OPERATIONS WATER USE

SOIL&WATER-5: The ISEGS use of groundwater for all construction and operations activities shall not exceed 100 acre-feet per year. Prior to the use of groundwater for construction, the project owner shall install and maintain metering devices as part of the water supply and distribution system to document project water use and to monitor and record in gallons per day the total volume(s) of water supplied to the ISEGS from this water source. The metering devices shall be operational for the life of the project.

Verification:

1. Beginning six (6) months after the start of construction, the project owner shall prepare a semi-annual summary of amount of water used for construction purposes. The summary shall include the monthly range and monthly average of daily water usage in gallons per day.

2. At least sixty (60) days prior to the start of construction of the ISEGS project, the project owner shall submit to the CPM a copy of evidence that metering devices have been installed and are operational.

3. The project owner shall prepare an annual summary, which will include the monthly range and monthly average of daily water usage in gallons per day, and total water used on a monthly and annual basis in acre-feet. For years subsequent to the initial year of operation, the annual summary will also include the yearly range and yearly average water use by source. For calculating the total water use, the term "year" will correspond to the date established for the annual compliance report submittal.

ZERO LIQUID DISCHARGE SYSTEM REQUIREMENTS

SOIL&WATER-6: The project owner shall treat all process wastewater streams with a Zero Liquid Discharge (ZLD) system. The project owner shall operate the ZLD system in accordance with a ZLD management plan approved by the CPM. The ZLD management plan shall include the following elements:

a. A flow diagram showing all water sources and wastewater disposal methods at the power plant;

b. A narrative of expected operation and maintenance of the ZLD system;

c. A narrative of the redundant or back-up wastewater disposal method to be implemented during periods of ZLD system shutdown or maintenance;

d. A maintenance schedule;

e. A description of on-site storage facilities and containment measures;

f. A table identifying influent water quality; and

g. A table characterizing the constituent concentrations of the solid waste or brine and specifying the permit limits of the selected landfill.

The ISGES project operation and wastewater production shall not exceed the treatment capacity of the ZLD system or result in an industrial wastewater discharge.

Verification: At least 60 days prior to the start of commercial operation, the project owner shall submit to the CPM evidence that the final design of the ZLD system has the approval of the Chief Building Officer. At least 60 days prior to the start of commercial operation, the project owner shall prepare a ZLD management plan for review and approval by the CPM. The ZLD management plan shall be updated by the project owner and submitted to the CPM for review and approval if a change in water source or infrastructure is needed.

In the annual compliance report, the project owner shall submit a status report on operation of the ZLD system, including dates and length of disruptions, maintenance activities performed, and volumes of interim wastewater streams stored on site. The annual compliance report shall contain an evaluation of whether the ZLD is being operated within the parameters described in the ZLD management plan. The ZLD management plan shall be updated by the project owner if the CPM has determined it is necessary based on the project owner's Annual Compliance Report.

LANDSCAPE IRRIGATION

SOIL&WATER-7: The project owner shall comply with Title 22 requirements for landscape irrigation using secondary treated wastewater.

Verification: No later than thirty days (30) days prior to the start of operations, the project owner shall submit to the CPM permits issued by the Lahontan Regional Water Quality Control Board for the application of treated wastewater for landscape irrigation.

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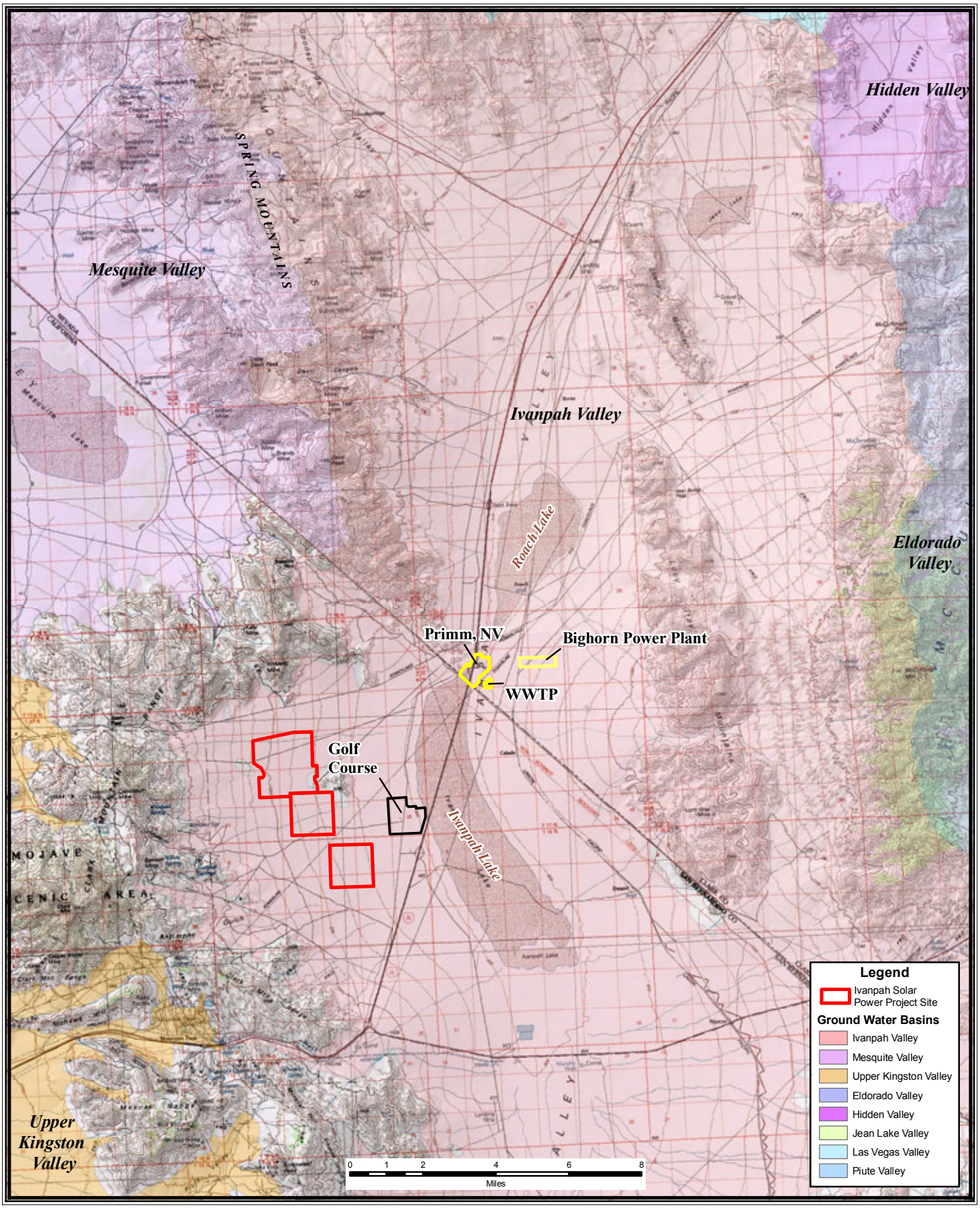
SOIL AND WATER RESOURCES - APPENDIX A

Acronyms Used in the Soil and Water Resources Section

AF	acre-feet
AFY	acre-feet per year
BMP	Best Management Practices
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CPM	Compliance Project Manager
CWA	Clean Water Act
CWC	California Water Code
DESCP	Drainage, Erosion, and Sediment Control Plan
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
FEMA	Federal Emergency Management Agency
FSA	FSA
gpd	gallons per day
gpm	gallons per minute
IEPR	Integrated Energy Policy Report
LORS	laws, ordinances, regulations, and standards
mg/l	milligrams per liter
MW	megawatt
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
Porter-Cologne	Porter-Cologne Water Quality Control Act
PSA	Preliminary Staff Assessment
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
WQMP	Water Quality Management Plan
WSP	Water Supply Plan
WWTP	wastewater treatment plant
ZLD	zero liquid discharge

SOIL & WATER - FIGURE 1

Ivanpah Solar Power Project - Local Ground Water Basins



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: California Energy Commission - USGS 100K TOPO

TRAFFIC AND TRANSPORTATION

Jason Ricks

SUMMARY OF CONCLUSIONS

Staff has analyzed the traffic-related information provided in the Application for Certification and other sources to determine the potential for the Ivanpah Solar Electric Generating System Project (ISEGS) to have significant adverse traffic and transportation-related impacts. Staff has also assessed the availability of mitigation measures that could reduce or eliminate the significance of these impacts.

Neither construction nor operation of the project would have a significant adverse impact on the local or regional road network, except for northbound Interstate 15 on Fridays between the hours of 12 p.m. and 10 p.m. Vehicle trips generated during construction and operation of the project would contribute to a significant adverse direct and cumulative impact on northbound Interstate 15 on Fridays between the hours of 12 p.m. and 10 p.m. during construction and operation.

To reduce project impacts on area traffic and to facilitate safety during construction, the applicant has proposed to limit the amount of project-related traffic generated on area roadways on Friday afternoons. To ensure that the ISEGS impact on area traffic, and in particular on northbound I-15 on Friday afternoons, during construction and operation is reduced to a less-than-significant level, staff has incorporated the applicant's proposal along with other mitigations into Condition of Certification **TRANS-1**. Condition of Certification **TRANS-2** is recommended to ensure the repair of physical damage to area roadways caused during project construction. In addition, because the project would place structures greater than 200 feet in height in the vicinity of military flight training routes and air traffic from the proposed Ivanpah Valley Airport, staff has proposed Condition of Certification **TRANS-3** to ensure the project complies with FAA recommendations for lighting of tall structures.

The applicant has indicated that the project could be a potential source of glare to traffic on I-15 and that such glare could adversely affect aviation activities at the proposed Ivanpah Valley Airport. Staff continues to investigate this issue and will provide a complete analysis in the Final Staff Assessment (FSA).

The Ivanpah Solar Electric Generating System Project, as proposed would be consistent with all applicable laws, ordinances, regulations, and standards, including the Circulation and Infrastructure Element of the County of San Bernardino General Plan.

INTRODUCTION

In the **Traffic and Transportation** analysis, staff addresses the extent to which the project may impact the transportation system in the local area. This analysis focuses on (1) whether construction and operation of the Ivanpah ISEGS Project would result in traffic and transportation impacts under the California Environmental Quality Act (CEQA) and (2) if the project would be in compliance with applicable laws, ordinances, regulations, and standards (LORS).

In this analysis staff identifies the (1) the roads and routings that are proposed for use for construction and operation; (2) potential traffic-related problems associated with the use of those routes by construction workers and truck drivers; (3) anticipated encroachments upon public rights-of-way during the construction of the proposed project and associated facilities; (4) frequency of trips and probable routes associated with the delivery of hazardous materials; and (5) possible effect of project operations on local airport flight traffic.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Traffic and Transportation Table 1 provides a general description of adopted federal, state, and local LORS pertaining to traffic and transportation relevant to the proposed project.

Traffic and Transportation Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal	
Code of Federal Regulations (CFR), Title 14 Aeronautics and Space, Part 77 Objects Affecting Navigable Airspace (14 CFR 77)	This regulation establishes standards for determining physical obstructions to navigable airspace; sets noticing and hearing requirements; and provides for aeronautical studies to determine the effect of physical obstructions to the safe and efficient use of airspace.
CFR, Title 49, Subtitle B	49 CFR Subtitle B includes procedures and regulations pertaining to interstate and intrastate transport (including hazardous materials program procedures) and provides safety measures for motor carriers and motor vehicles that operate on public highways.
State	
California Vehicle Code (CVC), Division 2, Chapter 2.5; Div. 6; Chap. 7; Div. 13; Chap. 5; Div. 14.1; Chap. 1 & 2; Div. 14.8; Div. 15	This code 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, Chapter 3; Division 2 Chapter 5.5	This code includes regulations for the care and protection of state and county highways and provisions for the issuance of written permits.
Local	
SANBAG Regional Transportation Plan	Identifies public policies and strategies for the transportation system in the San Bernardino County region.
SANBAG Congestion	Requires maintenance of level of service (LOS) E or better on CMP segments.

Management Plan (CMP)	
San Bernardino County General Plan	Establishes regional transportation objectives, policies, and implementation measures for various modes of transportation.
San Bernardino County Code, Title 5, Division 1, Highway Permit	Addresses permitting requirements for oversize/overweight vehicles.

SETTING

The project site is located approximately one mile west of the Yates Well Road interchange on Interstate 15 (I-15) in San Bernardino County, approximately 3.1 miles west of the California-Nevada border. Access to the site is via the Yates Well Road interchange on I-15 and Colosseum Road (BSE 2007A, p. 2-3). The project site is vacant with the exception of a 115 kV electrical transmission line (BSE 2007A p.2-4) and the two-lane Colosseum Road. The ISEGS would be comprised of three separate solar energy plants: Ivanpah 1, Ivanpah 2, and Ivanpah 3. This staff assessment addresses construction and operation of all three facilities.

The project site is surrounded by open space with the exception of a golf course located approximately one mile east of the site.

Parking for construction workers would be provided at the on-site laydown areas located on the outside edges of the heliostat fields (BSE 2007A, p. 2-17).

CRITICAL ROADS AND FREEWAYS

Traffic and Transportation Figure 1 and Figure 2 show the regional and local transportation features as described in the Application for Certification (AFC).

Information about critical roadways follows. This information is based on the Traffic and Transportation section of the AFC (BSE 2007A, p.5.12-9) as well as traffic data from the California Department of Transportation (Caltrans) and the County of San Bernardino.

Interstate 15 (I-15)

I-15 is a north-south divided freeway linking Los Angeles, California, to Las Vegas, Nevada. I-5 also extends from California through Nevada, Utah, Idaho, and Montana. Access from I-15 to the project site is provided via Yates Well Road. At this location I-15 consists of two lanes in each direction. Caltrans reports that I-15 carries approximately 59,690 daily vehicle trips near the ISEGS site (Caltrans 2007a).

Yates Well Road

Yates Well Road is a two-lane east-west local road providing direct access to I-15 (Caltrans 2007b). The ramp terminal intersections at the I-15/Yates Well Road Interchange are stop-controlled. No other controlled intersections exist on Yates Well Road in the vicinity of the project (BSE 2007A, p.5.12-9). San Bernardino County

reports that Yates Well Road carries approximately 249 daily vehicle trips between I-15 and Colosseum Road (COSB 2007).

Colosseum Road

Colosseum Road, an east-west two-lane direct road, provides access to the site and the Primm Valley Golf Club. Colosseum Road is located both on and immediately to the east of the project site and connects to Yates Well Road. The County of San Bernardino does not have any traffic counts on record for Colosseum Road (COSB 2007).

LEVEL OF SERVICE

"Level of service" (LOS) is a qualitative measure used to describe operational conditions within a traffic stream. LOS is used to describe and quantify the congestion level on a particular roadway or intersection in terms *speed*, *travel time,* and *delay.* The 2000 Highway Capacity Manual[1] defines six levels of service for roadways or intersections ranging from LOS A-- the best operating conditions--to LOS F—the worst. See **Traffic and Transportation APPENDIX A** for additional information.

The County of San Bernardino uses the LOS criteria to assess the performance of its street and highway system and the capacity of roadway segments (COSB 2007). The County's Threshold Standards Policy requires that LOS C or better be maintained on roadway segments under the County's jurisdiction (COSB 2006).

The San Bernardino Associated Governments (SANBAG) has adopted a Congestion Management Program (CMP). The CMP defines a network of state highways and arterials, level of service standards, and related procedures. The CMP's level of service standard requires all CMP segments to operate at LOS E or better. I-15 is a CMP roadway.

Traffic and Transportation Table 2 includes information about the existing LOS for potentially affected intersections in the project area. LOS A represents free-flowing traffic; whereas, LOS F represents slow-moving or stalled traffic (overcapacity operation). All intersections currently operate at LOS A.

Traffic and Transportation Table 2
Existing Intersection Level of Service

Intersection	AM Peak Hour	PM Peak Hour
Colosseum Road at Yates Well Road Westbound left/through approach	A	A
Colosseum Road at Yates Well Road Northbound left/right approach	A	A
I-15 southbound ramps at Yates Well Road Westbound left/through approach	A	A
I-15 southbound ramps at Yates Well Road Southbound left/through/right approach	A	A

[1] The *Highway Capacity Manual* is the most widely used resource for traffic analysis. The Highway Capacity Manual is prepared by the Transportation Research Board, Committee on Highway Capacity and Quality of Service. The current edition was published in 2000.

I-15 northbound ramps at Yates Well Road Eastbound left/through approach	A	A
I-15 northbound ramps at Yates Well Road Northbound left/through/right approach	A	A

Source: BSE 2007A, page 5.12-11

Traffic and Transportation Table 3 includes information about the existing volume-to-capacity (V/C) ratios and LOS for potentially affected roadway segments in the project vicinity.

Traffic and Transportation Table 3
Level of Service Summary for Existing Conditions

Name	Design Capacity	Volume*	V/C*	LOS*
Colosseum Road	3,000	NA	NA	A
Yates Well Road	6,000	249	0.04	A
I-15 NB & SB	72,000	59,690	0.83	C

Volume data for Colosseum Road a 2-lane dirt road is not maintained, however, based on field observation, this road is seldom used (BSE 2007A, p. 5.12-17).
Sources of capacity and volume data for Yates Well Road and I-15 are, TRB 2000, COSB 2007, and Caltrans 2007a, respectively.
V/C = volume-to-capacity ratio;
LOS = level of service

Although I-15 operates at LOS C or better most days of the week (Monday through Thursday), northbound I-15 experiences increased traffic volumes on Friday afternoons because of commuter and tourist traffic from California to Las Vegas, Nevada. On most days, as presented in **Traffic and Transportation Table 3**, I-15 experiences an average daily traffic volume of approximately 60,000 trips—or an hourly average of approximately 1,200 trips per lane. However, on Fridays from approximately 12 p.m. to 10 p.m., northbound I-15 experiences an hourly average of approximately 2,000 trips per lane and operates at LOS F (BSE 2007A, p. 5.12-11 and Figure 5.12-5).

RAILWAYS

An active Union Pacific Railroad line exists approximately five miles east of the project site (BNSF 2005). Project construction traffic is not expected to cross this rail line (BSE 2007A, p. 5.12-11).

PUBLIC TRANSPORTATION

No public transit service exists in the vicinity of the project site. Amtrak serves the corridor via bus only, with service between Las Vegas and Los Angeles. Many private bus companies operate on demand for Primm Valley Golf Club customers; but no established regular schedule exists (BSE 2007A, p. 5.12-11).

BICYCLE ROUTES

No bicycle facilities exist in the project area (BSE 2007A, p. 5.12-11).

AIRPORTS

One existing public airport, Jean Airport, is located approximately 14 miles northeast of the project site and one mile south of Jean Nevada. In addition, one additional airport is proposed for the same area. Jean Airport has two paved runways that serve less than 50 aircraft, most of which are single engine airplanes and gliders (AirNav.com 2008).

In addition, the Federal Aviation Administration (FAA) and the Bureau of Land Management (BLM) are currently preparing an Environmental Impact Statement for a proposed Ivanpah Valley Airport to be constructed on approximately 6,000 acres of land just south of Jean, Nevada (VHB 2008). As currently planned, the proposed Ivanpah Valley Airport would provide sufficient airport capacity to accommodate future aircraft operations and aviation passenger demand in the Las Vegas Metropolitan Area (VHB 2008). The proposed ISEGS would be located approximately 40,000 feet (7.6 miles) southwest of the nearest runway at the proposed Ivanpah Valley Airport.

ASSESSMENT OF IMPACTS AND MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

To determine whether a potentially significant impact would be generated by a project, staff reviewed the project using the criteria found in the CEQA Guidelines, Appendix G, Environmental Checklist Form, and applicable LORS used by other governmental agencies. Specifically, staff analyzed whether the proposed project would:

- Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)
- Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks
- Generate glare that could present a hazard to aircraft
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)
- Result in inadequate emergency access
- Result in inadequate parking capacity
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

In addition staff analyzes two additional potential traffic and transportation impacts concerning (1) nearby school operations and (2) transportation of hazardous materials. However, no schools are located within at least 30 miles of ISEGS site. Consequently, this staff assessment does not contain such an analysis. However, an analysis of the impacts of transporting hazardous materials may be found in the Operation Impacts and Mitigation Section.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Construction Impacts and Mitigation

Total Construction Traffic

Facility construction is projected to take place over 48 months, beginning in first quarter 2009 and completed in last quarter 2012. Construction activities would generally occur from Monday through Saturday between the hours of 5 a.m. and 7 p.m. However, additional hours may be necessary to compensate for schedule deficiencies or to complete critical construction activities. **Traffic and Transportation Table 4** contains peak construction traffic estimates for the ISEGS.

Traffic and Transportation Table 4
Estimated Construction Trip Generation

Trip Type	Average Daily Traffic	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Container trucks for heliostat fields	7	7	0	7	0	7	7
Delivery trucks for power block	2	2	0	2	0	2	2
Heavy vehicles for power block	3	3	0	3	0	3	3
Worker Busses	39	39	0	39	0	39	39
Private Vehicles	192	192	0	192	0	192	192
Total Construction Traffic	**243**	**243**	**0**	**243**	**0**	**243**	**243**

Source: BSE 2007A, p. 5.12-15

Assumptions on which the information in Table 4 is based follow.

1. Sixty percent of the 959 staff would arrive to the site by bus transport (15 people per bus) and 40 percent of staff would arrive by private vehicle typically with two persons per vehicle. During peak construction, workers would commute to the site in 39 busses and 192 private vehicles for a total of 231 trips. As included in **Traffic and Transportation Table 4,** delivery of construction materials during peak construction would require seven container trucks for heliostat fields; two delivery trucks for the power block; and three heavy vehicles for the power block, for a total of 12 truck trips per day (BSE 2007A, p 5.12-15). Therefore, a total of 243 construction vehicles are expected to drive to the site each day during peak construction.

2. Ninety-five percent of workers in private vehicles (183 vehicles) would originate in Las Vegas, Nevada. The remaining five percent of workers (9 private vehicles) as well as the trucks transporting the heliostats and power bloc would travel from California. Therefore, a total of 227 vehicles would travel from Nevada (39 busses; 183 private vehicles; 5 power block item deliveries) and 16 vehicles (9 private vehicles and 7 heliostat item deliveries) would travel from California (BSE 2007A, p 5.12-15). Although construction materials would likely arrive at the site throughout the day, all construction-related trips would arrive at the project site during the AM peak hour and would depart the site during the PM peak hour.

An HCM (Highway Capacity Manual) intersection analysis was conducted for the six approaches that would be directly affected by project construction traffic. Peak construction period intersection volumes were generated by adding the project peak intersection volumes to the existing peak intersection volumes. **Traffic and Transportation Table 5** includes information about the change in LOS with the addition of project peak construction traffic during the morning and afternoon peak hours.

Traffic and Transportation Table 5
Levels of Service During Project Peak Construction

Intersection	Existing				With Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Trips	LOS	Trips	LOS	Trips	LOS	Trips	LOS
Colosseum Road at Yates Well Road ; westbound left/through approach	7	A	26	A	7	A	269	A
Colosseum Road at Yates Well Road' northbound left/right approach	26	A	7	A	269	A	7	A
I-15 southbound ramps at Yates Well Road; westbound left/through approach	8	A	7	A	24	A	3	A
I-15 southbound ramps at Yates Well Road; southbound left/through/right approach	26	A	3	A	253	A	248	A
I-15 northbound ramps at Yates Well Road; eastbound left/through approach	5	A	3	A	5	A	3	A
I-15 northbound ramps at Yates Well Road; northbound left/through/right approach	8	A	19	A	24	A	246	B

Source: BSE 2007A, page 5.12-11, Figure 5.12-3, and Figure 5.12-4; and CH2ML 2008a.

As indicated in **Traffic and Transportation Table 5**, all intersections would continue to operate at an acceptable level of service (LOS C or better) in the morning and afternoon peak hours with the addition of peak construction traffic. Construction traffic would result in a change to the level of service at the intersection of the I-15 northbound ramps and Yates Well Road from LOS A to LOS B during the PM peak hour. However this change would not be significant because it would be below LOS C.

Traffic and Transportation Table 6 includes information about the predicted change to critical road segment LOS levels during construction of the ISEGS. As indicated in the table, project-related construction traffic would not cause the LOS on project area roadway segments to decline. All roadway segments would continue to operate at LOS C or better.

Traffic and Transportation Table 6
Intersection LOS Analysis with Project Construction Traffic

Roadway Segment on Main Street	Capacity (vehicle/ hour)	Existing			Construction Traffic (vehicle/day)	With Project		
		Volume (vehicle/ day)	V/C	LOS		Volume (vehicle/ day)	V/C	LOS
Colosseum Road	3,000	NA	NA	A	243	0.08	NA	A
Yates Well Road	6,000	249	0.04	A	243	492	0.08	A
I-15 NB & SB	72,000	59,690	0.83	C	243	59,933	0.83	C

Volume data for Colosseum Road a 2-lane dirt road is not maintained, however, based on field observation, this road is seldom used and is therefore assumed to operate at LOS A (BSE 2007A, p. 5.12-17).
Sources of capacity and volume data for Yates Well Road and I-15 are: TRB 2000, COSB 2007, and Caltrans 2007a, respectively.
V/C = volume-to-capacity ratio;
LOS = level of service

As indicated previously, northbound I-15 operates at LOS F on Friday afternoons. The proposed project would add 227 vehicles during construction to northbound I-15 on Friday afternoons, when traffic on this road is highly congested. The number of vehicles added to northbound I-15 on Friday afternoons as a result of the project would be minor compared to the number of vehicles traveling on northbound I-15 during the same time. However, the project would exacerbate existing congestion on I-15 in the area of Yates Well Road.

Because northbound I-15 is already highly congested on Friday afternoons, and project-related construction traffic would exacerbate congestion in the area of Yates Well Road, project impacts on northbound I-15 on Fridays are considered significant (BSE 2007A, p. 5.12-16). To limit the proposed project's contribution to existing congestion on northbound I-15 on Friday afternoons, staff has proposed Condition of Certification **TRANS-1**, which would require development and Energy Commission staff approval of a traffic control plan that must include methods to substantially reduce the project's impact on I-15 traffic, such as staggering the departure of construction workers from the ISEGS site on Friday afternoons and/or establishing a carpool/vanpool incentive program. Staff believes that with proper implementation of the traffic control plan, the project's direct impact during construction can be reduced to a less-than-significant level.

Regarding existing levels of service, the addition of 243 vehicle trips to Yates Well Road would not result in a significant impact. However, because this road is primarily traveled by recreationists--people traveling to the Primm Valley Golf Club and to desert recreation activities such as photography, off-highway vehicle riding, and so forth--proposed Condition of Certification **TRANS-1** also requires adequate signage along Yates Well Road as well as on the northbound and southbound I-15 off-ramps at Yates Well Road to alert travelers to the presence of construction vehicles.

Additionally, construction truck traffic could result in unexpected damage to Yates Well Road and I-15 freeway ramps. Therefore, staff is proposing Condition of Certification **TRANS-2** to require that any project construction-related damage to Yates Well Road or I-15 freeway ramps be repaired to their original condition, prior to the start of project construction.

Construction Workforce Parking and Laydown Area

The approximately 231 vehicles used to transport workers to the proposed project site during the peak construction period would park onsite. Private vehicles and busses would be parked at the approximately 300-acre laydown area at the project site (BSE 2007A, p.5.12-17; CH2ML 2008u, p.5-1). Although the precise number of available parking spaces is unknown, using a conservative assumption of 12 feet by 25 feet of area for one parking space, the applicant would need an approximate area of at least 69,300 square feet (1.5 acres) to accommodate 192 private vehicles and 39 busses. The 300-acre laydown are would be more than adequate to park 231 vehicles.

Hazards Due to a Street Design Feature

Primary access to the ISEGS site would be from Colosseum Road, which runs through the Ivanpah 2 site. However, prior to construction, this road would be realigned to run between Ivanpah 1 and Ivanpah 2 (BSE 2007A, p.5.12-17). The project site is comprised of mostly vacant desert land except for Colosseum Road and the electrical transmission line that traverses the site.

Most of the land surrounding the project site is unimproved with the exception of the two-lane unpaved Colosseum Road located adjacent to the site and the electrical transmission line (these features are located both on and adjacent to the project site). The entrance to the ISEGS site would be graded to dimensions to accommodate construction trucks; therefore, no impacts are expected to occur as a result of a street design feature.

The project would result in placement of three fields of reflective heliostat mirrors over an area of greater than 4,000 acres located within 0.9 mile from I-15. These mirrors would reflect and focus solar energy (sunlight) on power tower receivers near the center of the heliostat array. The reflecting area of an individual heliostat is about 7.04 square meters (BSE 2007a, p.2-2). However, the applicant has indicated that design controls would restrict movement of the heliostats such that the mirrors would not reflect sunlight toward vehicles on I-15 (CH2ML 2008a, p. 69).

Additionally, the applicant has indicated that a potential source of glare for traffic on I-15 is the solar receivers installed on the top of the power towers. The closest distance between an onsite power tower and I-15 is approximately 1.2 miles (CH2ML 2008a, p. 69). The applicant has indicated that the radiance from the solar receivers perceived by drivers at this distance would be similar to viewing a 100-watt light bulb from a distance of over 130 feet (CH2ML 2008a). However, staff continues to investigate this issue and will provide a complete analysis in the FSA.

Linear Facilities

The proposed project would use potable water from wells located approximately 0.5 mile east of Ivanpah 2. Water would be treated using a package treatment plant. Fire suppression water would be stored onsite in a raw water tank reserved for that purpose (BSE 2007A, p. 5.12-16).

The project includes a small package sewage system located at each power block and at the administration building/operations and maintenance building for potable water streams, including showers and toilet. Sewage sludge would be removed from the site by sanitary service.

All wastewater is recycled in the system except for a small stream of treated water used for landscape irrigation. Therefore, no traffic impacts due to water line construction would result from this project (BSE 2007A, p. 5.12-16).

Approximately 5.3 miles of new 4- to 6-inch-diameter natural gas pipeline from the Kern River Gas Transmission Line would extend south through the Ivanpah 2 and Ivanpah 3 sites to the power block of the Ivanpah 1 site. The gas line would connect to the Kern River line approximately 0.5 mile north of the Ivanpah 3 boundary. The line would not require public road closure and would not affect traffic (BSE 2007A, p. 5.12-17).

Ivanpah 1, 2, and 3 would be interconnected to the grid through upgrades to Southern California Edison's 115-kV line passing through the site on a northeast-southwest right-of-way. Ivanpah 1 would be connected to the substation with a 5,800-foot-long line; Ivanpah 2, through the substation with a 3,900-foot-long line; and Ivanpah 3 would be connected through the substation with a 14,100-foot-long line. Construction of the lines would not require public road closure and would not affect traffic (BSE 2007A, p. 5.12-17).

Operation Impacts and Mitigation

Operation Workforce Traffic

The operational phase of the proposed project would require 90 employee commutes, or 180 daily trips. Thirty employees are required for the daytime shift. The remaining 60 employees work on the night time shift and would not travel during the peak hours (BSE 2007A, p.5.12-17). However, it is assumed that the daytime workforce of 30 would travel from the Las Vegas area during the AM peak hours and to the Las Vegas area during the PM peak hours.

Thirty operational trips added to I-15 during peak hours would not represent a substantial increase in traffic volume and would not result in a significant impact Monday through Thursday. However, as indicated previously, northbound I-15 operates at LOS F on Friday afternoons and into the late evening. The number of project-related vehicles added to northbound I-15 on Friday afternoons would be minor compared to the number of vehicles traveling on northbound I-15 during the same time. However, because the project would exacerbate existing congestion on I-15 in the area of Yates Well Road, project impacts on northbound I-15 on Friday afternoons are considered significant. To limit the proposed project's contribution to existing congestion on northbound I-15 on Friday afternoons, staff has proposed Condition of Certification **TRANS-1**, which would require development and Energy Commission staff approval of a traffic control plan that must include methods to substantially reduce the project's impact on traffic on I-15, such as staggering the departure of operational employees from the ISEGS site on Friday afternoons and/or establishing a carpool/vanpool incentive program.

Condition of Certification **TRANS-1** would reduce the impact from project operation-related traffic on northbound I-15 to a less-than-significant level. Staff consulted with Dan Kopulsky of Caltrans District 8 on the content of staff's proposed Condition of Certification TRANS-1, and Mr. Kopulsky indicated that although the addition of any project-related trips would be considered adverse, with the expected vehicle reductions from implementation of Condition of Certification TRANS-1, these impacts would be less than significant (Kopulsky 2008).

Operational employees would park in a parking lot provided at Ivanpah 1. The onsite parking is expected to be large enough to accommodate at least 60 vehicles, therefore, operation of the ISEGS is not expected to result in an inadequate parking capacity.

Airports

FAA Regulations, Part 77, Section 77.13(a)(1), require that objects greater than 200 feet tall from the ground surface constructed within three miles of an airport with a runway of more than 3,200 feet in length may present an obstruction hazard to aircraft. Furthermore, obstruction standards presented in 14 CFR 77.25 affecting navigable air space state that an object may present a hazard to air navigation if it penetrates the horizontal departure surface from a distance of 10,000 feet at a slope of 50 to 1 with an additional 40,000 feet at a slope of 40 to 1. The ISEGS would require construction of seven power towers to a height of 469 feet above the ground surface.

No existing airports are located within three miles of the proposed project site. However, one runway of the proposed Ivanpah Valley Airport is proposed to be located approximately 40,000 feet from the ISEGS site. Therefore, in May 2008, the applicant submitted FAA Form 7460-1 (Notice of Proposed Construction or Alteration) to the FAA. **Traffic and Transportation Table 7** includes information about FAA's review of project towers.

Traffic and Transportation Table 7
Status of FAA Review of Form 7460-1

Tower Number	Location	Aeronautical Study No.[1]	FAA Determination
Power Tower 1	Ivanpah 1	2008-AWP-3209-OE	No Hazard to Navigation
Power Tower 2	Ivanpah 2	2008-AWP-3210-OE	No Hazard to Navigation
Power Tower 3	Ivanpah 3	2008-AWP-3211-OE	No Hazard to Navigation
Power Tower 4	Ivanpah 3	2008-AWP-3212-OE	No Hazard to Navigation
Power Tower 5	Ivanpah 3	2008-AWP-3213-OE	No Hazard to Navigation
Power Tower 6	Ivanpah 3	2008-AWP-3214-OE	No Hazard to Navigation
Power Tower 7	Ivanpah 3	2008-AWP-3215-OE	No Hazard to Navigation

1 Source: Determinations downloaded from https://www.oeaaa.faa.gov/oeaaa/external/portal.jsp, accessed September 9, 2008.
2 Determination is based upon standardized, non-project specific analysis. Applicant has requested that the FAA initiate project specific analysis (CH2ML 2008a).

As included in **Traffic and Transportation Table 7,** the FAA has determined that none of the seven towers would present a hazard to navigation to aircraft from the proposed

Ivanpah Valley Airport. Power Tower 1 received a determination of no hazard to navigation, however it was identified to be within the flight path of Instrument Route 213 (IR-213), a U.S. Navy training flight route (FAA 2008a). However, the U.S. Navy has confirmed that construction of Power Tower 1 would not impose a significant impact to IR-213, and that the Department of the Navy has no objection to the construction (Thompson 2008).

The FAA Determination for each tower includes a recommendation that each tower be marked and/or lighted in accordance with FAA Advisory circular 70/7460-1 K. To ensure that each tower is marked with appropriate lighting, Staff has proposed Condition of Certification **TRANS-3.** Condition of Certification **TRANS-3** requires the applicant to implement all FAA recommendations regarding structure lighting for Power Towers 1 through 7.

During the operational phase, the project could adversely affect aviation operations at the proposed Ivanpah Valley Airport due to glare from the solar thermal arrays. Staff continues to investigate this issue and will provide a complete analysis in the Final Staff Assessment (FSA).

Emergency Services Vehicle Access

The San Bernardino County Fire Department (SBCFD) Station No. 53 in Baker, CA would provide service to the proposed project site. Station No. 53 is located approximately 45 miles from the project site and is staffed by three personnel including a full-time Captain and two paid-call firefighters (PCFs), who are supported as needed by other PCFs who live in the local area (SBCFD 2008).

In the event of an emergency at the proposed project site, emergency vehicles would enter the project site via Colosseum Road. Based on the proposed site plan, staff believes emergency services vehicle access is adequate.

Transportation of Hazardous Materials

Operation of the ISEGS would result in transportation of hazardous materials. Staff has addressed this issue in the **Hazardous Materials Management** section of this Staff Assessment. As presented in that section, staff believes that during construction and operation of ISEGS, minimal amounts and types of hazardous materials (paint, cleaners, solvents, gasoline, diesel fuel, motor oil, lubricants, 20 percent sulfuric acid, 20 percent aqueous ammonia, and welding gases in standard-sized cylinders) do not pose a significant risk of either spills or public impacts along any transportation route. Staff therefore does not recommend a specific route.

Although the transportation and handling of hazardous materials can increase roadway hazard potential, impacts associated with the hazardous materials can be mitigated to a level of insignificance by compliance with existing federal and state standards established to regulate the transportation of hazardous substances. These standards constitute a comprehensive regulatory program whose purpose is to ensure the safety of hazardous materials transportation. Staff has assessed the efficacy of these standards and finds that they are successful in minimizing the risks associated with hazardous materials transportation. The applicant stated that delivery of hazardous

materials will comply with Caltrans, California Highway Patrol (CHP), and California Vehicle Code (CVC) (BSE 2007A, p. 5.12-18).

Specific sections of the CVC and the California Streets and Highways Code ensure that the transportation and handling of hazardous materials is done in a manner that protects public safety. Enforcement of these statutes is under the jurisdiction of the CHP.

The California Department of Motor Vehicles specifically licenses all drivers who carry hazardous materials. Drivers are required to check weight limits and conduct periodic brake inspections. Commercial truck operators handling hazardous materials are required to take instruction in first aid and procedures on handling hazardous waste spills. Drivers transporting hazardous waste are required to carry a manifest, which is available for review by the CHP at inspection stations along major highways and interstates.

The applicant would be required to comply with all LORS governing the transport, storage, and use of hazardous materials. For a more detailed discussion on the handling and disposal of hazardous substances, see the **Hazardous Materials Management** section of this Staff Assessment.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).
There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables which are contained in the **Cumulative Scenario** section of this document.

- Cumulative Impacts Figure 1, Regional Renewable Applications
- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts to traffic and transportation could occur. The cumulative impact analysis itself

describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts can occur if implementation of the ISEGS project could combine with those of other local or regional projects. Cumulative impacts would occur locally if ISEGS project impacts combined with impacts of projects located within the Ivanpah Valley. Cumulative impacts could also occur as a result of development of some of the many proposed solar and wind development projects that have been or are expected to be under consideration by the BLM and the Energy Commission in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

Cumulative impacts could occur to both the local roadway network and the regional roadway network. Local impacts are impacts that would occur to the transportation system in the immediate vicinity of the project site, such as damage to local roadways, traffic delays due to road closures, and increased congestion from project-related traffic. Cumulative impacts to the local roadway network would occur if project impacts combined with impacts of projects located within the same general vicinity of the ISEGS site. Therefore, the analysis of cumulative traffic and transportation impacts is evaluated for the local roadway network, defined as the area up to two miles from the ISEGS project site.

Cumulative impacts could also affect the regional roadway network, based on potential impacts that would occur to I-15. Primary access to the project site would be provided via I-15, which is an interstate highway that connects Los Angeles, California to Las Vegas, Nevada, as well as California to Nevada, Utah, Idaho, and Montana. Existing traffic on I-15 is mostly attributable to commuter, commercial, and tourist traffic that originates from well beyond the project area, such as Las Vegas, Nevada; Barstow, California; Victorville, California; and Los Angeles, California. However, a comprehensive analysis of traffic generated by projects in such distant locations is beyond the scope of this analysis. Therefore, the geographic extent for the analysis of cumulative traffic and transportation impacts to the regional roadway network is defined as the area up to 30 miles from the project.

It should be noted that the geographic extent of regional cumulative impacts would include the future solar and wind projects that are currently proposed on California Desert Conservation Area land and in Nevada that would have the potential to generate traffic on the same segment of I-15 as the ISEGS project because the vast area over which these projects are spread and the different construction schedules would preclude the potential for traffic from these projects to combine to result in significant cumulative impacts.

Potential Environmental Impacts

Local Impacts

Construction related commuter traffic and equipment deliveries for the ISEGS project would generate up to 243 additional daily trips to roadways in the immediate vicinity of

the site (Yates Well Road, Coliseum Road, and the I-15 (regional impacts to I-15 are discussed below) on- and off-ramps located at Yates Well Road) throughout the 48-month construction period. The addition of these trips to local roadways would result in less-than-significant impacts with respect to delays to local traffic, congestion, roadway hazards, and damage to roadways. Only one of the foreseeable projects presented on Cumulative Impacts Figure 3 and Table 3, the OptiSolar photovoltaic project, has the potential to add traffic to the same local roadways as the ISEGS project. If construction of this reasonably foreseeable project were to overlap with construction of the ISEGS project, it is likely that traffic from both projects would combine to result in significant delays at area intersections, congestion on area roadways and freeway ramps, and damage to local roadways. However, the environmental review process has not yet begun for the OptiSolar photovoltaic project and there is currently no publicly available information regarding the potential construction schedule of this project. Therefore, because the environmental review process has not begun, the potential for construction of this project to overlap with construction of the ISEGS project is considered unlikely. Therefore, impacts of the ISEGS project are not expected to combine with impacts from the OptiSolar photovoltaic project to result in significant cumulative impacts to local roadways.

Several projects presented on Cumulative Impacts Figure 3 and Table 3 with the potential to result in increased congestion on I-15 are located within 15 miles of the ISEGS project. The projects currently undergoing environmental review that have the potential to be under construction at the same time as the ISEGS are the Nevada Supplemental Airport (Ivanpah Valley Airport), the Desert Xpress Train, the I-15 Mountain Pass Truck Lane, and the Caltrans Joint Port of Entry projects. Construction of each of these projects would result in increased vehicle trips on I-15. It is highly likely that some, if not all of these projects would result in additional vehicle trips on northbound I-15 on Friday afternoons. Additionally, because it is proposed to facilitate tourist travel to Las Vegas, operation of the Ivanpah Valley Airport would likely result in a substantial increase in vehicle traffic on northbound I-15 on Friday afternoons.

As discussed above under Operational Impacts and Mitigation, mitigation measures have been implemented to reduce project-related impacts to northbound I-15 on Friday afternoons to less than significant. However, even with these measures, the proposed ISEGS would result in additional vehicle trips on northbound I-15 during construction and operation. Therefore, ISEGS project impacts would be cumulatively considerable.

Regional Impacts

I-15 currently operates at a congested level of service (LOS F) on Friday afternoons due to the high volume of commuter and tourist traffic traveling from California to Las Vegas, Nevada. Although ISEGS-related project impacts are considered to be less than significant, when combined with vehicle trips generated during construction and operation of the many other solar and wind projects that could be constructed concurrently with ISEGS, the total volume of traffic that would be added to northbound I-15 would further exacerbate existing congestion on Friday afternoons. Such an increase in congestion would be a significant cumulative impact, and the contribution of the ISEGS project to this cumulative impact, during construction and operation, would be

significant. No additional mitigation measures are available to reduce the ISEGS project's contribution to this impact to less than considerable.

Cumulative Impact Conclusion

Traffic and transportation impacts of the ISEGS project would not combine with impacts of any past, present, or reasonably foreseeable projects to result in cumulatively considerable impacts to streets in the immediate vicinity of the ISEGS project site. However, traffic and transportation impacts of the ISEGS project would combine with impacts of past, present, or reasonably foreseeable projects to result in cumulatively considerable local and regional impact to northbound I-15.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Traffic and Transportation Table 8 provides a general description of applicable statutes, regulations, and standards adopted by the federal government, the State of California, and San Bernardino County pertaining to traffic and transportation with which the project is required to comply. Conditions of certification have been proposed to ensure project consistency with a law, ordinance, regulation, or standard where it was not already mandated by federal or state regulations.

Traffic and Transportation Table 8
Project Compliance with Adopted Traffic and Transportation LORS

Applicable Law	LORS Description and Project Compliance Assessment
Federal	
Code of Federal Regulations (CFR), Title 14, section 77 (14 CFR 77)	Includes standards for determining physical obstructions to navigable airspace. Sets forth requirements for notice to the Federal Aviation Administration of certain proposed construction or alteration. Also provides for aeronautical studies of obstructions to air navigation to determine their effect on the safe and efficient use of airspace (including temporary flight restrictions).
	Implementation of Condition of Certification TRANS-5 would ensure that the proposed project would comply with FAA regulations.
CFR, Title 49, Subtitle B	Includes procedures and regulations pertaining to interstate and intrastate transport (includes hazardous materials program procedures) and specifies safety measures for motor carriers and motor vehicles that operate on public highways.
	Enforcement is conducted by state and local law enforcement agencies and through state agency licensing and ministerial permitting (e.g., California Department of Motor Vehicles licensing, Caltrans permits), and/or local agency permitting.
State	
California Vehicle Code, Division 2, Chapter. 2.5; Div. 6,	Includes regulations pertaining to licensing, size, weight, and load of vehicles operated on highways; safe operation of vehicles; and the transportation of hazardous materials.

Chap. 7; Div. 13, Chap. 5; Div. 14.1, Chap. 1 & 2; Div. 14.8; Div. 15	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 & 2, Chapter 3 & Chapter 5.5	Includes regulations for the care and protection of state and county highways and provisions for the issuance of written permits.
	Enforcement is provided by state and local law enforcement and through ministerial state agency licensing and permitting and/or local agency permitting.
Local	
SANBAG Regional Transportation Plan	Identifies public policies and strategies for the transportation system in the San Bernardino County region.
	Enforcement is provided by CHP, local law enforcement, and through ministerial state agency licensing and permitting and/or local agency permitting.
SANBAG Congestion Management Plan (CMP)	Requires maintenance of level of service (LOS) E or better on CMP segments.
	Although it would contribute to an existing LOS F condition on I-15 on Friday afternoons, the ISEGS project would not cause any CMP segment to exceed minimum LOS E standards.
San Bernardino General Plan	Establishes regional transportation objectives, policies, and implementation measures for various modes of transportation.
	Project construction and operation traffic would comply with the general plan because the project would not cause LOS to drop below the County of San Bernardino's minimum criteria of LOS C.
San Bernardino County Code Title 5 Division 1 Highway Permit	Addresses permitting issues for oversize/overweight vehicles.
	Enforcement is provided by CHP, local law enforcement, and through ministerial state agency licensing and permitting and/or local agency permitting.

NOTEWORTHY PUBLIC BENEFITS

Neither the applicant nor staff has identified any traffic-related benefits associated with the ISEGS.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received no comments related directly to traffic and transportation.

CONCLUSIONS

Staff has analyzed the project's potential construction and operational impacts related to the regional and local traffic and transportation system and concludes the following:

1. During construction, because project-related construction traffic would not result in an unacceptable level of service along study area roadway segments or intersections, potential impacts created by workforce traffic and truck traffic would be less than significant. The project would exacerbate existing congestion on I-15 on Friday afternoons in the area of Yates Well Road, and impacts are considered

significant. To reduce the proposed project's construction- and operation-related contribution to congestion on northbound I-15 on Friday afternoons, staff has proposed Condition of Certification **TRANS-1** to reduce impacts to less than significant.

2. During construction, the project would substantially increase the volume of traffic on roadways and intersections in the vicinity of recreation resources. Therefore, staff's proposed Condition of Certification **TRANS-1** requires adequate signage along local roads and intersections to alert travelers to the presence of construction vehicles.

3. Because proposed project construction traffic has the potential to result in unexpected damage to Yates Well Road and I-15 freeway ramps, staff has proposed Condition of Certification **TRANS-2** to ensure that any damage to local roadways would be repaired to pre-project levels to not present a safety hazard to motorists.

4. Saturday through Thursday during operation, workforce and truck traffic to and from the facility would not result in a substantial increase in congestion, deterioration of the existing level of service, or creation of a traffic hazard during any time in the daily traffic cycle and would have a less-than-significant impact along the routes or roadway intersections that would be used to access the ISEGS site..

5. Because the proposed project would result in construction of structures greater than 200 feet tall in the vicinity of a proposed airport and existing military training flight route, staff has proposed Condition of Certification **TRANS-3** to ensure that onsite power towers are lighted in accordance with FAA recommendations. The project would not adversely affect aircraft operations associated with any aircraft flight traffic.

6. The construction and operation of the ISEGS as proposed, with the effective implementation of staff's recommended conditions of certification below, would ensure that the project's direct adverse traffic and transportation impacts would be less than significant.

7. Vehicle trips generated by construction and operation of the ISEGS would combine with vehicle trips generated by past, present and reasonably foreseeable projects to contribute to the existing significant cumulative impact of congestion on northbound I-15 on Friday afternoons.

8. Staff has determined that, with the implementation of the traffic control plan required by proposed Condition of Certification **TRANS-1**, construction and operation of the ISEGS would not cause a direct significant impact on northbound I-15 on Friday afternoons, but would contribute to a cumulatively considerable significant impact on northbound I-15 on Friday afternoons. All other direct and cumulative project impacts would be less than significant or would be mitigated to a level of less than significant.

9. The applicant has indicated that the project could be a potential source of glare to traffic on I-15 and that such glare could adversely affect aviation activities at the proposed Ivanpah Valley Airport. Staff continues to investigate this issue and will provide a complete analysis in the Final Staff Assessment (FSA).

If the Energy Commission elects to grant certification for this project, staff is proposing three conditions of certification.

PROPOSED CONDITIONS OF CERTIFICATION

TRAFFIC CONTROL PLAN

TRANS-1 Prior to start of construction of the ISEGS, the project owner shall prepare and implement a traffic control plan for ISEGS construction and operation traffic, containing:

- a Traffic Management Plan addressing the movement of vehicles and materials, including arrival and departure schedules, and designated workforce and delivery routes.
- redirection of construction traffic with a flag person.
- signage, lighting, and traffic control device placement at the project construction site and laydown areas.
- signage along east bound and westbound Yates Well Road and at the entrance of each the I-15 northbound and southbound off-ramps at Yates Well Road notifying drivers of construction traffic throughout the duration of the construction period.
- a Heavy Haul Plan addressing the transport and delivery of heavy and oversized loads requiring permits from Caltrans or other state and federal agencies.
- a work schedule and end-of-shift departure plan, and/or a carpool/vanpool incentive program to substantially reduce the number of project-related vehicles traveling from the project site to Las Vegas during Friday afternoon peak traffic hours (e.g., limiting departures from the site to fewer than 15 vehicles every 15 minutes between 12:00 PM and 10:00 PM every Friday).

The project owner shall consult with the County of San Bernardino and the Caltrans District 8 office in the preparation and implementation of the traffic control plan and shall submit the proposed traffic control plan to the County of San Bernardino and the Caltrans District 8 office in sufficient time for review and comment and to the Energy Commission Compliance Project Manager (CPM) for review and approval prior to the proposed start of construction and implementation of the plan. The project owner shall provide a copy of any written comments from the County of San Bernardino and the Caltrans District 8 office and any changes to the traffic control plan to the CPM prior to the proposed start of construction.

Verification: At least 90 calendar days prior to the start of construction, including any grading or site remediation on the power plant site or its associated easements, the project owner shall submit the proposed traffic control plan to the County of San Bernardino and the Caltrans District 8 office for review and comment and to the CPM for review and approval. The project owner shall also provide the CPM with a copy of the

transmittal letter to the County of San Bernardino and the Caltrans District 8 office requesting review and comment.

At least 30 calendar days prior to the start of construction, the project owner shall provide copies of any comment letters received from either the County of San Bernardino and the Caltrans District 8 office, along with any changes to the proposed traffic control plan to the CPM for review and approval.

REPAIR OF PUBLIC RIGHT-OF-WAY

TRANS-2 The project owner shall restore all public roads, easements, and rights-of-way that have been damaged due to project-related construction activities to original or near-original condition in a timely manner.

Prior to the start of site mobilization, the project owner shall consult with the County of San Bernardino and Caltrans District 8 and notify them of the proposed schedule for project construction. The purpose of this notification is to request that the County of San Bernardino and Caltrans consider postponement of public right-of-way repair or improvement activities in areas affected by project construction until construction is completed and to coordinate with the project owner regarding any concurrent construction-related activities that are planned or in progress and cannot be postponed.

Verification: At least 30 days prior to the start of mobilization, the project owner shall photograph or videotape all affected public roads, easements, and right-of-way segment(s) and/or intersections and shall provide the CPM, the affected local jurisdiction(s) and Caltrans (if applicable) with a copy of these images.

Within 60 calendar days after completion of construction, the project owner shall meet with the CPM, the County of San Bernardino and Caltrans District 8 to identify sections of public right-of-way to be repaired. At that time, the project owner shall establish a schedule to complete the repairs and to receive approval for the action(s). Following completion of any public right-of-way repairs, the project owner shall provide a letter signed by the County of San Bernardino and Caltrans District 8 stating their satisfaction with the repairs to the CPM.

POWER TOWER LIGHTING

TRANS-3 The project owner shall ensure that each power tower is marked and lighted according to the recommendations included in the FAA aeronautical study performed for each tower. Additionally, the project owner shall submit FAA Form 7460-2 Part II, Notice of Actual Construction or Alteration, to the FAA within 5 days of completion of construction of the tower to its greatest height.

The project owner shall provide evidence of compliance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting by submitting a copy of Form 7460-2 to the CPM for review and approval upon completion of construction or each power tower.

Verification: Within 5 days of completion of construction of each of the seven power towers, the project owner shall submit the above referenced evidence to the CPM for review and approval.

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FAA 2008d. Federal Aviation Administration. Determination of No Hazard to Air Navigation. Aeronautical Study No. 2008 AWP-3212-OE. July 23.

FAA 2008e. Federal Aviation Administration. Determination of No Hazard to Air Navigation. Aeronautical Study No. 2008 AWP-3213-OE. July 23.

FAA 2008f. Federal Aviation Administration. Determination of No Hazard to Air Navigation. Aeronautical Study No. 2008 AWP-3214-OE. July 23.

FAA 2008g. Federal Aviation Administration. Notice of Presumed Hazard. Aeronautical Study No. 2008 AWP-3215-OE. October 9.

FAA 2008h. Federal Aviation Administration. Public Notice. Aeronautical Study No. 2008 AWP-3215-OE. July 29.

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Traffic and Transportation APPENDIX A

HIGHWAY CAPACITY MANUAL

The *Highway Capacity Manual* is prepared by the Transportation Research Board, Committee on Highway Capacity and Quality of Service. It represents a concentrated, multi-agency effort by the Transportation Research Board, the Federal Highway Administration, the American Association of Highway and Transportation Officials, and other traffic/transportation related agencies. It is the most widely used resource for traffic analysis. Several versions of the Highway Capacity Manual have been published. The current edition was published in 2000. It contains concepts, guidelines, and computational procedures for computing the capacity and quality of service of various highway facilities, including freeways, signalized and unsignalized intersections, rural highways, and the effects of transit, pedestrians, and bicycles on the performance of these systems.

LEVEL OF SERVICE

The description and procedures for calculating capacity and level of service are found in the *Highway Capacity Manual 2000*. The *Highway Capacity Manual 2000* represents the latest research on capacity and quality of service for transportation facilities.

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six levels of service are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with level of service A representing the best operating conditions and level of service F the worst. Each level of service represents a range of operating conditions and the driver's perception of these conditions. Safety is not included in the measures that establish service levels. A general description of service levels for various types of facilities is shown in **Table A-1**.

Traffic and Transportation Table A-1
Level of Service Description

Facility Type	Uninterrupted Flow	Interrupted Flow
	Freeways Multi-Lane Highways Two-Lane Highways Urban Streets	Signalized Intersections Unsignalized Intersections - Two-Way Stop Control - All-Way Stop Control
Level of Service		
A	Free-flow	Very low delay
B	Stable flow. Presence of other users noticeable.	Low delay
C	Stable flow. Comfort and convenience starts to decline.	Acceptable delay
D	High density stable flow	Tolerable delay
E	Unstable flow	Limit of acceptable delay
F	Forced or breakdown flow	Unacceptable delay
Source: *Highway Capacity Manual 2000*		

Interrupted Flow

One of the more important elements limiting, and often interrupting, the flow of traffic on a highway is the intersection. Flow on an interrupted facility is usually dominated by points of fixed operation such as traffic signals and stop and yield signs. These all operate quite differently and have differing impacts on overall flow.

Signalized Intersections

The capacity of a highway is related primarily to the geometric characteristics of the facility, as well as to the composition of the traffic stream on the facility. Geometrics are a fixed, or non-varying, characteristic of a facility.

At the signalized intersection, an additional element is introduced into the concept of capacity: time allocation. A traffic signal essentially allocates time among conflicting traffic movements seeking use of the same physical space. The way in which time is allocated has a significant impact on the operation of the intersection and on the capacity of the intersection and its approaches.

Level of service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions (i.e., in the absence of traffic control, geometric delay, any incidents, and any other vehicles). Specifically, level of service criteria for traffic signals is stated in terms of average control delay per vehicle, typically for a 15-minute analysis period. Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the ratio of green time to cycle length and the volume-to-capacity ratio for the lane group.

For each intersection analyzed, the average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection. A level of service designation is given to the control delay to better describe the level of operation. Descriptions of levels of service for signalized intersections can be found in **Table A-2**.

Traffic and Transportation Table A-2
Description of Level of Service for Signalized Intersections

Level of Service	Description
A	Very low control delay, up to 10 seconds per vehicle. Movement forward (progression) is extremely favorable, and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.
B	Control delay greater than 10 and up to 20 seconds per vehicle. There is good progression or short cycle lengths or both. More vehicles stop causing higher levels of delay.
C	Control delay greater than 20 and up to 35 seconds per vehicle. Higher delays are caused by fair progression or longer cycle lengths or both. Individual cycle failures may begin to appear. Cycle failure occurs when a given green phase does not serve a waiting line of vehicles, and overflow occurs. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.
D	Control delay greater than 35 and up to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volumes. Many vehicles stop, the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Control delay greater than 55 and up to 80 seconds per vehicle. The limit of acceptable delay. High delays usually indicate poor progression, long cycle lengths, and high volumes. Individual cycle failures are frequent.
F	Control delay in excess of 80 seconds per vehicle. Unacceptable to most drivers. Oversaturation and arrival flow rates exceed the capacity of the intersection. Many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to higher delay.
Source: *Highway Capacity Manual 2000*	

The use of control delay, often referred to as signal delay, was introduced in the 1997 update to the *Highway Capacity Manual*. It represents a departure from previous updates. In the third edition of the *Highway Capacity Manual*, published in 1985 and the 1994 update to the third edition, delay only included stop delay. Thus, the level of service criteria listed in Table B differs from earlier criteria.

Unsignalized Intersections

The current procedures on unsignalized intersections were first introduced in the 1997 update to the *Highway Capacity Manual* and represent a revision of the methodology published in the 1994 update to the 1985 *Highway Capacity Manual*. The revised procedures use control delay as a measure of effectiveness to determine level of service. Delay is a measure of driver discomfort, frustration, fuel consumption, and

increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions (i.e., in the absence of traffic control, geometric delay, any incidents, and any other vehicles). Control delay is the increased time of travel for a vehicle approaching and passing through an unsignalized intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection.

Two-Way Stop Controlled Intersections

Two-way stop controlled intersections in which stop signs are used to assign the right-of-way, are the most prevalent type of intersection in the United States. At two-way stop-controlled intersections, the stop-controlled approaches are referred as the minor street approaches and can be either public streets or private driveways. The approaches that are not controlled by stop signs are referred to as the major street approaches.

The capacity of movements subject to delay is determined using the "critical gap" method of capacity analysis. Expected average control delay based on movement volume and movement capacity is calculated. A level of service designation is given to the expected control delay for each minor movement. Level of service is not defined for the intersection as a whole. Control delay is the increased time of travel for a vehicle approaching and passing through an all-way, stop-controlled intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection. A description of levels of service for two-way stop-controlled intersections is found in **Table A-3**.

Traffic and Transportation Table A-3
Description of Level of Service for Two-Way Stop Controlled Intersections

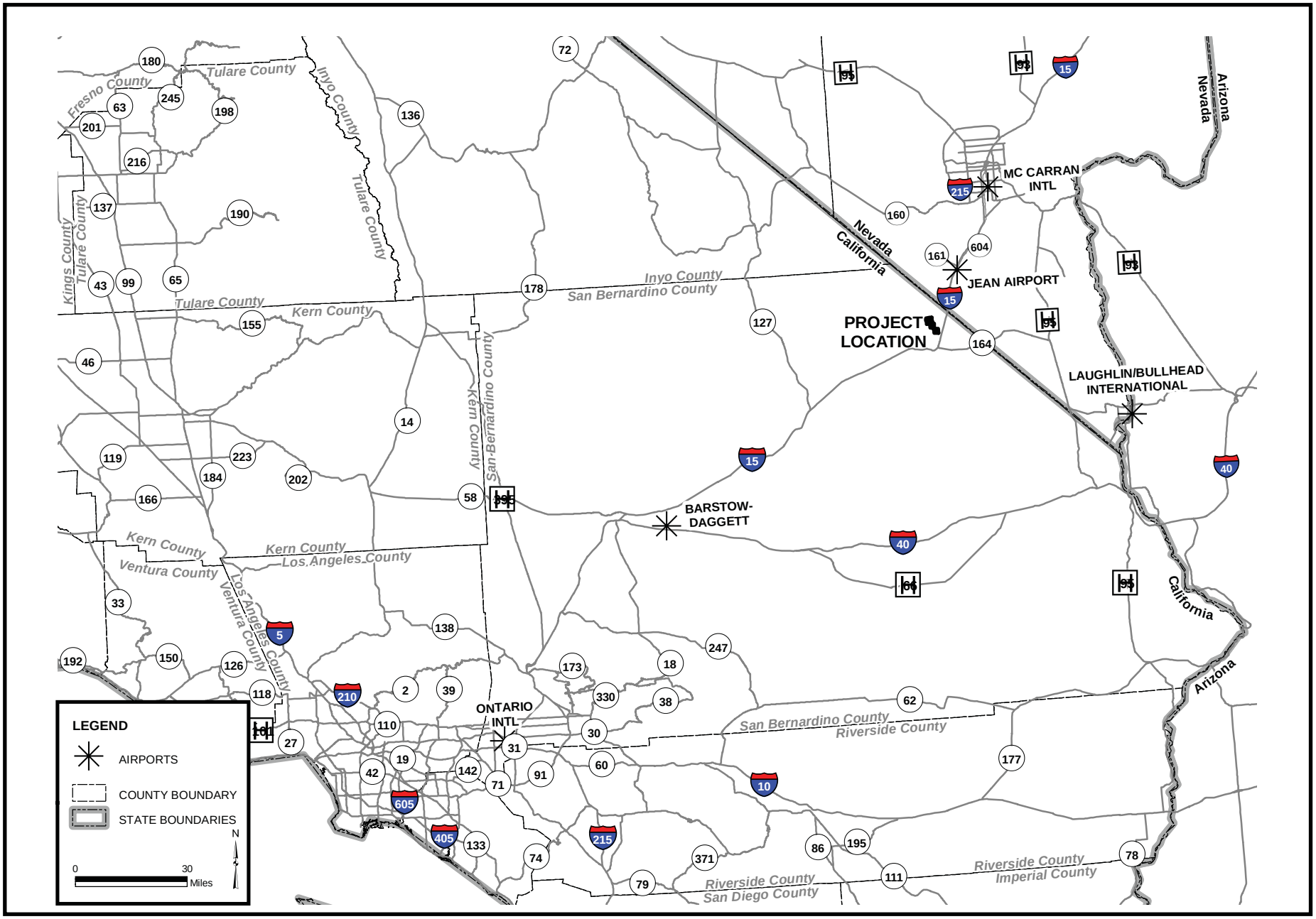
Level of Service	Description
A	Very low control delay less than 10 seconds per vehicle for each movement subject to delay.
B	Low control delay greater than 10 and up to 15 seconds per vehicle for each movement subject to delay.
C	Acceptable control delay greater than 15 and up to 25 seconds per vehicle for each movement subject to delay.
D	Tolerable control delay greater than 25 and up to 35 seconds per vehicle for each movement subject to delay.
E	Limit of acceptable control delay greater than 35 and up to 50 seconds per vehicle for each movement subject to delay.
F	Unacceptable control delay in excess of 50 seconds per vehicle for each movement subject to delay.
Source: *Highway Capacity Manual 2000*	

REFERENCE

Transportation Research Board. Highway Capacity Manual 2000. Washington, D.C.

TRAFFIC & TRANSPORTATION - FIGURE 1

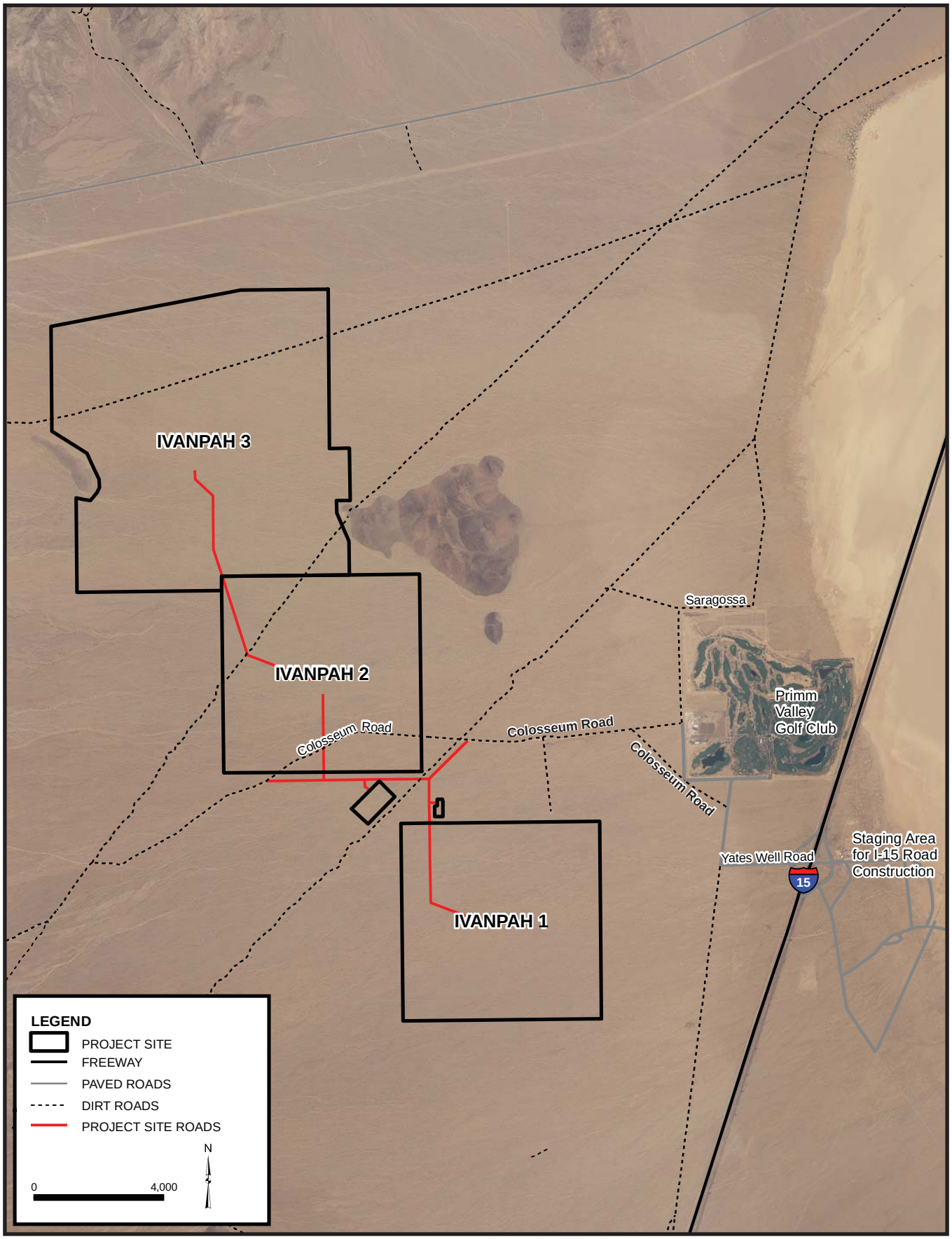
Ivanpah Solar Electric Generating System - Regional Transportation Network



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: AFC Fig. 5.12-1

TRAFFIC & TRANSPORTATION - FIGURE 2
Ivanpah Solar Electric Generating System - Local Roadways



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008
SOURCE: AFC Fig. 5.12-2

TRANSMISSION LINE SAFETY AND NUISANCE

Obed Odoemelam, Ph.D.

INTRODUCTION

The purpose of this analysis is to assess the proposed Ivanpah Solar Electric Generating System Units 1 through 3 transmission lines' design and operational plan to determine whether their related field and non-field impacts would constitute a significant environmental hazard in the areas around the proposed routes. All related health and safety laws, ordinances, regulations, and standards (LORS) are currently aimed at minimizing such hazards. Staff's analysis focuses on the following issues taking into account both the physical presence of the lines and the physical interactions of their electric and magnetic fields:

- aviation safety;
- interference with radio-frequency communication;
- audible noise;
- fire hazards;
- hazardous shocks;
- nuisance shocks; and
- electric and magnetic field (EMF) exposure.

The following federal, state, and local laws and policies apply to the control of the field and non-field impacts of electric power lines. Staff's analysis examines the project's compliance with these requirements.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

TRANSMISSION LINE SAFETY AND NUISANCE (TLSN) TABLE 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Aviation Safety	
Federal	
Title 14, Part 77 of the Code of Federal Regulations (CFR),"Objects Affecting the Navigable Air Space"	Describes the criteria used to determine the need for a Federal Aviation Administration (FAA) "Notice of Proposed Construction or Alteration" in cases of potential obstruction hazards.
FAA Advisory Circular No. 70/7460-1G, "Proposed Construction and/or Alteration of Objects that May Affect the Navigation Space"	Addresses the need to file the "Notice of Proposed Construction or Alteration" (Form 7640) with the FAA in cases of potential for an obstruction hazard.
FAA Advisory Circular 70/460-1G, "Obstruction Marking and Lighting"	Describes the FAA standards for marking and lighting objects that may pose a navigation hazard as established using the criteria in Title 14, Part 77 of the CFR.

Applicable LORS	Description
Interference with Radio Frequency Communication	
Federal	
Title 47, CFR, section 15.2524, Federal Communications Commission (FCC)	Prohibits operation of devices that can interfere with radio-frequency communication.
State	
California Public Utilities Commission (CPUC) General Order 52 (GO-52)	Governs the construction and operation of power and communications lines to prevent or mitigate interference.
Audible Noise	
Local	
San Bernardino County General Plan, Noise Element	**References the county's Ordinance Code for noise limits.**
San Bernardino County Development Code	**Establishes performance standards for planned residential or other noise-sensitive land uses.**
Hazardous and Nuisance Shocks	
State	
CPUC GO-95, "Rules for Overhead Electric Line Construction"	Governs clearance requirements to prevent hazardous shocks, grounding techniques to minimize nuisance shocks, and maintenance and inspection requirements.
Title 8, California Code of Regulations (CCR) section 2700 et seq. "High Voltage Safety Orders"	Specifies requirements and minimum standards for safely installing, operating, working around, and maintaining electrical installations and equipment.
National Electrical Safety Code	Specifies grounding procedures to limit nuisance shocks. Also specifies minimum conductor ground clearances.
Industry Standards	
Institute of Electrical and Electronics Engineers (IEEE) 1119, "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Specifies the guidelines for grounding-related practices within the right-of-way and substations.
Electric and Magnetic Fields	
State	
GO-131-D, CPUC "Rules for Planning and Construction of Electric Generation Line and Substation Facilities in California"	Specifies application and noticing requirements for new line construction including EMF reduction.
CPUC Decision 93-11-013	Specifies CPUC requirements for reducing power frequency electric and magnetic fields.
Industry Standards	
American National Standards Institute (ANSI/IEEE) 644-1944 Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines	Specifies standard procedures for measuring electric and magnetic fields from an operating electric line.

Applicable LORS	Description
Fire Hazards	
State	
14 CCR sections 1250-1258, "Fire Prevention Standards for Electric Utilities"	Provides specific exemptions from electric pole and tower firebreak and conductor clearance standards and specifies when and where standards apply.

SETTING

As discussed by the applicant, Bright Source Energy/Solar Partners I, LLC/J. Woolard, (BSE2007a pp. 3-1 through 3-5, 5.6-1, 5.6-2, and 5.6-7 through 5.6-12), the total area required for the three facilities (Ivanpah 1–3) that would constitute the proposed Ivanpah Solar Electric Generating System (ISEGS) would be 4,065 acres of federal land currently managed by the Bureau of Land Management (BLM). Each of these facilities would consist of a solar field and related electric power generating equipment from which the generated power would be transmitted to Southern California Edison's (SCE's) power grid via a new 220/115-kilovolt (kV) SCE substation (Ivanpah Substation) to be located between Ivanpah 1 and Ivanpah 2. The connection to the SCE grid would be through SCE's existing 115-kV line that passes through the site on a northeast-southwest right-of-way. The site is in an uninhabited open space with transmission line corridors. The nearest community is Primm, Nevada, with a population of 436, 4.5 miles to the northeast. The city of San Bernardino is approximately 145 miles to the southwest while the Edwards Air Force Base is approximately 145 miles west-southwest.

PROJECT DESCRIPTION

The proposed project tie-in line system would consist of the following individual segments:

- one new, single-circuit 115-kV overhead transmission line extending 5,800 feet from the Ivanpah 1 switchyard to the Ivanpah Substation;
- two new single-circuit 115-kV overhead transmission lines extending from the Ivanpah 2 and Ivanpah 3 switchyards and merging into a double-circuit overhead transmission line at a point 1,400 feet from the Ivanpah Substation before entering it;
- each generating unit's own 115-kV on-site switchyard through which its line would extend towards the Ivanpah Substation;
- project-related reliability upgrades of the area's SCE 115-kV line system; and
- SCE's new 220/115-kV Ivanpah Substation.

The tie-in line for Ivanpah 3 would be 14,000 feet long while the one for Ivanpah 2 would be 3,900 feet. All three lines and related facilities would be designed, operated, and maintained in keeping with SCE guidelines that ensure line safety and efficiency together with reliability and maintainability. The applicant (BSE2007a, Figures 3.2-1 and 3.2-30) provided the details of the proposed support structures as related to line safety, maintainability, and field reduction efficiency.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

The potential magnitude of the line impacts of concern in this staff analysis depends on compliance with the listed design-related LORS and industry practices. These LORS and practices have been established to maintain impacts below levels of potential significance. Thus, if staff determines that the project would comply with applicable LORS, staff would conclude that any transmission line-related safety and nuisance impacts would be less than significant. The nature of these individual impacts is discussed below together with the potential for compliance with the LORS that apply.

DIRECT IMPACTS AND MITIGATION

Aviation Safety

Any potential hazard to area aircraft would relate to the potential for collision in the navigable airspace. The requirements listed on **TLSN Table 1** establish the standards for assessing the potential for obstruction hazards within the navigable space and establish the criteria for determining when to notify the FAA about such hazards. As noted by the applicant (BSE 2007a, pp. 3-13 and 3-14), these regulations require FAA notification in cases of structures over 200 feet from the ground. Notification is also required if the structure is to be below 200 feet in height but would be located within the restricted airspace in the approaches to public or military airports. For airports with runways longer than 3,200 feet, the restricted space is defined by the FAA as an area extending 20,000 feet from the runway. For airports with runways of 3,200 feet or less, the restricted airspace would be an area that extends 10,000 feet from this runway. For heliports, the restricted space is an area that extends 5,000 feet.

One existing public airport, Jean Airport, is located approximately 14 miles northeast of the project site and one mile south of Jean Nevada.In addition, one additional airport is proposed for the same area. Jean Airport has two paved runways that serve less than 50 aircraft, most of which are single engine airplanes and gliders (AirNav.com 2008).

In addition, the Federal Aviation Administration (FAA) and the Bureau of Land Management (BLM) are currently preparing an Environmental Impact Statement for a proposed Ivanpah Valley Airport to be constructed on approximately 6,000 acres of land just south of Jean, Nevada (VHB 2008). As currently planned, the proposed Ivanpah Valley Airport would provide sufficient airport capacity to accommodate future aircraft operations and aviation passenger demand in the Las Vegas Metropolitan Area (VHB 2008). The proposed ISEGS would be located approximately 40,000 feet (7.6 miles) southwest of the nearest runway at the proposed Ivanpah Valley Airport.
The maximum height of 85 feet for the proposed transmission line support structures (BSE2007a Figure 3.2-2) would be much less than the 200 feet that triggers the concern over aviation hazard according to FAA requirements.

Interference with Radio-Frequency Communication

Transmission line-related radio-frequency interference is one of the indirect effects of line operation and is produced by the physical interactions of line electric fields. Such interference is due to the radio noise produced by the action of the electric fields on the surface of the

energized conductor. The process involved is known as *corona discharge*, but is referred to as *spark gap electric discharge* when it occurs within gaps between the conductor and insulators or metal fittings. When generated, such noise manifests itself as perceivable interference with radio or television signal reception or interference with other forms of radio communication. Since the level of interference depends on factors such as line voltage, distance from the line to the receiving device, orientation of the antenna, signal level, line configuration and weather conditions, maximum interference levels are not specified as design criteria for modern transmission lines. The level of any such interference usually depends on the magnitude of the electric fields involved and the distance from the line. The potential for such impacts is therefore minimized by reducing the line electric fields and locating the line away from inhabited areas.

The proposed project lines would be built and maintained in keeping with standard SCE practices that minimize surface irregularities and discontinuities. Moreover, the potential for such corona-related interference is usually of concern for lines of 345 kV and above, and not for 115-kV lines such as the proposed lines. The lines' proposed low-corona designs are used for all SCE lines of similar voltage rating to reduce surface-field strengths and the related potential for corona effects. Since the proposed lines would traverse an uninhabited open space, staff does not expect any corona-related radio-frequency interference or related complaints and does not recommend any related condition of certification.

Audible Noise

The noise-reducing designs related to electric field intensity are not specifically mandated by federal or state regulations in terms of specific noise limits. As with radio noise, such noise is limited instead through design, construction, or maintenance practices established from industry research and experience as effective without significant impacts on line safety, efficiency, maintainability, and reliability. Audible noise usually results from the action of the electric field at the surface of the line conductor and could be perceived as a characteristic crackling, frying, or hissing sound or hum, especially in wet weather. Since the noise level depends on the strength of the line electric field, the potential for perception can be assessed from estimates of the field strengths expected during operation. Such noise is usually generated during rainfall, but mainly from overhead lines of 345 kV or higher. It is, therefore, not generally expected at significant levels from lines of less than 345 kV as proposed for ISEGS. Research by the Electric Power Research Institute (EPRI 1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a right-of-way of 100 feet or more. Since the low-corona designs are also aimed at minimizing field strengths, staff does not expect the proposed line operation to add significantly to current background noise levels in the project area. For an assessment of the noise from the proposed line and related facilities, please refer to staff's analysis in the **Noise and Vibration** section.

Fire Hazards

The fire hazards addressed through the related LORS in **TLSN Table 1** are those that could be caused by sparks from conductors of overhead lines, or that could result from direct contact between the line and nearby trees and other combustible objects.

Standard fire prevention and suppression measures for similar SCE lines would be implemented for the proposed project lines (BSE 2007a, p. 3-14). The applicant's intention to

ensure compliance with the clearance-related aspects of GO-95 would be an important part of this mitigation approach. Condition of Certification **TLSN-3** is recommended to ensure compliance with important aspects of the fire prevention measures.

Hazardous Shocks

Hazardous shocks are those that could result from direct or indirect contact between an individual and the energized line, whether overhead or underground. Such shocks are capable of serious physiological harm or death and remain a driving force in the design and operation of transmission and other high-voltage lines.

No design-specific federal regulations have been established to prevent hazardous shocks from overhead power lines. Safety is assured within the industry from compliance with the requirements specifying the minimum national safe operating clearances applicable in areas where the line might be accessible to the public.

The applicant's stated intention to implement the GO-95-related measures against direct contact with the energized line (BSE 2007a, p. 3-14) would serve to minimize the risk of hazardous shocks. Staff's recommended Condition of Certification **TLSN-1** would be adequate to ensure implementation of the necessary mitigation measures.

Nuisance Shocks

Nuisance shocks are caused by current flow at levels generally incapable of causing significant physiological harm. They result mostly from direct contact with metal objects electrically charged by fields from the energized line. Such electric charges are induced in different ways by the line's electric and magnetic fields.

There are no design-specific federal or state regulations to limit nuisance shocks in the transmission line environment. For modern overhead high-voltage lines, such shocks are effectively minimized through grounding procedures specified in the National Electrical Safety Code (NESC) and the joint guidelines of the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE). For the proposed project line, the project owner will be responsible in all cases for ensuring compliance with these grounding-related practices within the right-of-way.

The potential for nuisance shocks around the proposed line would be minimized through standard industry grounding practices (BSE 2007a, p.3-13). Staff recommends Condition of Certification **TLSN-4** to ensure such grounding for ISEGS.

Electric and Magnetic Field Exposure

The possibility of deleterious health effects from EMF exposure has increased public concern in recent years about living near high-voltage lines. Both electric and magnetic fields occur together whenever electricity flows, and exposure to them together is generally referred to as *EMF exposure*. The available evidence as evaluated by the CPUC, other regulatory agencies, and staff has not established that such fields pose a significant health hazard to exposed humans. There are no health-based federal regulations or industry codes specifying environmental limits on the strengths of fields from power lines. Most regulatory agencies believe, as staff does, that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

Staff considers it important, as does the CPUC, to note that while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. Staff therefore considers it appropriate, in light of present uncertainty, to recommend feasible reduction of such fields without affecting safety, efficiency, reliability, and maintainability.

While there is considerable uncertainty about EMF health effects, the following facts have been established from the available information and have been used to establish existing policies:

- Any exposure-related health risk to the exposed individual will likely be small.
- The most biologically significant types of exposures have not been established.
- Most health concerns are about the magnetic field.
- There are measures that can be employed for field reduction, but they can affect line safety, reliability, efficiency, and maintainability, depending on the type and extent of such measures.

State

In California, the CPUC (which regulates the installation and operation of many high-voltage lines owned and operated by investor-owned utilities) has determined that only no-cost or low-cost measures are presently justified in any effort to reduce power line fields beyond levels existing before the present health concern arose. The CPUC has further determined that such reduction should be made only in connection with new or modified lines. It requires each utility within its jurisdiction to establish EMF-reducing measures and incorporate such measures into the designs for all new or upgraded power lines and related facilities within their respective service areas. The CPUC further established specific limits on the resources to be used in each case for field reduction. Such limitations were intended by the CPUC to apply to the cost of any redesign to reduce field strength or relocation to reduce exposure. Publicly owned utilities, which are not within the jurisdiction of the CPUC, voluntarily comply with these CPUC requirements. This CPUC policy resulted from assessments made to implement CPUC Decision 93-11-013.

In keeping with this CPUC policy, staff requires a showing that each proposed overhead line would be designed according to the EMF-reducing design guidelines applicable to the utility service area involved. These field-reducing measures can impact line operation if applied without appropriate regard for environmental and other local factors bearing on safety, reliability, efficiency, and maintainability. Therefore, it is up to each applicant to ensure that such measures are applied in ways that prevent significant impacts on line operation and safety. The extent of such applications would be reflected by ground-level field strengths as measured during operation. When estimated or measured for lines of similar voltage and current-carrying capacity, such field strength values can be used by staff and other regulatory agencies to assess the effectiveness of the applied reduction measures. These field strengths can be estimated for any given design using established procedures. Estimates are specified for a height of one meter above the ground, in units of kilovolts per meter (kV/m), for the electric field, and milligauss (mG) for the companion magnetic field. Their magnitude depends on line voltage (in the case of electric fields), the geometry of the support structures,

degree of cancellation from nearby conductors, distance between conductors, and, in the case of magnetic fields, amount of current in the line.

Since the CPUC currently requires that most new lines in California be designed according to the EMF-reducing guidelines of the electric utility in the service area involved, their fields are required under this CPUC policy to be similar to fields from similar lines in that service area. Designing the proposed project line according to existing SCE field strength-reducing guidelines would constitute compliance with the CPUC requirements for line field management.

The CPUC has recently revisited the EMF management issue to assess the need for policy changes to reflect the available information on possible health impacts. The findings did not point to a need for significant changes to existing field management policies. Since there are no residences in the immediate vicinity of the proposed project line, there would not be the long-term residential EMF exposures mostly responsible for the health concern of recent years. The only project-related EMF exposures of potential significance would be the short-term exposures of plant workers, regulatory inspectors, maintenance personnel, visitors, or individuals in the vicinity of the line. These types of exposures are short term and well understood as not significantly related to the health concern.

Industry's Approach to Reducing Field Exposures

The present focus is on the magnetic field because unlike electric fields, it can penetrate the soil, buildings, and other materials to produce the types of human exposures at the root of the health concern of recent years. The industry seeks to reduce exposure, not by setting specific exposure limits, but through design guidelines that minimize exposure in each given case. As one focuses on the strong magnetic fields from the more visible high-voltage power lines, staff considers it important, for perspective, to note that an individual in a home could be exposed to much stronger fields while using some common household appliances than from high-voltage lines (National Institute of Environmental Health Services and the U.S. Department of Energy, 1998). The difference between these types of field exposures is that the higher-level, appliance-related exposures are short term, while the exposure from power lines are lower level, but long term. Scientists have not established which of these types of exposures would be more biologically meaningful in the individual. Staff notes such exposure differences only to show that high-level magnetic field exposures regularly occur in areas other than around high-voltage power lines.

As with similar SCE lines, specific field strength-reducing measures would be incorporated into the proposed line upgrade to ensure the field strength minimization currently required by the CPUC in light of the concern over EMF exposure and health.

The field reduction measures to be applied include the following:

1. increasing the distance between the conductors and the ground to an optimal level;

2. reducing the spacing between the conductors to an optimal level;

3. minimizing the current in the line; and

4. arranging current flow to maximize the cancellation effects from interacting of conductor fields.

Since the routes of the proposed project lines would have no nearby residences, the residential field exposures at the root of the health concern of recent years would not be a consideration. The strengths of the lines' fields along the routes would depend on the effectiveness of the applied field-reducing measures. The applicant (BSE 2007a, pp. 3-9 through 3-12 and Figures 3-31 through 3-39) calculated the maximum electric and magnetic field intensities expected along all the proposed routes. The maximum electric field strength was calculated as 1.04 kV/m, which is similar to those of SCE lines of the same voltage rating. The maximum magnetic field intensity of 117.14 mG is similar to that of similar SCE lines (as required under current CPUC regulations) but is much less than the 200 mG currently specified by the few states with regulatory limits. The requirements in Condition of Certification **TLSN-2** for field strength measurements are intended to validate the applicant's assumed reduction efficiency.

CUMULATIVE IMPACTS AND MITIGATION

When field intensities are measured or calculated for a specific location, they reflect the interactive, and therefore, cumulative effects of fields from all contributing conductors. This interaction could be additive or subtractive depending on prevailing conditions. Since the proposed project transmission lines would be designed, built, and operated according to applicable field-reducing SCE guidelines (as currently required by the CPUC for effective field management), any contribution to cumulative area exposures should be at levels expected for SCE lines of similar voltage and current-carrying capacity. It is this similarity in intensity that constitutes compliance with current CPUC requirements on EMF management. The actual field strengths and contribution levels for the proposed line design would be assessed from the results of the field strength measurements specified in Condition of Certification **TLSN-2**.

COMPLIANCE WITH LORS

As previously noted, current CPUC policy on safe EMF management requires that any high-voltage line within a given area be designed to incorporate the field strength-reducing guidelines of the main area utility lines to be interconnected. The utility in this case is SCE. Since the proposed project lines and related switchyards would be designed according to the respective requirements of the LORS listed in **Table 1**, and operated and maintained according to current SCE guidelines on line safety and field strength management, staff considers the the proposed design and operational plan to be in compliance with the health and safety requirements of concern in this analysis. The actual contribution to the area's field exposure levels would be assessed from results of the field strength measurements required in Condition of Certification **TLSN-2**.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received no public or agency comments on the transmission line nuisance and safety aspects of the proposed ISEGS.

CONCLUSIONS

Since staff does not expect the proposed transmission lines to pose an aviation hazard according to current FAA criteria, staff does not consider it necessary to recommend location changes on the basis of a potential hazard to area aviation.

The potential for nuisance shocks would be minimized through grounding and other field-reducing measures that would be implemented in keeping with current SCE guidelines (reflecting standard industry practices). These field-reducing measures would maintain the generated fields within levels not associated with radio-frequency interference or audible noise.

The potential for hazardous shocks would be minimized through compliance with the height and clearance requirements of CPUC's General Order 95. Compliance with Title 14, California Code of Regulations, section 1250, would minimize fire hazards while the use of low-corona line design, together with appropriate corona-minimizing construction practices, would minimize the potential for corona noise and its related interference with radio-frequency communication in the area around the route.

Since electric or magnetic field health effects have neither been established nor ruled out for the proposed ISEGS and similar transmission lines, the public health significance of any related field exposures cannot be characterized with certainty. The only conclusion to be reached with certainty is that the proposed lines' design and operational plan would be adequate to ensure that the generated electric and magnetic fields are managed to an extent the CPUC considers appropriate in light of the available health effects information. The long-term, mostly residential magnetic exposure of health concern in recent years would be insignificant for the proposed line given the absence of residences along the proposed route. On-site worker or public exposure would be short term and at levels expected for SCE lines of similar design and current-carrying capacity. Such exposure is well understood and has not been established as posing a significant human health hazard.

Since the proposed project line would be operated to minimize the health, safety, and nuisance impacts of concern to staff and would remain in its present route without nearby residences, staff considers the proposed design, maintenance, and construction plan as complying with the applicable laws. With implementation of the conditions of certification proposed below, any such impacts would be less than significant.

PROPOSED CONDITIONS OF CERTIFICATION

TLSN-1 The project owner shall construct the proposed transmission lines according to the requirements of California Public Utility Commission's GO-95, GO-52, GO-131-D, Title 8, and Group 2. High Voltage Electrical Safety Orders, sections 2700 through 2974 of the California Code of Regulations, and Southern California Edison's EMF-reduction guidelines.

Verification: At least 30 days before starting the transmission line or related structures and facilities, the project owner shall submit to the Compliance Project Manager (CPM) a letter signed by a California registered electrical engineer affirming that the lines will be constructed according to the requirements stated in the condition.

TLSN-2 The project owner shall use a qualified individual to measure the strengths of the electric and magnetic fields from the line at the points of maximum intensity along the route for which the applicant provided specific estimates. The measurements shall be made before and after energization according to the American National Standard Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) standard procedures. These measurements shall be completed not later than 6 months after the start of operations.

Verification: The project owner shall file copies of the pre-and post-energization measurements with the CPM within 60 days after completion of the measurements.

TLSN-3 The project owner shall ensure that the rights-of-way of the proposed transmission line are kept free of combustible material, as required under the provisions of section 4292 of the Public Resources Code and section 1250 of Title 14 of the California Code of Regulations.

Verification: During the first 5 years of plant operation, the project owner shall provide a summary of inspection results and any fire prevention activities carried out along the right-of-way and provide such summaries in the Annual Compliance Report.

TLSN-4 The project owner shall ensure that all permanent metallic objects within the right-of-way of the project-related lines are grounded according to industry standards regardless of ownership. In the event of refusal by any property owner to permit such grounding, the project owner shall so notify the CPM. Such notification shall include, when possible, the owner's written objection. Upon receipt of such notice, the CPM may waive the requirement for grounding the object involved.

Verification: At least 30 days before the lines are energized, the project owner shall transmit to the CPM a letter confirming compliance with this condition.

REFERENCES

BSE 2007a — Bright Source Energy/Solar Partners, LLC/ J. Woolard. Application for certification of the Ivanpah Solar Electric Generating System Volumes I and II. Submitted to the California Energy Commission on August 31, 2007.

EPRI — Electric Power Research Institute. 1982. Transmission Line Reference Book: 345 kV and Above.

National Institute of Environmental Health Services. 1998. *An Assessment of the Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. A Working Group Report, August 1998.

VISUAL RESOURCES

William Kanemoto

SUMMARY OF CONCLUSIONS

Staff has analyzed visual resource related information pertaining to the proposed Ivanpah Solar Electric Generating System (ISEGS) and concludes that the proposed project would not meet the applicable visual objectives of the Bureau of Land Management's (BLM) Visual Resource Management (VRM) assessment method, as seen from several Key Observation Points in the Ivanpah Valley and Clark Mountains, including:

- Middle-ground-distance viewpoints on Highway I-15
- Viewpoints in the Mojave National Preserve, including the Benson Mine and vicinity
- Viewpoints in the Stateline Wilderness Area, including the Umberci Mine and vicinity

Staff also concludes that the visual analysis and resulting findings, obtained using the BLM Visual Resource Management (VRM) assessment method, were essentially consistent with findings that would be obtained under the Energy Commission visual assessment method. Consequently, staff concludes that potentially significant visual impacts would occur in those locations as a result of the project.

In addition, staff concludes that the project would not conform with applicable goals and policies of the San Bernardino General Plan Conservation and Open Space Elements as follows:

- Conservation Element Goal D/CO 1, calling for preservation of scenic vistas in the County.
- Open Space Element Goal OS 5, and Policy OS 5.2, which require projects to be visually compatible with the scenic qualities of designated County scenic routes. Highway I-15 in the project vicinity is a County-designated scenic route.

Finally, staff concludes that the project in combination with foreseeable future projects could have significant cumulative visual impacts of two kinds:

1. cumulative impacts within the immediate project viewshed, essentially comprising foreseeable future projects in the Ivanpah Valley; and

2. cumulative impacts of foreseeable future solar and other renewable energy projects within the California Desert District and Mojave Desert.

As stated, staff concludes that the project would have significant unavoidable adverse impacts. However, if the Energy Commission approves the project, staff recommends that all of staff's proposed conditions of certification be adopted in order to minimize impacts to the greatest feasible extent.

INTRODUCTION

The following analysis evaluates potential visual impacts of the Ivanpah Solar Electric Generating System (ISEGS); its consistency with applicable Laws, Ordinances, Regulations and Standards (LORS); and conformance with applicable guidelines of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

VISUAL ANALYSIS METHODOLOGY

BUREAU OF LAND MANAGEMENT AND CALIFORNIA ENERGY COMMISSION VISUAL ASSESSMENT METHODOLOGIES

Typically, Energy Commission staff applies its own visual assessment methodology in conducting its staff assessments. For the ISEGS project Energy Commission staff, in coordination with U.S. Bureau of Land Management (BLM), the federal lead agency for environmental review of the ISEGS project under NEPA, applied the BLM Visual Resource Management (VRM) system of visual assessment in order to conform with BLM guidelines. In doing so, it is staff's professional opinion that adoption of the VRM methodology for this analysis is consistent with application of the Energy Commission staff's own visual assessment methodology in this particular case, for the following reasons (a brief summary of the VRM methodology and accompanying references is provided in **Appendix VR-1**; a summary of the Energy Commission visual assessment methodology ise provided in **Appendix VR-2)**:

- The Energy Commission methodology was modeled in large part on VRM method, and thus the two methodologies are essentially similar in structure and approach. Although the methods differ in details, the end results are conceptually analogous and substantially comparable.
- Baseline setting evaluations used in this analysis were essentially equivalent under the two methods. Staff compared its own evaluation of the existing ISEGS project setting with those provided by BLM in its Interim VRM Class mapping, prepared for the project EIS analysis. In staff's opinion, these baseline characterizations were substantially equivalent.
- Impact criteria under the two methodologies can be made substantially equivalent. Due to the similarity in structure of the two methods, staff was able to review impact thresholds as defined under both methods, and found them to be substantially similar.

Thus, in staff's opinion it is possible to apply the two methods in an essentially equivalent manner, if they are applied consistently, with equivalent baseline characterizations. In this analysis, staff attempted to maintain typical Energy Commission procedure to the extent possible, while remaining consistent with the key components and terminology of the VRM methodology.

HOW THE ANALYSIS WAS CONDUCTED

A brief introduction to the VRM methodology is necessary to understand the terminology in this study, and follows below. A more detailed discussion of the VRM and Energy Commission staff's methods may be found in **VR-1 and VR-2**.

The existing visual setting baseline under the VRM methodology is characterized in terms of Visual Resource (VR) Classes. Under the VRM system areas of the project viewshed are delineated and mapped based on broadly uniform characteristics of visual quality, viewers' sensitivity, and distance from project to viewers. These delineated areas are then assigned a VR Class (from I through IV). VR Classes are analogous to Overall Sensitivity ratings under staff's method, and are used to determine an area's visual objective, that is, the level of project-caused contrast that is acceptable, above which contrast could constitute a potentially significant adverse impact.

VR Class I, the highest and most restrictive class, applies specifically to federally-designated scenic areas and does not have a direct equivalent in staff's method. Class II may be considered equivalent to a high overall sensitivity rating under staff's method; Class III corresponds to a moderate sensitivity rating under staff's method; Class IV corresponds to a low sensitivity rating under the Energy Commission method. A VR Class IV (or Energy Commission Low Sensitivity) viewpoint may accommodate high levels of visual change without representing a potentially significant impact. A VR Class II (or Energy Commission High Sensitivity) viewpoint can accommodate a low level of visual change, but higher levels of change may indicate a potentially significant impact, and so on.

As required under its own administrative rules, BLM provided Interim VRM (IVRM) Class mapping for the preparation of the EIS portion of this analysis. IVRM mapping is required in cases where the applicable BLM Resource Management Plan (RMP), in this case the California Desert Conservation Area (CDCA) Plan, did not include VRM mapping as typically required. This IVRM mapping was used as the baseline for the visual analysis in this study.

Next, Key Observation Points (KOPs) are identified to represent those key sensitive viewer groups most likely to be affected by the project. As in the Energy Commission method, the analysis of impacts is conducted from these KOPs, and in fact the use of KOPs in staff's method is derived from the VRM system.

The visual characteristics of the proposed project are then described. Typically, visual simulations of the project as seen from KOPs are required, accurately representing the perceived scale and contrast of the project from these locations.

Finally, potential visual impacts are assessed in terms of project visual contrast, using the visual simulations and field reconnaissance. In the VRM system, project-caused visual change is referred to as Contrast Rating, and measured on a scale of strong, moderate, or weak.

Visual contrast (Overall Visual Change) and VR Class (Overall Visual Sensitivity) are then compared as specified in BLM Handbook H-8431-1 to arrive at preliminary findings of potential project impact significance (USDI, 1987, H-8431-1 et seq.; www.

blm.gov/nstc/VRM/8431.html). The levels of project contrast correspond generally to impact thresholds or visual objectives of each VRM Class as shown in the following table (drawn from Handbook H-8431-1):

VISUAL RESOURCES Table 1
VRM Classes and Visual Objectives

VRM Class	Visual Objective (Impact Threshold) of VRM Class	Acceptable Contrast Rating
I	Preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should very low and must not attract attention.	Very low or none
II	Retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.	Weak
III	Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.	Moderate
IV	Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. Every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.	Strong

In addition, under staff's procedures the project is evaluated for conformance with applicable LORS. Adopted expressions of local public policy pertaining to visual resources are also given great weight in determining levels of viewer concern.

In accordance with staff's procedure, conditions of certification are proposed as needed to reduce potentially significant impacts to less than significant levels, and to ensure LORS conformance, if feasible.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following discussion describes applicable laws, ordinances, regulations and standards. Project conformance with these standards is discussed in the Compliance with Applicable LORS section of Impacts, below.

VISUAL RESOURCES Table 2
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
National Environmental Policy Act (NEPA)	Under the National Environmental Policy Act (NEPA), it is the responsibility of the federal government to "use all practicable means to ensure all Americans safe, healthful, productive and aesthetically and culturally pleasing surroundings (42 USC 4331(b)2). "
Federal Land Policy and Management Act of 1976 (FLPMA)	FLPMA is the enabling legislation establishing the Bureau of Land Management's responsibilities for lands under its jurisdiction. Section 102 (a) of the Federal Land Policy and Management Act of 1976 (FLPMA) states that "...the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values…" Section 103 (c) identifies "scenic values" as one of the resources for which public land should be managed. Section 201 (a) states that "The Secretary shall prepare and maintain on a continuing basis an inventory of all public lands and their resources and other values (including...scenic values)..." Section 505 (a) requires that "Each right-of-way shall contain terms and conditions which will...minimize damage to the scenic and esthetic values..."
California Desert Conservation Area (CDCA) Plan	The ISEGS project is located within the California Desert Conservation Area Plan, which is the BLM Resource Management Plan applicable to the project site (USDI, 1980, as amended). The CDCA Plan did not include VRM inventory or management

	classes; consequently, BLM developed Interim VRM Classes for use in preparing the EIS/Staff Assessment, as called for in BLM Manual 8410-1. The ISEGS site is classified in the CDCA Plan as Multiple-Use Class (MUC) L (Limited Use). Multiple-Use Class L, the most restrictive under the plan, "protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished."
Northern and Eastern Mojave CDCA Plan Amendments (NEMO), 2002	The NEMO plan amendments to the CDCA Plan did not directly affect visual resource management. Among the elements of the NEMO plan amendments was designation of approved motorized vehicle trails, including several such trails within the ISEGS site. According to the NEMO Routes Designation EA, "the off-road vehicle experience of traveling historic routes provides an educational and scenic experience of the natural wonders of a harsh desert region and the elements that the pioneers and founders of the historical route had to endure." (USDI, 2004). The East Mojave Heritage Trail, a 650-mile trail identified in the NEMO Proposed Route Designation Plan Amendment as a major historical trail of scenic, historic, and Native American values, is one such designated trail within the Ivanpah Valley. However, it does not cross the ISEGS site and would not be affected by it (Murray, Tel. Con. 9/23/08).
Visual Resource Management (VRM) Methodology	Pursuant to FLPMA, the Bureau of Land Management (BLM) developed and applies a standard visual assessment methodology to inventory and manage scenic values on lands under its jurisdiction, the Visual Resource Management (VRM) methodology. Guidelines for applying the method are described in BLM Manual 8400 et seq.

	Because the ISEGS project is located within BLM jurisdiction, visual impact standards are defined by VRM Classes mapped by BLM as discussed under Methodology, above, and in **Appendix VR-1.**	
National Historic Preservation Act (NHPA)	Under regulations of the NHPA, visual impacts to a listed or eligible National Register property that may diminish the integrity of the property's "...setting...(or) feeling..." in a way that affects the property's eligibility for listing, may result in a potentially significant adverse effect. "Examples of adverse effects...include... Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features..." (36 CFR Part 800.5)	
State		
State Scenic Highway Program	The California State Department of Transportation (Caltrans) identifies a state system of eligible and designated scenic highways which, if designated, are subject to various controls intended to preserve their scenic quality (Ca. Streets and Highways Code, Sections 260 through 263). Highway I-15 within the project viewshed is not listed as an eligible State Scenic Highway.	
Local		
County of San Bernardino General Plan	Various policies of the Conservation and Open Space Elements of the San Bernardino County General Plan referring to the protection of scenic resources in the project area, as described in detail in Visual Resources Table 3. In particular, Open Space Policies 5.1 through 5.3 provide protection to designated County scenic routes. Highway I-15 in the Ivanpah Valley is a designated County scenic route.	
Night Sky Protection Ordinance Ord. 3900 (San Bernardino County Code 87.0921)	Ordinance intended "to encourage effective, non-detrimental lighting; to maintain night-time safety, utility, security and productivity; and to encourage lighting practices and systems which will minimize light pollution, glare and light trespass, conserve energy and resources and curtail the degradation of the night time visual environment…"	

SETTING

REGIONAL LANDSCAPE SETTING

The proposed project landscape is part of the Great Basin section of Fenneman's Basin and Range physiographic province, a vast desert area of the western U.S. extending from eastern Oregon to western Texas, characterized by periodic mountain ranges separated by desert plain (Fenneman, 1931). It is also located within the Mojave Desert, immediately north and east of the northernmost portions of the Mojave National Preserve. Locally, the site is situated within the Ivanpah Valley, notable for the level playa or dry lakebed of Ivanpah Lake. Steeply rising, barren slopes and ridges of the Clark, Spring, and Ivanpah Mountains to the south, west, and north, and the Lucy Gray, McCullough, and New York Mountains to the east, define the Ivanpah Valley in the project vicinity. While the project portion of the Ivanpah Valley is visually relatively intact, it is located roughly 30 miles south of the City of Las Vegas, within a visual corridor along Highway I-15 that becomes increasingly urbanized and less scenically intact as one progresses northward. Thus, in a regional context, the site is located at the outer edge of urban influence of the City of Las Vegas metropolitan area. I-15 adjacent to the project site is the principal travel route for visitors to Las Vegas from southern California.

PROJECT SITE

VISUAL RESOURCES Figure 1, Views of the Project Site, depicts views of the Ivanpah Valley from the vicinity of the proposed project site.

The ISEGS site comprises approximately four square miles west of Highway I-15 and the northern half of the Ivanpah Lake dry lakebed. The site occupies a moderately sloping alluvial fan or bajada that descends eastward from the foot of the Clark Mountains and Mojave National Preserve immediately to the west. Visual exposure to viewers on I-15, due both to proximity and slope orientation, is thus high. This portion of the Ivanpah Valley, defined at the north by a pass between the Clark and Lucy Gray Mountains at Primm, Nevada, is scenically relatively intact, as depicted in **VISUAL RESOURCES Figure** 1. The Bighorn Electric Generating Station, the town of Primm at the north end of the valley, the Primm Golf Course, existing high-voltage power lines, several unpaved vehicular trails and Highway I-15 intrude on the valley's scenic intactness but overall these features are very subordinate visually, and the landscape appears predominantly undisturbed. The proposed site is located immediately to the west of the Primm Golf Course, a slightly elevated site who's irrigated landscaping and perimeter berm-slopes contrast conspicuously with the surrounding natural landscape for viewers in its vicinity. The project site also surrounds an isolated, 416 -foot tall rock formation that serves as a prominent landmark within a radius of several miles and represents a striking scenic feature of the valley.

Landcover on the site consists primarily of Mojave Creosote Bush Scrub, including areas of smaller, younger Joshua Trees. Surface disturbance is relatively minimal and inconspicuous overall, including unpaved vehicular trails and access roads.

PROJECT AREA VISUAL SETTING

VISUAL RESOURCES Figure 2, Existing Landscape Setting and Key Observation Points (KOPs), depicts the project visual setting in terms of the project viewshed, Interim VRM Classes provided by BLM, and the location of KOPs used as the basis of the impact analysis. (All figures referred to in the text may be found at the end of this section.)

Project Viewshed

The *viewshed* or area of potential visual effect (the area within which the project could potentially be seen) is indicated by the reddish-colored area in **VISUAL RESOURCES Figure 2**. The computer-generated viewshed mapping was projected from the top of the proposed solar collectors. The mapping is accurate within the limits of error of the USGS digital elevation model (DEM) topographic map surveys from which it is created. In this landscape, because of the general absence of tall land-cover that could alter the actual viewshed, the topographically-generated viewshed mapping is considered generally accurate. A feature of this desert landscape is the potential for large projects to be seen over great distances where elevated viewpoints exist, due to the large open areas of level topography and absence of intervening landscape features.

Landscape Units, VRM Classes, and KOPs – Scenic Quality and Viewer Sensitivity

VISUAL RESOURCES Figure 2 subdivides the project viewshed into broad landscape units and their associated VRM class. These units represent contiguous areas with broadly consistent prevailing visual character, quality, and viewer sensitivity – the VRM Class - as identified by BLM staff in the field. As explained above, this mapping represents the existing setting baseline condition under the VRM system.

It should be noted that references to distances and distance zones are used in a generic sense in the discussion below, and do not refer to the distance zone mapping used in the BLM VRM inventory mapping process, described in **Appendix VR-1**. In the VRM mapping process, no distinction is made between foreground and middle-ground distances for purposes of map development only. However, in the discussion below, ‘foreground’ is used to refer to viewing distances under ½-mile; ‘middle-ground’ to distances between ½ and 4 miles; ‘near middle-ground’ refers to that portion of middle-ground under roughly one mile; and ‘background’ to distances over 4 miles.

Portions of the viewshed within the state of Nevada have not yet been mapped for VRM Class. However, no high-sensitivity KOPs were identified in those areas.

The three major landscape units depicted are the Ivanpah Valley floor, including the Ivanpah dry lakebed; and the adjoining mountain ranges that define the valley: the Clark Mountains to the north, west, and south; and the Lucy Gray Mountains to the east. The Clark Mountains are divided into two major categories: portions of the Mojave National Preserve under National Park Service (NPS) jurisdiction; and the Stateline and Mesquite Wilderness Areas (WAs), under BLM jurisdiction.

VISUAL RESOURCES Figure 2 also depicts Key Observation Points (KOPs) used as the basis for this analysis. KOPs are used in the VRM system to evaluate potential project impacts. These viewpoints represent key sensitive viewer groups and viewing locations likely to be affected by the project. In accordance with the VRM procedure, the KOPs reflect the VRM class ratings of the landscape units within which they are located. Existing views and simulated views with the proposed project from each KOP may be seen in **VISUAL RESOURCES Figures 6 to 15** at the end of this section. The KOPs below are presented according to landscape unit and key viewer group.

Ivanpah Valley (KOPs 1 through 8)

The Ivanpah Valley floor was identified as VRM Class III. The objective of Class III areas is to partially retain the existing character of the landscape, and the permissible level of visual change is moderate (moderate contrast). Management activities may attract attention, but should not dominate the view of the casual observer (BLM Handbook H-8410-1).

As noted in **VISUAL RESOURCES Figure 2**, the underlying component ratings for the valley floor are: Scenic Quality: B (Moderate); Viewer Sensitivity: Medium.

Note: The KOP numbers in the discussion below do not correspond to the numbers used in the applicant's data responses, but have been re-numbered for this analysis. The locations of the KOPs are depicted in **VISUAL RESOURCES Figure 2**.

Primm Golf Course: KOPs 1 – 2

The two KOPs from the AFC are both taken from the Primm Golf Course, located on I-15 south of Ivanpah Lake and east of the proposed project site. Viewing distances are 1.5 and under 1.0 miles respectively.

These KOPs represent a developed, outdoor recreational viewpoint with moderate to high use, at middle-ground distance.

I-15 Motorists: KOPs 3 –5

I-15 views are all within the valley and thus VRM Class III. Viewer numbers on this segment of highway are extremely high, particularly on Friday evenings and other peak periods, although the recreational destination for the majority of such motorists is Las Vegas rather than the Mojave Desert and the level of concern with scenic quality thus likely to be moderate or low. Viewing distance ranges from background (over four miles) to near- middleground (approximately one mile).

KOP 3: I-15 near Yates Well Road. KOP 3 depicts views of the Ivanpah 2 and 3 portions of the project site from I-15 at middle-ground distance (roughly 2 miles).

KOP 4: I-15 near Yates Well Road. KOP 4 depicts views of the Ivanpah 1 portion of the project site from I-15 at middle-ground distance (roughly 1 mile).

KOPs 3 and 4 are actually a single viewpoint, oriented to capture different portions of the project, which occupies too wide an angle of view to be captured in a single

photograph. These KOPs are approximately one mile from the proposed project at its nearest point.

KOP 5: I-15 at Nipton Road. KOP 5 depicts views of motorists as they enter the Ivanpah Valley from the south at background distance (roughly 4 miles). This viewpoint demonstrates the high level of visual exposure toward I-15 created by the site's eastward sloping bajada topography.

Ivanpah Lake: KOPs 6 –7

Ivanpah Lake. KOP 6 is taken from the most heavily used access point for wind sailors, on the eastern side of the dry lakebed. KOP 7 is taken from a second, also heavily used wind sailing access point on the west side of the lakebed, west of I-15.

These KOPs represent a natural, outdoor recreational viewpoint with very high use at far middle-ground/background distance 4 and 3 miles respectively.

Primm: KOP 8

View from parking lot at southern boundary of Primm (roughly 4 miles).

Primm is a high-volume visitor destination within middle-ground distance of the project. Although it is within the larger Class III area of the valley, viewer exposure and sensitivity from this indoor activity-oriented KOP is considered relatively low, and existing visual quality, dominated by large parking areas and commercial development, is also relatively low. Nevertheless, open and scenic views toward the project site exist from various locations in the southern area of Primm.

Clark Mountains: KOPs 9 – 10

Portions of the project viewshed in the Clark Mountain Range, which encloses the valley to the north, west, and south are comprised almost entirely of either the Mojave National Preserve or Stateline and Mesquite BLM Wilderness Areas, as indicated in **VISUAL RESOURCES Figure 2**. Consequently, under the VRM system they are by definition considered Class I (special status) areas. The special status of these areas in these cases simply reflects their unusually high scenic and recreational value, and thus their corresponding high viewer sensitivity. The objective of Class I areas is to preserve the existing character of the landscape, and the permissible level of visual change is very low and must not attract attention.

KOP 9: Umberci Mine. KOP 9 is a popular hiking destination from Primm and the northern part of the valley, located on the trail to Umberci Mine within the Stateline Wilderness Area.

This KOP represents a moderate- to high-use, high-sensitivity recreational viewpoint at middle-ground distance.

KOP 10: Benson Mine. KOP 10, located in the vicinity of the Benson Mine, a heavily-used rock-climbing destination within the Mojave National Preserve and representative of Preserve visitors in the Clark Mountains within the project viewshed.

This KOP represents high use, high sensitivity recreational viewpoint at background distance.

Lucy Gray Mountains

No high-sensitivity recreational destinations or other KOPs were identified in the mountains to the east of the valley. This portion of the viewshed was classified as VRM Class III.

IMPACTS

As described previously under Visual Analysis Methodology, visual impacts are evaluated as a function of VRM Class (viewer and setting attributes) from key observation points; and Contrast Rating (anticipated degree of visual change due to the project, measured as project contrast/ dominance and view blockage from those same KOPs.

Ratings of existing and proposed project contrast, dominance, and view blockage were made on the basis of field observation, photo documentation, and study of applicant-prepared visual simulations and other project information. KOP photos were taken with a 35mm camera and fixed 50mm lens, with a resulting horizontal field of view of approximately 40 degrees. This field of view, sometimes referred to as 'normal', approximates the actual field of view experienced in the field if viewed as a 9.5 inch-wide image at a reading distance of about 1 foot.

SIGNIFICANCE CRITERIA

The following regulatory criteria were considered in determining whether a visual impact would be significant.

Federal

As discussed above, guidelines for the application of the BLM VRM methodology were used as an initial indication of potential impact significance. If impacts meet the Interim VRM class objectives of a given KOP, they are considered less than significant in this analysis. If they do not meet the applicable interim management class objectives of a given KOP, they are considered potentially significant.

State

The CEQA *Guidelines* define a "significant effect" on the environment to mean a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including . . . objects of historic or aesthetic significance." (Cal. Code Regs., tit.14, § 15382.)

Appendix G of the *Guidelines*, under Aesthetics, lists the following four questions to be addressed regarding whether the potential impacts of a project are significant.

1. Would the project have a substantial adverse effect on a scenic vista?

2. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

3. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

4. The conformance or non-conformance of the project with respect to VRM Class objectives at a particular KOP is addressed under this criterion in this analysis.

5. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Local

Energy Commission staff considers any local goals, policies, or designations regarding visual resources. Conflicts with such laws, ordinances, regulations, and standards can constitute significant visual impacts. See the section on Applicable Laws, Ordinances, Regulations, and Standards.

VISUAL PROJECT DESCRIPTION

Power Plant

VISUAL RESOURCES Figure 3 depicts the layout of the three proposed units. **VISUAL RESOURCES Figure 4** depicts architectural elevations of the Ivanpah 3 power block, based upon the original AFC plan. Components of the other two units would be essentially similar in appearance and heights. **VISUAL RESOURCES Figure 5** depicts elevations of the proposed mirror units.

Solar Collectors and Mirror Arrays

The overall area of the three proposed project phases would be approximately 6.4 square miles or 4,065 acres, most of which would be occupied by mirror fields.

Under the modified project plan, there would be one tower each at Ivanpah 1 and 2, and four towers (one solar re-heater and three receiving towers) at Ivanpah 3. All proposed towers would have an overall height of approximately 459 feet (140 meters), with an additional 5 to 10 feet of FAA-required lighting. Mirror array units would be approximately 12 feet (4 meters) tall (DR Set 1D, #4). Towers would require day and night FAA strobe lighting.

Other visually prominent structures would include steam turbine generators, air-cooled condensers, water storage tanks, a substation, retention ponds, drainage structures, administrative and maintenance facilities, and a 1,400-foot length of new transmission lines and towers. Of these the most prominent would be the air-cooled condenser (approximately 118 feet in height) (AFC Fig 2.2-3c); and new transmission towers. Proposed retention ponds could also represent prominent, high contrast visual features, especially as seen from elevated mountain viewpoints.

Site Grading

Site grading would potentially represent a significant visual component of the proposed project. Surface disturbance of the proposed site, as in most desert landscapes of the region, can result in high contrast between the disturbed area and surroundings, due to high contrast between the disturbed soil color and albedo, and the color and albedo of

the existing undisturbed, vegetated surface (DR Set 2, # 150). Alterations in landform from construction of berms, ponds, and channels could also be visually prominent features of the project.

Plant Night Lighting

Lighting to support plant operation would be required but is not described in detail in the AFC. FAA strobe and other aircraft warning lighting is assumed to be required atop the tall solar receiver towers due to proximity to existing and possible future flight paths.

Linear Facilities

Transmission Lines

Fourteen hundred feet of new transmission lines and towers are proposed.

Water Lines

Water would be provided from two wells located adjacent to the northwest corner of Ivanpah 1 (DR Set 1D, #4). Potential visual effects would result primarily from color contrast of soil disturbance and vegetation removal for pipeline construction.

Gas Lines

Natural gas would be supplied via a 1.4 mile pipeline connecting to the Kern River pipeline located north of Ivanpah 3, along the west side of Ivanpah 2 and 3. From there, further pipelines would connect to Ivanpah 2 and 1 through the Ivanpah 2 site (DR Set 1D, #4; PD 2.2.6, p. 2-8). Typical visual effects of new pipeline consist primarily of color contrast between adjoining undisturbed land and pipeline right-of-way due to soil disturbance and vegetation removal, an effect that usually persists for the long term in arid environments.

Construction Staging Area

Construction parking and laydown would occur within the units under construction. A 120-acre construction logistics area would be located between Ivanpah 1 and 2. After Ivanpah 3 construction is complete, associated fabrication buildings would be removed and the area restored. In addition, a 257-acre area would be reserved for temporary construction use, and for the permanent substation site (DR Set 1D, # 4).

VISUAL IMPACT ASSESSMENT

Staff Discussion of AFC Analysis

In both the AFC and subsequent data responses, the applicant has applied the VRM system as the basis of its analysis, as does this study. However, in both the AFC and subsequent analyses, the applicant erroneously attributed a Class IV VRM baseline rating to the study area and two KOPs which it has addressed (at Primm Golf Course). In addition, the AFC and subsequent Data Response 1D identified the golf course as having a low sensitivity level.

In staff's opinion there is no basis for identifying the site and surroundings as a VRM Class IV area. Previously, no VRM mapping had been adopted for the area by BLM. As

discussed previously and shown in **VISUAL RESOURCES FIGURE 2**, BLM subsequently identified the site as VRM Class III. Energy Commission staff's independently conducted VRM inventory also resulted in a Class III rating of the area. BLM and Energy Commission staff assigned the study area a moderate scenic quality level (B) and moderate sensitivity level. In general, recreational destinations with high use levels within relatively scenic natural settings such as KOP 1 would not be considered VRM Class IV, the lowest possible rating and one that implies either low sensitivity or low scenic quality, neither of which apply to this site. Viewer sensitivity would generally be considered moderate or high due to the recreational activity type and high use numbers. Similarly, staff disagrees with the applicant's project contrast ratings as described in DR # 97-2, as indicated in the analysis of KOPs 3 and 4, below.

A principal disagreement with the AFC analysis by both Energy Commission and BLM staff is the omission of sensitive outdoor recreational KOPs outside of the golf course. This omission was addressed in DR # 147 with visual simulations developed by the applicant from KOPs selected by BLM and Energy Commission staff. These KOPs were not analyzed by the applicant in the Data Responses, and are discussed by staff, below.

Direct Impacts

Potential direct impacts of the proposed project are discussed below under the four significance criteria of the CEQA Guidelines Appendix G.

a. Would the project have a substantial adverse effect on a scenic vista?

Although no designated scenic vistas were identified in the study area, various viewpoints, particularly those in the Clark Mountains within the Mojave Preserve and Stateline Wilderness Area would qualify as such due both to their very high scenic quality and high levels of recreational use. Both representative KOPs within the Clark Mountains, KOPs 5 and 6, would experience substantial adverse visual effects as a result of the proposed project. Panoramic elevated views of the valley would change from a relatively undisturbed desert floor landscape dominated by striking views of the Ivanpah dry lake bed, to an industrial, highly man-altered one dominated by roughly four square miles of mirror-arrays and 459-foot tall solar collector towers, a large graded area, and retention ponds, as well as light rays reflected off of ambient atmospheric dust, and the bright glow of the receiving portions of the solar collectors.

The mirror fields would display a high degree of visual unity, due to their orientation in large-scale circular patterns of high regularity around the collector towers. Reflected light rays, when present, would create striking, tent-like patterns, also with high visual unity, which some viewers might consider attractive or interesting. Nevertheless, since the existing intact natural landscape is considered one of the primary attractions for visitors to these mountains, the resulting dramatic alteration of landscape character, particularly as seen from high sensitivity recreational viewpoints in the Clark Mountains, is considered to represent a substantial adverse visual effect. These effects are discussed in further detail below, in the discussion of individual KOPs 5 and 6 under CEQA Criterion C.

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?

The project is adjacent to Highway I-15, which is not listed as an eligible State Scenic Highway.

The proposed project would be located in immediate proximity to a large rock-outcropping that is a prominent landmark for viewers throughout the viewshed to background distances. The project would not damage this rock outcropping but would dramatically alter its visual setting. No other notable scenic features are present on-site.

Potential effects on scenic resources in general are discussed under CEQA Criterion C, below.

c. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

Project Operation Impacts

Impacts of Structures on Key Observation Points

Ivanpah Valley – Primm Golf Course

As described above, views from within the valley are VRM Class III, Scenic Quality Class B, Medium Sensitivity.

KOP 1 – Looking Southwest from Primm Golf Course toward Ivanpah 1, (roughly 1.5 miles). **VISUAL RESOURCES Figures 6 A** and **6B.**

Contrast Rating – As depicted in **VISUAL RESOURCES Figure 6B**, the project would appear very prominently from this near-middle-ground viewpoint. Form, line, color and texture contrast of the project structures would all be very strong. The tall solar collector towers would introduce highly dominant vertical line and form contrast into the setting. This form contrast would be strongly accentuated by the bright illumination of the heated solar collector at the top of each tower, as well as by rays of reflected sunlight when ambient dust particles are present in the surrounding air. The solar collector towers and adjacent air-cooled condenser, as well as the substation and related facilities south of Ivanpah 2, would present a utilitarian, , industrial character. The mirror arrays would also alter the character of the desert floor to a highly industrial visual texture. Portions of the desert floor below the mirror arrays, where visible, would contrast sharply in hue, brightness and value with surrounding undisturbed soil surfaces, and with the mirror structures themselves.

When present, reflected light rays would create a luminous, transparent surface of tent-like form that would to some degree repeat that of the mountain ridgeline, would have a legible form with high unity, and to some observers could be perceived as an interesting and vivid, albeit man-made, sight. At other times in the absence of the light rays, the

view of the solar tower and mirror fields would be more purely industrial in character, and both less dominant and less picturesque.

Nevertheless, overall the project would demand attention, could not be overlooked, and would be strongly dominant in the landscape.

Staff Comments on Simulation

Staff notes that the simulation of KOP 1 does not clearly depict the portion of the mirror fields nearest the viewer, which appear in the images as an indistinct area with the same color and texture as the background soils. In fact these would appear as a large field of angular, 12-foot-tall metallic structures with an industrial texture and complex patterns of light and shadow that would accentuate their contrast with the surrounding landscape, lending the facility a distinctly industrial character. Color contrast with the surroundings could be strong depending upon the paint color used. Similarly, the far portion of the mirror fields, in which the mirror surfaces themselves are visible, would appear as distinct, angular structures with highly variable surface color and brightness and a dense, industrial texture. **VISUAL RESOURCES Figure 7a**, depicting a similar solar thermal project in southern Spain, illustrates the appearance of these features, including the high color and form contrast of unpainted mirror arrays.

Staff also notes that the proposed air-cooled condenser units, which would be over 100 feet in height, appear to be under-represented in this and all other simulations. These structures would approximate the size of a 10-story building, and would be quite prominent.

VISUAL RESOURCES Figure 7b, c and d, photographs of the Solar One project in Dagget, CA, illustrate the variable appearance of the mirror surfaces, including areas of bright specular glare that occur under certain conditions; the potential for soil color contrast beneath the heliostats due to visibility of the soil surface from elevated viewpoints, and the role of heliostat shadow in creating visual contrast.

Staff was unable to obtain data from the applicant about likely frequency, duration or intensity of the reflected ‘light-ray’ effect depicted in the simulations. However, **VISUAL RESOURCES Figure 7a** also presents some anecdotal documentary evidence on the appearance of this phenomenon, though not on its frequency or duration. Staff also notes that in the absence of light rays, the project would appear far less vivid, both less dominant and more purely industrial in character, than depicted in the simulations.

Impact Significance – The project’s very high level of contrast at this KOP would strongly dominate the view and thus not meet the applicable VRM Class III visual objectives for the Ivanpah Valley (moderate visual change that does not dominate the view of the casual observer).

Thus, although some viewers could consider views of the project striking and interesting when the light ray phenomenon is present, under the VRM and Energy Commission staff’s framework, impacts would constitute a potentially significant impact due to the high level of contrast with the existing high quality natural setting.

Mitigation – Views of the proposed project from the golf course could be partially or substantially screened by perimeter tree plantings.. Substantial tall screening would also tend to block the panoramic natural views of the Clark Mountains that are the location's scenic attraction. Partial screening of the project with low-growing trees or tall shrubs could screen views of the mirror fields from within the golf course while leaving views of the Clark Mountains intact. In that case the tower and light rays would also remain visible, but the tower alone would be less dominant, and the light rays would be occasional and more visually interesting. However, screening only quadrants containing views of the project (northwest to southwest) could leave scenic views eastward over Ivanpah Lake and mountains to the east intact. These measures are described in **VIS- 2** . Staff recommends that if the project is approved, this measure be required if desired by the golf course owner, with input by the owner as described in the Condition. Potential contrast of the mirror arrays could be reduced considerably by painting the non-mirror surfaces in dark non-reflective colors to blend with the visual background of the surrounding terrain and the slopes of the Clark Mountains, as described in Condition of Certification **VIS-1**.

Residual Impact Significance After Mitigation with Staff-Recommended Measures - With Conditions of Certification **VIS-1** and **VIS- 2**, impacts to viewers at Primm Golf Course, especially during periods when no light rays are visible, could be reduced to a less-than-significant level in the long term. If VIS-2 is not implemented, impacts would remain significant.

KOP 2 – Looking West from Primm Golf Course toward Ivanpah 1, (roughly 1.5 miles). **VisUAL RESOURCES Figures 8A** and **8B.**

KOP 1 and 2 are actually, in effect, a single KOP (i.e., the golf course). The affected field of view is too wide to fit into a single photograph; thus the two photographs are needed to depict all of the project. Therefore staff believes that KOP 2 is analyzed under the preceding discussion of KOP 1, with the same conclusions.

Ivanpah Valley – I-15 Motorists

I-15 views are all located within the valley and are thus VRM Class III. Viewer numbers on this segment of highway are extremely high, particularly on Friday evenings and other peak periods, although the recreational destination for the majority of such motorists is Las Vegas rather than the Mojave Desert, thus the level of concern with scenic quality is likely to be moderate or low.

KOP 3 – Looking West from I-15 near Yates Well Road, 2.5 Miles from site. **VISUAL RESOURCES Figures 9 A** and **9B**.

KOP 4 – Looking West from I-15 near Yates Well Road, 1 Mile from site. **VISUAL RESOURCES Figures 10A** and **10B**.

KOP 3 depicts views of Ivanpah 2 and 3 from I-15, near the Yates Well Road interchange south of the Primm Golf Course, at a distance of roughly 2-1/2 miles from Ivanpah 2.

KOP 4, rotated slightly to the left of KOP 3, depicts views of Ivanpah 1 from the same segment of I-15, near the Yates Well Road interchange south of the Primm Golf Course at a distance of roughly 1 mile from Ivanpah 1..

As in the case of KOPs 1 and 2, KOPs 3 and 4 are essentially the same KOP, rotated to capture the entire field of view that would be affected by the project. Both KOPs are addressed in the following analysis:

Contrast Rating – As depicted in Figures 9b and 10b, the project would be highly prominent from this near-middle-ground viewpoint. Form, line, color and texture contrast of the project structures would all be strong. The tall solar collector towers would introduce highly dominant vertical features into the setting. This form contrast would be strongly amplified by the bright illumination of the heated solar collector at the top of each tower, as well as by light rays of reflected sunlight when ambient dust particles are present in the surrounding air. The mirror arrays would alter the character of the desert floor to an industrial visual texture. Visible areas of disturbed soil would contrast sharply in color and brightness with the surrounding soil surface. The project would demand attention, could not be overlooked, and would be strongly dominant in the landscape.

Impact Significance - This very strong level of contrast would not meet the applicable Class III visual objectives for the Ivanpah Valley (moderate visual change) and would thus represent a potentially significant visual impact.

Mitigation – No available mitigation measures were identified to fully address these impacts. However, if the project is approved, staff recommends Condition of Certification **VIS-1**, Surface Color Treatment of Structures, to minimize structure contrast to the greatest degree feasible.

Residual Impact Significance After Mitigation with Staff-Recommended Measures - No measures were identified by staff to fully address impacts. Impacts would remain significant and unavoidable.

Staff Comments on Simulations

As discussed above under KOP 1, staff notes that the simulations of KOPs 3 and 4 do not clearly depict the mirror arrays, which would appear as a large field of angular, 12-foot-tall metallic structures with a distinctly industrial texture in views of Ivanpah 1 due to its proximity to viewers. The indistinct texture and uniform color in the images is thus somewhat unrealistic and understates the actual level of contrast that would be experienced by viewers. The visible mirror surfaces would appear as distinct, angular structures with highly variable surface color and brightness, including occasional areas of specular glare, and a dense, industrial texture as illustrated in **VISUAL RESOURCES Figure 7a, above.**

KOP 5 - Looking Northwest from I-15 at Nipton Road, 4 Miles from Site. **VISUAL RESOURCES Figures 11A** and **11B**.

KOP 5 depicts views of I-15 motorists at their farthest point from the project site, as they enter the Ivanpah Valley from the south at background distance. This viewpoint demonstrates the relatively high degree of visual exposure toward I-15 created by the site's open, eastward sloping terrain.

Contrast Rating – Contrast of the project at this farthest viewpoint on I-15 would be moderate, rapidly increasing to strong contrast as motorists progressed northward. Visual exposure to the site is high until motorists reach the Primm Golf Course, which obstructs highway views to the site.

Impact Significance – Arguably, the majority of motorists on I-15 are not highly concerned with the scenic quality of the setting. However, the very high number of viewers (up to 40,000 per day) makes it difficult to consider this KOP as having low sensitivity; under VRM manual guidelines, 40,000 vehicles per *year* may indicate a high level of sensitivity (H-8410-1). Following the VRM method this KOP is analyzed in terms of its VRM Class III rating and moderate sensitivity rating. In addition, the affected segment of I-15 within the project viewshed has been identified by San Bernardino County as a county scenic route, as discussed further under Compliance with Applicable LORS.

Moderate contrast as depicted in this background distance view would meet the VRM Class III visual objective and be less than significant. However, as motorists progressed northward, visual exposure of the project would remain high and contrast would quickly increase to a strong level. For the greater part of the drive between Nipton Road and Yates Well Road, contrast would be considered strong, and impacts potentially significant.

Mitigation – No available mitigation measures were identified to fully address these impacts. However, if the project is approved, staff recommends Condition of Certification VIS-1, surface color treatment of structures to minimize structure contrast to the greatest degree feasible.

Residual Impact Significance After Mitigation with Staff-Recommended Measures - No measures were identified by staff to fully address impacts. Impacts for most of the I-15 exposure within middle-ground (under four miles) distance would thus be significant and unavoidable.

Staff Comments on Simulation

Previous comments on the color and texture of the simulated mirror fields also apply in this view. At certain times of day, glare from the mirror surfaces would be prominent; at other times it would not, as in this simulation. The color and texture contrast of the nearer portion of the mirror fields would vary greatly depending upon surface treatment.

Ivanpah Valley – Ivanpah Lakebed

KOP 6 – View of Ivanpah 2 and 3 Looking West Toward Site from Eastern Side of Ivanpah Lake, 4 Miles from Site. **VISUAL RESOURCES Figures 12A** and**12B**.

KOP 6 is taken from the most heavily-used access point to the dry lakebed by wind sailors, on the eastern edge of the lakebed at a distance of roughly 4 miles.

Staff Comments on Simulation

Staff notes that the framing of the view is oriented to crop out Ivanpah 1, which would appear to the left of this view and would be closer and more prominent to viewers.

Contrast Rating - As depicted in **VISUAL RESOURCES Figure 12b**, because of distance and the relatively oblique vertical angle of view, the mirror arrays would occupy a narrow portion of the field of view, appearing relatively flat from Ivanpah Lake viewpoints. Form, line and color contrast of the mirror fields would thus be relatively weak. The vertical 459-foot towers and glow of solar collectors would have greater line and color contrast but would remain weak and subordinate to other features in the view. Light rays, when present as depicted in the simulation, would be more prominent, but would remain generally subordinate within the overall view. Overall, contrast would range from weak to moderate depending on prevalence of light rays.

Impact Significance – The weak to moderate levels of project contrast would meet the visual objectives of VRM Class III (Moderate). Impacts would thus be less than significant.

Mitigation – None required.

KOP 7 - Looking Southwest Toward Site from Western Side of Ivanpah Lake, 3 Miles from Site. **VISUAL RESOURCES Figures 13A** and 13**B**.

KOP 7 is taken from a second heavily-used wind sailing access point on the west side of the lakebed west of I-15, and illustrates the nearer range of viewing conditions existing for lakebed visitors.

Staff Comments on Simulation

Staff notes that as in KOP 6 above, the framing of the view is oriented to crop out Ivanpah 1, which would appear to the left of this view and in this case would be farther from the viewer than Ivanpah 3, to the right. As in KOPs 3 and4, and KOPs 6 and7, the overall horizontal angle of view occupied by the project is too wide to capture in a single photograph.

Contrast Rating - Similar to KOP 6 the mirror fields would be viewed at a relatively oblique vertical angle, reducing their overall prominence in the field of view. The solar receiving towers would be prominent due to the intense brightness of the illuminated solar receivers atop each tower. Both mirror fields and towers would be more visually dominant than at KOP 4 due to greater proximity and correspondingly greater visual magnitude. In the absence of reflective light rays, the project structures would remain visually subordinate to other features in the view, including the existing transmission towers, and their overall level of contrast would be weak to moderate. In the presence of light rays as depicted in the simulation, contrast would be moderate.

Impact Significance – The weak to moderate levels of project contrast would meet the visual objectives of VRM Class III (moderate visual change, may attract attention but should not dominate the view). Impacts would thus be less than significant.

Mitigation – None required.

Ivanpah Valley - Primm

KOP 8 - Looking South from Primm, 4 Miles from Site. **VISUAL RESOURCES Figure 14 .**

Primm is a high-volume visitor destination within middle-ground distance of the project, located within the larger VRM Class III area of the valley. Although scenic views toward the project site exist at the southern edge of Primm and from windows of Whiskey Pete's hotel, overall, viewer exposure and orientation to the project site are considered to be limited. Similarly, viewer sensitivity from this indoor activity-oriented KOP is considered relatively low. Existing visual quality within Primm, dominated by large parking areas and commercial development, is also relatively low. In addition, views toward the project site from this location would be essentially similar to those of KOP 7 (Ivanpah Lake), except from a greater distance (over 4 miles rather than 3 miles). For these reasons, BLM and Energy Commission staff agreed that a simulation from this location would not be required.

Contrast Rating – Similar to KOP 7 the mirror fields would be viewed at a relatively oblique vertical angle, reducing their overall prominence in the field of view. The solar receiving towers would be prominent due to the intense brightness of the illuminated solar receivers atop each tower. In the absence of reflected light rays, the project structures would remain visually subordinate to other features in the view, including the existing transmission towers, and their overall level of contrast would be weak to moderate. In the presence of light rays as depicted in the simulation, contrast would be moderate.

Impact Significance – The weak to moderate levels of project contrast would meet the visual objectives of VRM Class III (Moderate). Impacts would thus be less than significant.

Mitigation – None required.

Clark Mountains

All views from the Clark Mountains are VRM Class I (special designation).

KOP 9 – Looking South from Road to Umberci Mine, 1 Mile from Site. **VISUAL RESOURCES Figures 15A** and **15B**.

KOP 9 is located on the trail to Umberci Mine, a popular hiking destination from Primm and the northern part of the Ivanpah Valley, located within the BLM Stateline Wilderness Area.

Staff Comments on Simulation

Again, the simulation is framed to capture a portion of Ivanpah 3, in the foreground, and Ivanpah 2 farther in the distance, necessarily excluding Ivanpah 1, which would appear to the left of the view. The individual 12-foot-tall mirror units are distinguishable in this simulation. To provide a sense of scale, the towers are 459 feet tall. The mirror units are assumed in the simulation to be painted in a dark color. As discussed above and depicted in **VISUAL RESOURCES Figure 7b,** the appearance of the visible mirror surfaces would vary widely, from dark blue to bright solar specular glare, depending upon time and season. The visibility of mirror reflection would be greater from this and other KOPs within the Wilderness Area due to the elevated viewer position.

Contrast Rating – As depicted in **VISUAL RESOURCES Figure 15B**, form, line, color and texture contrast of the project structures would all be very strong from this viewpoint. In this particular photograph the existing transmission towers and lines are prominent in the foreground. Nevertheless, long, panoramic views of the site and Clark Mountains remain open and highly scenic from this elevated location.

Impact Significance – Class I represents the highest level of visual sensitivity in the VRM system, and even limited levels of visual change would not meet this objective. In this case the project would create a very strong level of contrast, greatly exceeding the visual objective, and would represent a potentially significant impact.

Mitigation – No available mitigation measures were identified to adequately address these impacts. However, if the project is approved, staff recommends Condition of Certification VIS-1 Color Treatment to minimize contrast of the mirror units to the greatest extent feasible.

Residual Impact Significance After Mitigation with Staff-Recommended Measures - Impacts would remain significant and unavoidable with recommended conditions of certification.

KOP 10 – Looking East from Vicinity of Benson Mine, 4 Miles from Site. **VISUAL RESOURCES Figures 16A** and **16B**.

KOP 10, located in the vicinity of the Benson Mine, is a heavily-used rock-climbing destination within the Mojave National Preserve and is representative of Preserve visitors in the Clark Mountains within the project viewshed.

Staff Comments on Simulation

Retention Ponds F and H west of Ivanpah 2 are not depicted in the simulation.

Contrast Rating – As depicted in Figure 16B, even at this distance the project would appear highly dominant with a very strong level of form, line, color and texture contrast, introducing an element of highly industrial, man-made character into a wide area of the field of view. The mirror fields would vary in their appearance from dark blue to bright specular glare as illustrated in **VISUAL RESOURCES Figure 7b**. From such elevated viewpoints in the surrounding mountains, the mirror arrays would become the dominant feature in these views of the valley and at certain times could be expected to create strong glare, particularly in late afternoon. Potential glare impacts are discussed further under Glare Impacts, below.

Impact Significance – The project would not meet the applicable VRM Class I objectives (very low visual change, must not attract attention).

Mitigation – No available mitigation measures were identified to fully address these impacts. However, if the project is approved, staff recommends the following Conditions of Certification:

In order to minimize the degree of color contrast of the mirror structures, staff recommends Condition of Certification VIS-1, Surface Treatment of Structures. In order to minimize color contrast of disturbed soil areas, staff recommends Condition of Certification VIS-3, Revegetation of Disturbed Soil Areas. The primary area requiring revegetation would be the large area to be used for construction laydown, and siting of a substation and other operation and support structures, located between Ivanpah 1 and 2. However, other structures, including soil berms and graded areas around retention ponds, shall also require revegetation where soil disturbance is expected to occur.

Residual Impact Significance After Mitigation with Staff-Recommended Measures - Recommended Condition of Certification VIS-1 would reduce the potential contrast of the non-mirror portions of the heliostat units. Recommended Condition of Certification VIS-3 would reduce the area and level of high contrast from soil disturbance over the long term. However, the larger impact of strong visual contrast and dominance of the mirror arrays, towers and solar receivers could not be mitigated. Impacts would thus remain significant and unavoidable.

Project Construction Impacts

Construction parking and laydown would occur within the units under construction. A 120-acre construction logistics area would be located between Ivanpah 1 and 2, including fabrication buildings. After Ivanpah 3 construction is complete, associated fabrication buildings would be removed and the area restored. In addition, a 257-acre area would be reserved for temporary construction use, and for the permanent substation site. Project construction is estimated to last for 48 months (DR Set 1D, # 4).

Contrast Rating – During construction, grading of the project phases would result in a very large area of disturbed soil surface, resulting in high color, line and texture contrast that would be prominent from the highway and elevated KOPs. The potential overall affected area of the three proposed project phases would be approximately 4 square miles or 3,613 acres. The majority of this area would eventually be transformed into mirror fields, with visual effects analyzed elsewhere in this report. The 120-acre construction area, and any graded or disturbed portions of the 257 acres used for temporary construction activities, however, could continue to have long-term adverse visual impacts. Graded areas could also result in adverse visual effects due to fugitive dust.

Nighttime construction lighting, without adequate mitigation, could result in light pollution affecting the Mojave National Preserve.

These effects together and individually could represent strong visual changes to affected KOPs on I-15 and in the Clark Mountains.

Impact Significance – Anticipated strong visual changes from construction would be inconsistent with the applicable VRM Classes of affected viewpoints on the highway and in the Clark Mountains, and would last for a period of several years. They thus represent a potentially significant adverse impact.

Mitigation – To address potential long-term impacts of site grading, staff recommends Condition of Certification BIO-14, as specified for specifically visual concerns in Condition of Certification VIS-3, Revegetation of Disturbed Soil Surfaces. To address potential light pollution impacts, staff recommends Condition of Certification VIS-4, Night Lighting Measures. Impacts from fugitive dust have been addressed elsewhere in this PSA and could be reduced to less than significant levels with recommended conditions of certification.

Residual Impact Significance After Mitigation with Staff-Recommended Measures – Because of the climatic constraints on successful re-vegetation in this region, it is anticipated that the impacts of disturbed areas of the site could remain significant over the long term. With recommended Condition of Certification **VIS-4**, Temporary and Permanent Exterior Lighting Measures, light pollution effects from nighttime construction lighting could be reduced to less than significant levels. Impacts from fugitive dust have been addressed elsewhere in this PSA and could be reduced to less than significant levels with recommended conditions of certification.

d. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Glare is an issue of concern for the ISEGS project, not only for aesthetic reasons, but for navigation and safety reasons due to the proximity of Highway I-15, and to aircraft flight paths associated with both existing facilities and with the anticipated future Ivanpah International Airport to be located a short distance north of the project.

Potentially affected receptors would include aircraft, motorists on I-15; hikers, climbers and other visitors in the Clark Mountains; and off-road vehicle (ORV) motorists, wind sailors, hikers and others in the valley.

In response to staff Data Requests 89 and 90, the applicant provided a series of data responses dealing with safety of reflected mirror array light beams, including calculations of beam intensity and safety, intensity of light from the solar receiver units on top of the power towers, and receiver glare safety calculations (CH2ML2008a) (DR (DR Set 1, # 89 – 90).

According to these data responses, the likelihood of hazard to aircraft from mirror reflection is negligible. Potential hazards or annoyance of mirror reflection to motorists or outdoor recreationists was not directly addressed.

According to Data Response DR 90-1, the potential hazard to motorists on I-15 of glare from the heated solar receiving units atop the towers would also be negligible.

These Data Responses have not yet been peer-reviewed by Energy Commission staff at the time of PSA publication. Review of these Data Responses will thus be incorporated in the FSA.

In addition to safety and aesthetic impacts from the mirror arrays and solar receivers, concern has been expressed in EIS scoping over potential nighttime light pollution impacts of construction or other project night lighting (NPCA, 2008). According to comments of the National Parks Conservation Association, the Mojave National Preserve contains some of the most pristine night sky views in the continental United States, and new artificial lighting may represent a deterioration of that resource. These concerns have been addressed in recommended Condition of Certification **VIS 5,** Temporary and Permanent Exterior Lighting Measures. With these measures, shielding of all project lighting, including construction lighting, to prevent upward-directed illumination would be required. However, FAA-required aircraft safety lighting, which is anticipated to include bright strobe lighting atop the 7 project towers, could not be shielded to prevent upwardly directed light. Staff is not aware of specific thresholds by which a significant light pollution impact may be defined. However, it was assumed in this study that with adequate control of all other project lighting, the 7 new aircraft safety lights would not likely constitute a significant impact.

Indirect Impacts

By substantially lowering the prevailing visual quality of its viewshed, the Ivanpah Valley, the project could have the indirect effect of encouraging additional subsequent development of similar character. Because the relatively intact existing landscape would appear highly compromised after introduction of the ISEGS, the incremental additional impact of other future projects could appear to be less significant than if they were occurring in the current landscape without ISEGS.

Cumulative Impacts

VISUAL RESOURCES

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).

There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables which are contained in the Cumulative Scenario section.

- Cumulative Impacts Figure 1, Regional Renewable Applications

- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts to visual resources could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts could occur if implementation of the ISEGS project would combine with those of other local or regional projects.

The ISEGS project is potentially associated with two types of cumulative impact: 1) cumulative impacts within the immediate project viewshed, essentially comprising foreseeable future projects in the Ivanpah Valley; and 2) cumulative impacts of foreseeable future solar and other renewable energy projects within the California Desert District (CDD), California Desert Conservation Area (CDCA), Mojave Desert, or other broad basin of the project's affected landscape type. The widest applicable basin of cumulative effect would include all of the Mojave Desert landscape type, including southeastern California, southern Nevada, and western Arizona.

Local Projects (Ivanpah Valley)

ISEGS and Past Projects

Past and present projects in the Ivanpah Valley were analyzed in the main staff assessment evaluation of the existing project setting. To summarize the conclusions of that analysis briefly, the existing Ivanpah Valley setting, though the site of existing development, is considered to be predominantly intact scenically, and was assigned a Moderate level of scenic quality, and VRM Class III. Cumulative effects of past projects in combination with ISEGS is thus as described in the main staff assessment analysis, above.

Past projects that have resulted in similar impacts in this area include the existing railroad track, the Primm Golf Course, a transmission line, the I-15 freeway, the Bighorn electric generating station, Chevron-Texaco evaporation pond and commercial development in Primm, NV.

*ISEGS and Foreseeable Future Projects*Cumulative Impacts Table 3, lists foreseeable future projects within the Ivanpah Valley. All of the projects listed in Cumulative Impacts Table 3, with the exception of G, J, and K, would lie within the viewshed of the ISEGS

project. The Ivanpah Airport would be located at a sufficiently great distance as to have limited visual interaction with the ISEGS project. On the other hand, the ISEGS, GEN 3, and Nextlight Primm solar projects, along with the existing Bighorn Generating Station, proposed Ivanpah Energy Project, and City of Primm, would simultaneously be visible within middle-ground distance to I-15 motorists, and also be cumulatively highly dominant from viewpoints in the Clark Mountains, including KOP 10, near Benson Mine and others within the Mojave National Preserve. This cumulative effect would be substantially more adverse than the significant impacts of the ISEGS project alone, or the future projects without ISEGS, both from I-15 and from the Preserve.

For I-15 motorists the cumulative effect of the existing Primm Golf Course together with the ISEGS, I-15 Widening, Port of Entry, and Desert Xpress projects would be substantially adverse, converting the majority of the western highway frontage within the valley to a more urbanized, developed foreground view with potential to intrude into scenic westward highway views of the Ivanpah Valley and Clark Mountains.

The overall effect of these cumulative changes would thus be to transform the current highly intact natural landscape into one that is in many respects highly urbanized, industrialized, and of relatively poor visual quality, particularly in the northern half of the valley. Views of the Clark Mountain ridgeline and the Ivanpah Lake would remain to motorists on I-15; however, foreground development could intrude heavily into those views, strongly compromising their scenic value. From the perspective of Mojave National Preserve visitors, views of the valley would be strongly dominated by industrial development, and there would be some likelihood of cumulative light pollution impacts due to an accumulation of night-time light sources, including the ISEGS aircraft lighting, Port of Entry and new and existing power plant lighting.

The anticipated impacts of the ISEGS project in combination with foreseeable future local projects in the Ivanpah Valley are thus considered cumulatively considerable and potentially significant.

Regional Solar/Renewable Development Projects

ISEGS and Past Regional Projects

The ISEGS project is among the first of a large number of existing solar project applications in the CDD. As such, past and present projects have had a negligible region-wide cumulative impact.

ISEGS and Foreseeable Future Projects

The Mojave Desert and California Desert Conservation Area (CDCA) within which the ISEGS project is located are a unique and highly valued scenic resource of national importance, as reflected by the presence of three national parks and numerous Wilderness Areas within its boundaries. Cumulative Impacts Table 1 identifies 76 solar projects and 61 wind project applications with a total overall area of over one million acres within the CDCA . This figure does not include renewable projects within the Nevada and Arizona portions of the Mojave Desert. With this very high number of renewable energy applications currently filed with BLM, the potential for profound widespread cumulative impacts to scenic resources within the CDCA is clear. These

impacts could include a substantial decline in the overall number and extent of scenically intact, undisturbed desert landscapes, and a substantially more industrial character in the overall CDCA and Mojave Desert landscape. Viewed in the cumulative context of either the CDCA or the Mojave Desert as a whole, potential visual impacts of renewable energy projects are thus considered to be cumulatively considerable and potentially significant.

Cumulative Impact Conclusion

The anticipated visual impacts of the ISEGS project in combination with past and foreseeable future local projects in the Ivanpah Valley, and past and foreseeable future region-wide projects in the Mojave Desert and CDCA are thus considered cumulatively considerable and potentially significant.

COMPLIANCE WITH APPLICABLE LORS

VISUAL RESOURCES Table 3
Project Compliance with Laws, Ordinances, Regulations, and Standards (LORS)

LORS		**Consistency with Staff-Recommended Conditions of Certification (Project)**
FEDERAL		
National Environmental Policy Act (NEPA)	As discussed above, applicable federal requirements for visual impact assessment are enacted through application of the BLM VRM methodology, discussed below.	
Federal Land Policy and Management Act of 1976 (FLPMA)	Section 102 (a) of the Federal Land Policy and Management Act of 1976 (FLPMA) states that "...the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values…" Section 103 (c) identifies "scenic values" as one of the resources for which public land should be managed. Section 201 (a) states that "The Secretary shall prepare and maintain on a continuing basis an inventory of all public lands and their resources and other values (including...scenic values)..."	Refer to VRM discussion, below.

	Section 505 (a) requires that "Each right-of-way shall contain terms and conditions which will... minimize damage to the scenic and esthetic values..." The VRM method represents the method for complying with FLPMA under applicable agency administrative rules.	
California Desert Conservation Area Plan (CDCA Plan)	The CDCA Plan represents the Resource Management Plan (RMP) for the area required under FLPMA. Although the CDCA Plan did not contain VRM mapping as in most RMPs, interim VRM mapping was prepared for this project by BLM, as called for under VRM Handbook guidance. The ISEGS site is classified in the CDCA Plan as Multiple-Use Class (MUC) L (Limited Use). Multiple-Use Class L, the most restrictive under the plan, "protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.	Not consistent. The ISEGS project would not represent a lower-intensity use that ensures that sensitive resources are not significantly diminished. See also VRM discussion, below.
Northern and Eastern Mojave (NEMO) Plan Amendments	The NEMO plan amendments to the CDCA Plan did not directly affect visual resource management.The NEMO identified visual impacts to viewers on historic routes. However, the only identified historic trail in the vicinity, the East Mojave Heritage Trail, would not be impacted by the ISEGS project (Murray, Tel. Con. 9/23/08).	Consistent with stated visual concerns. The East Mojave Heritage Trail would not be significantly affected.
Visual Resource Management System (VRM)	The VRM method represents the means for complying with the requirements of FLPMA in relation to visual resources under	Inconsistent. The project would not be consistent with applicable VRM impact thresholds from VRM Class

	applicable BLM rules.	I KOPs in the Clark Mountains within the Stateline Wilderness Area and Mojave National Preserve; nor would it be consistent with Class III objectives from near-middleground KOPs at Primm Golf Course, and on Highway I-15
National Historic Preservation Act (NHPA)	Under regulations of the NHPA, visual impacts to a listed or eligible National Register property that may diminish the integrity of the property's "...setting...(or) feeling..." in a way that affects the property's eligibility for listing, may result in a potentially significant adverse effect. "Examples of adverse effects...include...: Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features..." (36 CFR Part 800.5)	Potentially eligible pre-historic and historic sites were identified by Energy Commission staff within the viewshed of the ISEGS project, and may potentially be affected by visual effects of the project. These potential impacts are addressed in the Cultural Resources section of this PSA.
STATE		
State Scenic Highway Program (CA. Streets and Highways Code, Section 260 et seq.)	The State Scenic Highway Program promotes protection of designated State scenic highways through certification and adoption of local scenic corridor protection programs that conform with requirements of the State program.	Consistent. Highway I-15 within the project viewshed is not an eligible or designated State scenic highway.
LOCAL		
Applicable Conservation Element Goals, Objectives, Programs	**GOAL D/CO 1**. Preserve the unique environmental features and natural resources of the Desert Region, including native wildlife, vegetation, water and scenic vistas. **POLICIES** **D/CO 1.2** Require future land development practices to be compatible with the existing topography and scenic vistas, and protect the natural vegetation.	Inconsistent. The proposed project would intrude into scenic vistas in the Clark Mountains and would require removal of approximately 4 square miles of vegetation. Inconsistent. The project would not be compatible with existing scenic vistas, and would not substantially protect the natural vegetation. Likely consistent with recommended Condition of

	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.	Certification **VIS-4**, which would require conformance with Night Sky Protection Ordinance.
Applicable Open Space Element Goals, Objectives, Programs	**GOAL OS 5. The County will maintain and enhance the visual character of scenic routes in the County.** **POLICIES** **OS 5.1** Features meeting the following criteria will be considered for designation as scenic resources: a. A roadway, vista point, or area that provides a vista of undisturbed natural areas. b. Includes a unique or unusual feature that comprises an important or dominant portion of the viewshed (the area within the field of view of the observer). c. Offers a distant vista that provides relief from less attractive views of nearby features (such as views of mountain backdrops from urban areas). **OS 5.2** Define the scenic corridor on either side of the designated route, measured from the outside edge of the right-of-way, trail, or path. Development along scenic corridors will be required to demonstrate through visual analysis that proposed improvements are compatible with the scenic qualities present. **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	I-15 in the project viewshed is designated as a County scenic highway (Policy OS 5.3) Inconsistent. The project would not maintain or enhance the visual character of the views on I-15 within its viewshed. Inconsistent. The project would not conform with the applicable BLM visual management objectives of its viewshed.

	beauty to the County. Therefore, the County designates the following routes as scenic highways and applies all applicable policies to development on these routes (see Figures 2-4A through 2-4C of the Circulation and Infrastructure Background Report): **(MULTIPLE REGIONS):** c. *Interstate 15 from the junction with Interstate 215 northeast to the Nevada state line*, excepting those areas within the Barstow Planning Area and the community of Baker where there is commercial /industrial development; those portions within the Yermo area from Ghost Town Road to the East Yermo Road overcrossing on the south side only and from First Street to the East Yermo Road overcrossing on the north side; and all incorporated areas.	
Night Sky Protection Ordinance Ord. 3900 (San Bernardino County Code 87.0921)	Commercial and industrial outdoor lighting must be fully shielded, "so that no light is emitted above the horizontal plane...do not direct light or light trespass onto adjacent property...or to any member of the public who may be traveling on adjacent roadways..."	Consistent with recommended Condition of Certification **VIS-4**. FAA aircraft lighting could not be shielded.

CONCLUSIONS AND RECOMMENDATIONS

Staff concludes that the proposed project would not meet the visual objectives of the VRM Classes assigned to the site and viewshed by BLM, as seen from several Key Observation Points in the Ivanpah Valley and Clark Mountains, including:

- The Primm Golf Course
- Middle-ground-distance viewpoints on Highway I-15
- Viewpoints in the Mojave National Preserve, including the Benson Mine and vicinity
- Viewpoints in the Stateline Wilderness Area, including the Umberci Mine and vicinity

Staff also concludes that the visual analysis and resulting findings, obtained using the BLM VRM assessment method, were essentially consistent with findings that would be obtained under the Energy Commission visual assessment method.

Consequently, staff concludes that potentially significant visual impacts would occur in those locations as a result of the project.

Staff found that with recommended conditions of certification, potentially significant visual impacts at the Primm Golf Course (KOPs 1 and 2) could be mitigated to less than significant levels in the long term.

However, staff has concluded that potentially significant visual impacts at the other locations cited above could not be mitigated to less than significant levels and would thus result in significant and unavoidable impacts.

In addition, staff concludes that the project would not conform with applicable goals and policies of the San Bernardino General Plan Conservation and Open Space Elements as follows:

> Conservation Element Goal D/CO 1, calling for preservation of scenic vistas in the County. Staff found that the project would have significant adverse effects on scenic vistas.
>
> Open Space Element Goal OS 5, calling for the County to maintain and enhance the visual character of scenic routes in the County; and Policy OS 5.2, which states that "Development along scenic corridors will be required to demonstrate through visual analysis that proposed improvements are compatible with the scenic qualities present." The visual analysis of the project found that it would not be compatible with the scenic qualities present in the viewshed of portions of Highway I-15 designated as a County scenic route.

Finally, staff concludes that the project in combination with foreseeable future projects could have significant cumulative visual impacts of two kinds:

1. cumulative impacts within the immediate project viewshed, essentially comprising foreseeable future projects in the Ivanpah Valley; and

2. cumulative impacts of foreseeable future solar and other renewable energy projects within the California Desert District and Mojave Desert.

A final determination of potential glare-related aesthetic impacts has not been completed in the PSA, pending peer review of technical glare studies provided by the applicant. These findings will be incorporated in the FSA.

As stated, staff concludes that the project would have significant unavoidable adverse impacts. However, if the Commission approves the project, staff recommends that all of staff's proposed conditions of certification be adopted in order to minimize impacts to the greatest feasible extent.

PROPOSED CONDITIONS OF CERTIFICATION

The Energy Commission should adopt the following conditions of certification if it approves the project.

SURFACE TREATMENT OF PROJECT STRUCTURES AND BUILDINGS

VIS-1 The project owner shall treat the surfaces of all project structures and buildings visible to the public such that a) their colors minimize visual intrusion and contrast by blending with the landscape; b) their colors and finishes do not create excessive glare; and c) their colors and finishes are consistent with local policies and ordinances. The transmission line conductors shall be non-specular and non-reflective, and the insulators shall be non-reflective and non-refractive.

The project owner shall submit for CPM review and approval, a specific surface treatment plan that will satisfy these requirements. The treatment plan shall include:

a. A description of the overall rationale for the proposed surface treatment, including the selection of the proposed color(s) and finishes;

b. A list of each major project structure, building, tank, pipe, and wall; the transmission line towers and/or poles; and fencing, specifying the color(s) and finish proposed for each. Colors must be identified by vendor, name, and number; or according to a universal designation system;

c. One set of color brochures or color chips showing each proposed color and finish;

d. A specific schedule for completion of the treatment; and

e. A procedure to ensure proper treatment maintenance for the life of the project.

The project owner shall not specify to the vendors the treatment of any buildings or structures treated during manufacture, or perform the final treatment on any buildings or structures treated in the field, until the project owner receives notification of approval of the treatment plan by the CPM. Subsequent modifications to the treatment plan are prohibited without CPM approval.

Verification: At least 90 days prior to specifying to the vendor the colors and finishes of the first structures or buildings that are surface treated during manufacture, the project owner shall submit the proposed treatment plan to the CPM for review and approval and simultaneously to the [specify local jurisdiction] for review and comment.

If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for review and approval by the CPM before any treatment is applied. Any modifications to the treatment plan must be submitted to the CPM for review and approval.

Prior to the start of commercial operation, the project owner shall notify the CPM that surface treatment of all listed structures and buildings has been completed and they are ready for inspection and shall submit one set of electronic color photographs from the same key observation points identified in (d) above.

The project owner shall provide a status report regarding surface treatment maintenance in the Annual Compliance Report. The report shall specify a): the condition of the surfaces of all structures and buildings at the end of the reporting year; b) maintenance activities that occurred during the reporting year; and c) the schedule of maintenance activities for the next year.

LANDSCAPE SCREENING OF GOLF COURSE

VIS-2 At the request of, and in consultation with the CPM and the golf course owner, the project owner shall prepare a perimeter landscape screening plan to reduce the visibility of the proposed ISEGS project as seen from the golf course. The intent of the plan shall be to provide screening of the power project, particularly the mirror fields, while retaining as much of the scenic portion of the overall views of Ivanpah Valley and Clark Mountains as feasible. The design approach shall be developed with prior consultation with the golf course owner, and implemented only at the golf course owner's request.

The project owner shall submit to the CPM for review and approval and simultaneously to the golf course owner for review and comment a preliminary conceptual landscaping plan whose objective is to provide an attractive visual screen to views of the ISEGS project mirror fields.

Upon approval by the CPM and golf course owner, the project owner shall submit to the CPM for review and approval and simultaneously to the golf course owner for review and comment a landscaping plan whose proper implementation will satisfy these requirements. The plan shall include:

a. A detailed landscape, grading, and irrigation plan, at a reasonable scale. The plan shall demonstrate how the requirements stated above shall be met. The plan shall provide a detailed installation schedule demonstrating installation of as much of the landscaping as early in the construction process as is feasible in coordination with project construction.

b. A list (prepared by a qualified professional arborist familiar with local growing conditions) of proposed species, specifying installation sizes, growth rates, expected time to maturity, expected size at five years and at maturity, spacing, number, availability, and a discussion of the suitability of the plants for the site conditions and mitigation objectives, with the objective of providing the widest possible range of species from which to choose;

c. Maintenance procedures, including any needed irrigation and a plan for routine annual or semi-annual debris removal for the life of the project;

d. A procedure for monitoring for and replacement of unsuccessful plantings for the life of the project; and

e. One set of 11”x17” color photo-simulations of the proposed landscaping at five years and twenty years after planting, as viewed from adjoining segments of I-5.

The plan shall not be implemented until the project owner receives final approval from the CPM.

Verification: The landscaping plan shall be submitted to the CPM for review and approval and simultaneously to the golf course owner for review and comment at least 90 days prior to installation of the landscaping.

If the CPM determines that the plan requires revision, the project owner shall provide to the CPM and simultaneously to the golf course owner a revised plan for review and approval by the CPM.

The planting must occur during the first optimal planting season following site mobilization. The project owner shall simultaneously notify the CPM and the golf course owner within seven days after completing installation of the landscaping, that the landscaping is ready for inspection.

The project owner shall report landscape maintenance activities, including replacement of dead or dying vegetation, for the previous year of operation in each Annual Compliance Report.

REVEGETATION OF DISTURBED SOIL AREAS

VIS-3 The project owner shall revegetate disturbed soil areas to the greatest practical extent, as described in Condition of Certification BIO-14. In order to address specifically visual concerns, the required Reclamation Plan shall include reclamation of the area of disturbed soils used for laydown, project construction, and siting of the substation and other ancillary operation and support structures.

Verification: Refer to Condition of Certification BIO-14.

TEMPORARY AND PERMANENT EXTERIOR LIGHTING

VIS-4 To the extent feasible, consistent with safety and security considerations, the project owner shall design and install all permanent exterior lighting and all temporary construction lighting such that a) lamps and reflectors are not visible from beyond the project site, including any off-site security buffer areas; b) lighting does not cause excessive reflected glare; c) direct lighting does not illuminate the nighttime sky, except for required FAA aircraft safety lighting; d) illumination of the project and its immediate vicinity is minimized, and e) the plan complies with local policies and ordinances.

The project owner shall submit to the CPM and BLM for review and approval and simultaneously to the County of San Bernardino for review and comment a lighting mitigation plan that includes the following:

a. Location and direction of light fixtures shall take the lighting mitigation requirements into account;

b. Lighting design shall consider setbacks of project features from the site boundary to aid in satisfying the lighting mitigation requirements;

c. Lighting shall incorporate fixture hoods/shielding, with light directed downward or toward the area to be illuminated;

d. Light fixtures that are visible from beyond the project boundary shall have cutoff angles that are sufficient to prevent lamps and reflectors from being visible beyond the project boundary, except where necessary for security;

e. All lighting shall be of minimum necessary brightness consistent with operational safety and security; and

f. Lights in high illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have (in addition to hoods) switches, timer switches, or motion detectors so that the lights operate only when the area is occupied.

Verification: At least 90 days prior to ordering any permanent exterior lighting or temporary construction lighting, the project owner shall contact the CPM to discuss the documentation required in the lighting mitigation plan.

At least 60 days prior to ordering any permanent exterior lighting, the project owner shall submit to the CPM and BLM for review and approval and simultaneously to the County of San Bernardino for review and comment a lighting mitigation plan.

If the CPM and BLM determine that the plan requires revision, the project owner shall provide to the CPM and BLM a revised plan for review and approval by the CPM and BLM.

The project owner shall not order any exterior lighting until receiving CPM approval of the lighting mitigation plan.

Prior to commercial operation, the project owner shall notify the CPM that the lighting has been completed and is ready for inspection. If after inspection the CPM notifies the project owner that modifications to the lighting are needed, within 30 days of receiving that notification the project owner shall implement the modifications and notify the CPM that the modifications have been completed and are ready for inspection.

Within 48 hours of receiving a lighting complaint, the project owner shall provide the CPM with a complaint resolution form report as specified in the Compliance General Conditions including a proposal to resolve the complaint, and a schedule for implementation. The project owner shall notify the CPM within 48 hours after completing implementation of the proposal. A copy of the complaint resolution form report shall be submitted to the CPM within 30 days.

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APPENDIX VR-1

Bureau of Land Management Visual Resource Management

The Bureau of Land Management Visual Resource Management (VRM) methodology is a part of the BLM resource management planning process. Typically, a Resource Management Plan (RMP) is prepared for each BLM Resource Area. As part of that plan, the VRM methodology is used to incorporate visual resource values into the RMP.

The enabling legislation establishing the Bureau of Land Management's responsibilities for lands under its jurisdiction (Federal Land Policy and Mangement Act of 1976 (FLPMA)), also establishes its responsibility to protect scenic values.

Section 102 (a) of the Federal Land Policy and Management Act of 1976 (FLPMA) states that "... the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values…"

Section 103 (c) identifies "scenic values" as one of the resources for which public land should be managed.

Section 201 (a) states that "The Secretary shall prepare and maintain on a continuing basis an inventory of all public lands and their resources and other values (including ... scenic values)..."

Section 505 (a) requires that "Each right-of-way shall contain terms and conditions which will...minimize damage to the scenic and esthetic values..."

BLM Manual H-8400, Visual Resource Management, describes the VRM procedures to be used in RMP planning (USDI, 1987; http://www.blm.gov/nstc/VRM/8410.html). The following summary is taken primarily from this source.

A visual inventory of the resource area is prepared. The inventory consists of: 1) a scenic quality evaluation; 2) (viewer) sensitivity level analysis; 3) a delineation of distance zones. Based on these three factors, BLM lands are mapped as one of four visual resource inventory classes. The inventory classes represent the actual relative values of the visual resource. Class I represents special designation scenic areas, such as national parks, wilderness areas, designated scenic areas, and so on. Class II represents areas of high scenic value based on the three components just described. Class II represents moderate scenic values; Class IV low scenic value. The visual resource inventory classes provide the input, along with input from all other resource types, that inform the delineation of management areas in the Resource Area's Resource Management Plan, according to the various priorities defined in that plan. Visual resource management classes are then assigned in the RMP. The assignment of visual management classes is ultimately based on the management decisions made in

RMPs. Inventory classes may thus be modified to reflect non-visual considerations introduced in the resource management planning process. It is thus possible for visual resource management classes to diverge from Energy Commission resource baseline evaluations, if the management classes are modified to reflect non-visual considerations. However, in theory BLM visual resource inventory classes should conform with Energy Commission baseline resource evaluations.

In the case of the Ivanpah project and other projects in the Mojave Desert, the applicable RMP is the California Desert Conservation Area Plan (CDCA Plan)(USDI, 1980 as amended). The CDCA Plan was a unique document, and does not follow the typical BLM RMP process. One consequence of this is that VRM inventory and management class mapping were not prepared for the CDCA. The CDCA Plan is characterized in terms of four Multiple-Use Classes, C (wilderness and areas recommended for wilderness status), L (limited use), M (moderate use), and I (intensive use). The Ivanpah project is located within Class L. However, the Recreation Element of the CDCA Plan specifies that visual resource management objectives and the contrast rating procedure, be used to manage visual resources.

VISUAL RESOURCE INVENTORY MAPPING

Visual resource inventory mapping includes 1) a scenic quality evaluation; 2) (viewer) sensitivity level analysis; 3) a delineation of distance zones.

SCENIC QUALITY EVALUATION

In the visual resource inventory process, public lands are give an A, B, or C rating based on the apparent scenic quality which is determined using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. The planning area is subdivided into scenic quality rating units (SQRU) for rating purposes. SQRUs are delineated based on similar visual patterns, texture, color, variety, etc.; and areas which have similar impacts from man-made modifications. A team then evaluates the scenic quality of each unit from several key viewpoints (KOPs). These are recorded on Form 8400-1.

SENSITIVITY LEVEL ANALYSIS

Sensitivity levels are a measure of public concern for scenic quality. Public lands are assigned high, medium, or low sensitivity levels by analyzing the various indicators of public concern. Sensitivity evaluaion is based on : type of users; amount of use; level of public interest; adjacent land uses; special areas; and other relevant considerations.

DISTANCE ZONES

Landscapes are subdivided into 3 distance zones based on relative visibility from travel routes or observation points. The 3 zones are: foreground-middleground, background, and seldom seen. The foreground-middleground (fm) zone includes areas seen from highways, rivers, or other viewing locations which are less than 3 to 5 miles away. Seen areas beyond the foreground-middleground zone but usually less than 15 miles away are in the background (bg) zone. Areas not seen as foreground-middleground or background (i.e., hidden from view) are in the seldom-seen (ss) zone.

As can be seen, in practical terms this classification divides the resource area into areas of potential viewer concern – under 3 to 5 miles distance; and areas outside of that zone, that are not likely to be accessible to sensitive viewers. It does not distinguish between foreground and middleground distance zones, an important distinction in any visual analysis. Rather, this distinction can be introduced in the context of project-specific analyses, based on key viewpoints relevant to that project.

VISUAL RESOURCE CLASSES AND OBJECTIVES

Visual resource classes are categories assigned to public lands which serves two purposes: (1) an inventory tool that portrays the relative value of the visual resources, and (2) a management tool that portrays the visual management objectives. There are four classes (I, II, III, and IV).

Visual Resource Inventory Classes. Visual resource inventory classes are assigned through the inventory process. Class I is assigned to those areas where a management decision has been made previously to maintain a natural landscape. This includes areas such as national wilderness areas, the wild section of national wild and scenic rivers, and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Classes II, III, and IV are assigned based on a combination of scenic quality, sensitivity level, and distance zones. This is accomplished by combining the 3 overlays for scenic quality, sensitivity levels, and distance zones and using the guidelines shown in Illustration 11 to assign the proper class. The end product is a visual resource inventory class overlay as shown in Illustration 12. Inventory classes are informational in nature and provide the basis for considering visual values in the RMP process. They do not establish management direction and should not be used as a basis for constraining or limiting surface disturbing activities.

Visual Resource Management Classes. Visual resource management classes are assigned through RMP's. The assignment of visual management classes is ultimately based on the management decisions made in RMP's. However, visual values must be considered throughout the RMP process. All actions proposed during the RMP process that would result in surface disturbances must consider the importance of the visual values and the impacts the project may have on these values. Management decisions in the RMP must reflect the value of visual resources. In fact, the value of the visual resource may be the driving force for some management decisions. For example, highly scenic areas which need special management attention may be designated as scenic Areas of Critical Environmental Concern and classified as VRM Class I based on the importance of the visual values. A map is developed in each RMP showing the approved visual resource management classes.

OBJECTIVES FOR VISUAL RESOURCE CLASSES.

Class I Objective. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not eclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II Objective. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III Objective. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objectives. The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Interim VRM Classes and Objectives.

Interim visual management classes are established where a project is proposed and there are no RMP approved VRM objectives. These classes are developed using the guidelines in Section I to V and must conform with the land-use allocations set forth in the RMP which covers the project area. The establishment of interim VRM classes will not require a RMP amendment, unless the project that is driving the evaluation requires one.

APPENDIX VR-2

ENERGY COMMISSION VISUAL RESOURCE ANALYSIS EVALUATION CRITERIA

Energy Commission staff conducts a visual resource analysis according to Appendix G, "Environmental Checklist Form—Aesthetics," California Environmental Quality Act (CEQA). The CEQA analysis requires that commission staff make a determination of impact ranging from "Adverse and Significant" to "Not Significant."

Staff's analysis is based on Key Observation Points or KOPs. KOPs are photographs of locations within the project area that are highly visible to the public — for example, travel routes; recreational and residential areas; and bodies of water as well as other scenic and historic resources.

Those photographs are taken to indicate existing conditions without the project and then modified to include a simulation of the project. Consequently, staff has a visual representation of the viewshed before and after a project is introduced and makes its analysis accordingly. Information about that analytical process follows.

Visual Resource Analysis Without Project

When analyzing KOPs of existing conditions without the project, staff considers the following conditions: visual quality, viewer concern, visibility, number of viewers, duration of view. Those conditions are then factored into an overall rating of viewer exposure and viewer sensitivity. Information about each condition and rating follows.

Visual Quality

An expression of the visual impression or appeal of a given landscape and the associated public value attributed to the resource. Visual quality is rated from *high* to *low*. A high rating is generally reserved for landscapes viewers might describe as picture-perfect.

Landscapes rated high generally are memorable because of the way the components combine in a visual pattern. In addition, those landscapes are free from encroaching elements, thus retaining their visual integrity. Finally, landscapes with high visual quality are visually coherent and harmonious when each element is considered as part of the whole. On the contrary, landscapes rated *low* are often dominated by visually discordant human alterations.

Viewer Concern

Viewer concern represents the reaction of a viewer to visible changes in the viewshed — an area of land visible from a fixed vantage point. For example, viewers have a high expectation for views formally designated as a scenic area or travel corridor as well as for recreational and residential areas. Viewers generally expect that those views will be preserved. Travelers on highways and roads, including those in agricultural areas, are generally considered to have moderate viewer concerns and expectations.

However, viewers tend to have low-to-moderate viewer concern when viewing commercial buildings. And industrial uses typically have the lowest viewer concern. Regardless, the level of concern could be lower if the existing landscape contains discordant elements. In addition, some areas of lower visual quality and degraded visual character may contain particular views of substantially higher visual quality or interest to the public.

Visibility

Visibility is a measure of how well an object can be seen. Visibility depends on the angle or direction of views; extent of visual screening; and topographical relationships between the object and existing homes, streets, or parks. In that sense, visibility is determined by considering any and all obstructions that may be in the sightline—trees and other vegetation; buildings; transmission poles or towers; general air quality conditions such as haze; and general weather conditions such as fog.

Number of Viewers

Number of viewers is a measure of the number of viewers per day who would have a view of the proposed project. *Number of viewers* is organized into the following categories: residential according to the number of residences; motorist according to the number of vehicles; and recreationists.

Duration of View

Duration of view is the amount of time to view the site. For example, a high or extended view of a project site is one reached across a distance in two minutes or longer. In contrast, a low or brief duration of view is reached in a short amount of time—generally less than ten seconds.

Viewer Exposure

Viewer exposure is a function of three elements previously listed, *visibility*, *number of viewers*, and *duration of view*. Viewer exposure can range from a *low* to *high*. A partially obscured and brief background view for a few motorists represents a low value; and unobstructed foreground view from a large number of residences represents a high value.

Visual Sensitivity

Visual sensitivity is comprised of three elements previous listed, *visual quality*, *viewer concern*, and *viewer exposure*. Viewer sensitivity tends to be higher for homeowners or people driving for pleasure or engaged in recreational activities and lower for people driving to and from work or as part of their work.

Visual Resource Analysis with Project

Visual resource analyses with photographic simulations of the project involve the elements of contrast, dominance, view blockage, and visual change. Information about each element follows.

Contrast

Contrast concerns the degree to which a project's visual characteristics or elements — form, line, color, and texture — differ from the same visual elements in the existing landscape. The degree of contrast can range from *low* to *high*. A landscape with forms, lines, colors, and textures similar to those of a proposed energy facility is more visually absorbent; that is, more capable of accepting those characteristics than a landscape in which those elements are absent.[1] Generally, visual absorption is inversely proportional to visual contrast.

Dominance

Dominance is a measure of (a) the proportion of the total field of view occupied by the field; (b) a feature's apparent size relative to other visible landscape features; and (c) the conspicuousness of the feature due to its location in the view.

A feature's level of dominance is lower in a panoramic setting than in an enclosed setting with a focus on the feature itself. A feature's level of dominance is higher if it is (1) near the center of the view; (2) elevated relative to the viewer; or (3) has the sky as a backdrop. As the distance between a viewer and a feature increases, its apparent size decreases; and consequently, its dominance decreases. The level of dominance ranges from *low* to *high*.

View Blockage

The extent to which any previously visible landscape features are blocked from view constitutes view disruption. The view is also disrupted when the continuity of the view is interrupted. When considering a project's features, higher quality landscape features can be disrupted by lower quality project features, thus resulting in adverse visual impacts. The degree of view disruption can range from *none* to *high*.

Visual Change

Visual change is a function of *contrast*, *dominance*, and *view disruption*. Generally, *contrast* and *dominance* contribute more to the degree of visual change than does *view disruption*.

[1] Typically, the Energy Commission does not consider texture in its visual analyses.

VISUAL RESOURCES - FIGURE 1

Ivanpah Solar Power Project - Views of Site

a.

b.

c.

d.

a. Panorama of Ivanpah Valley, Looking East from Site

b. Site from Highway 164, Looking West at San Bernardino County Line (approximately 14 miles)

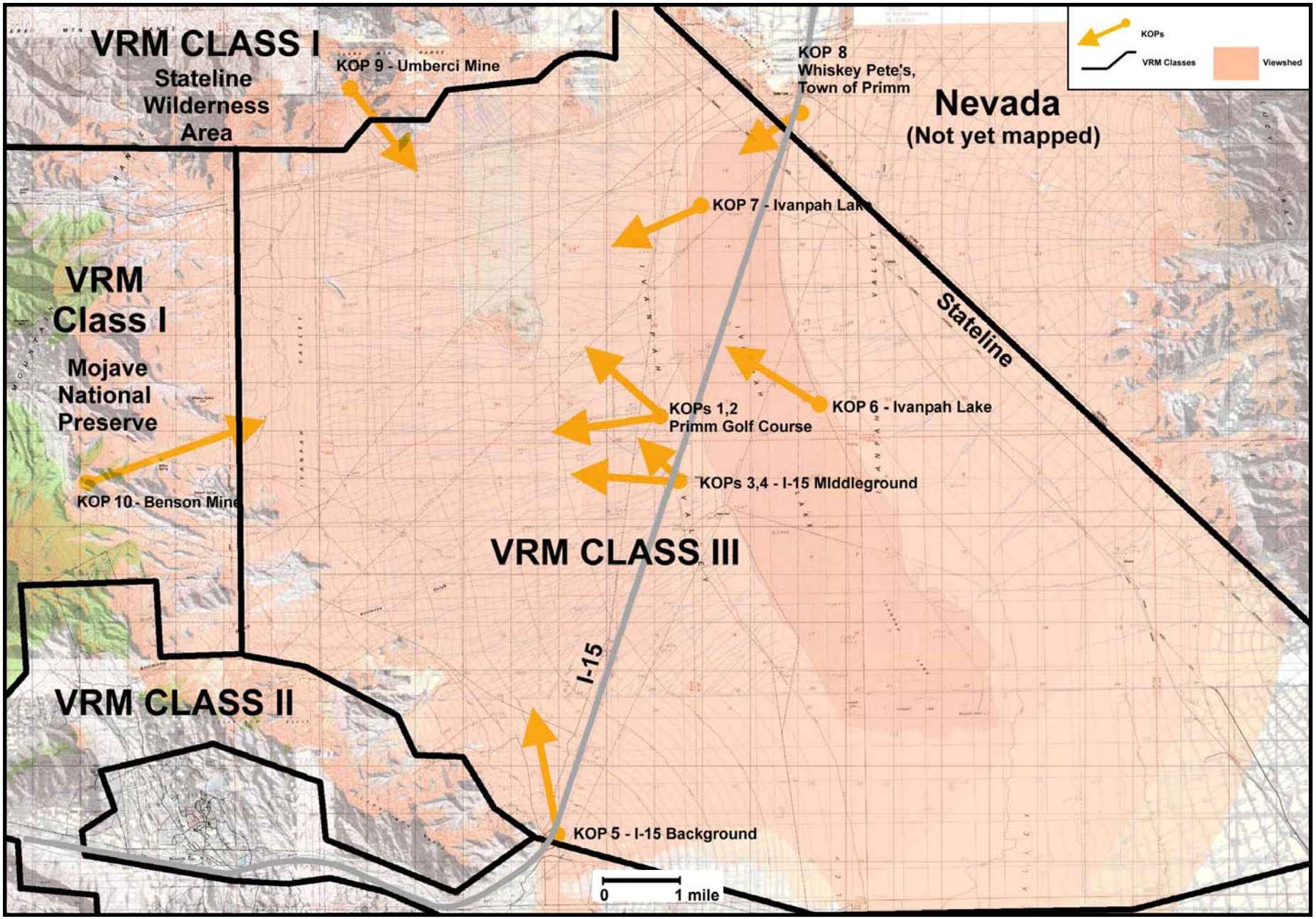
c. Site from Ivanpah Lake, Looking West (approximately 4 miles)

d. Site from I-15 Looking Northwest (approximately 5 miles)

SOURCE: WK Figure 1

VISUAL RESOURCES - FIGURE 2

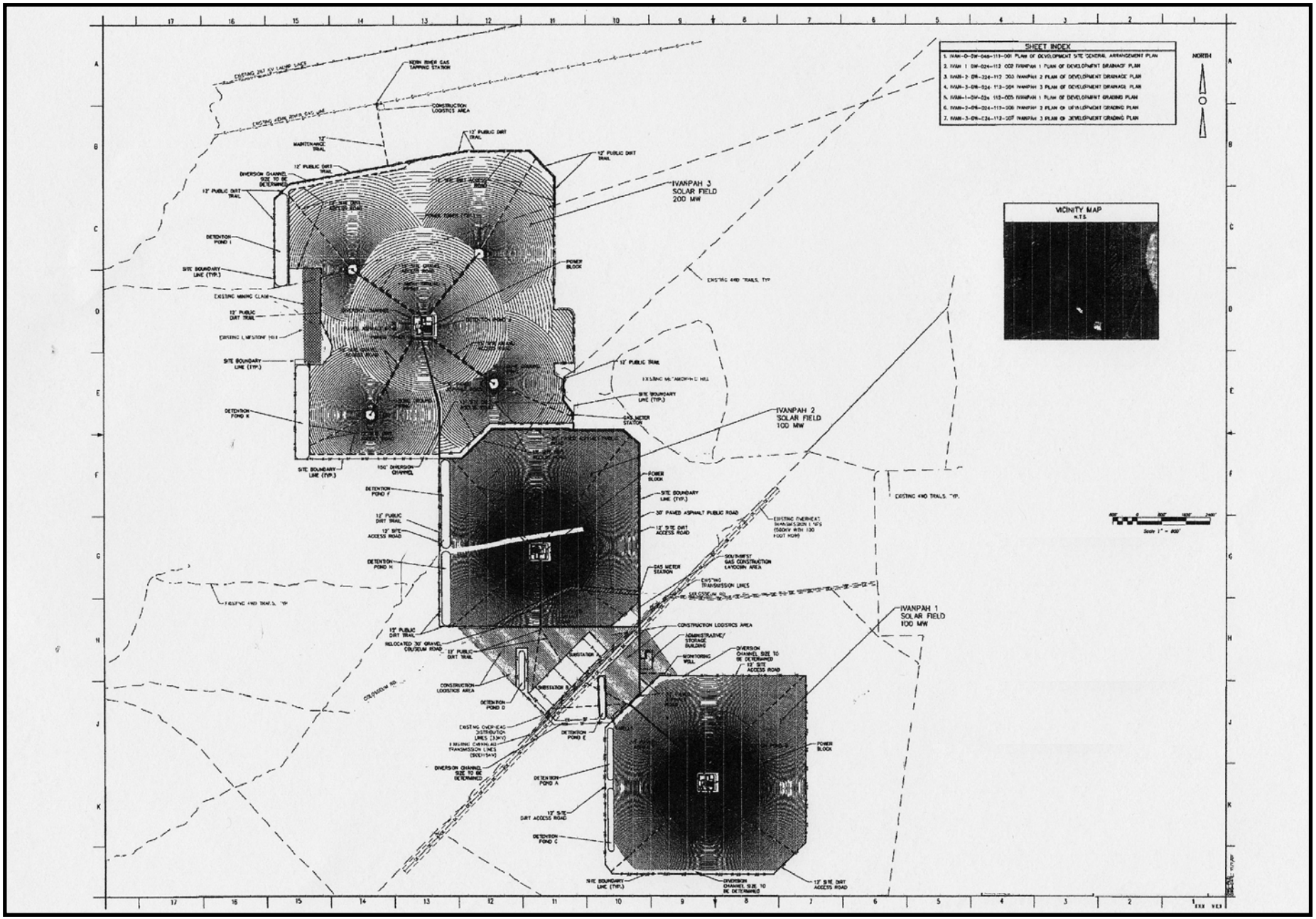
Ivanpah Solar Power Project - Landscape Setting



SOURCE: WK Figure 2

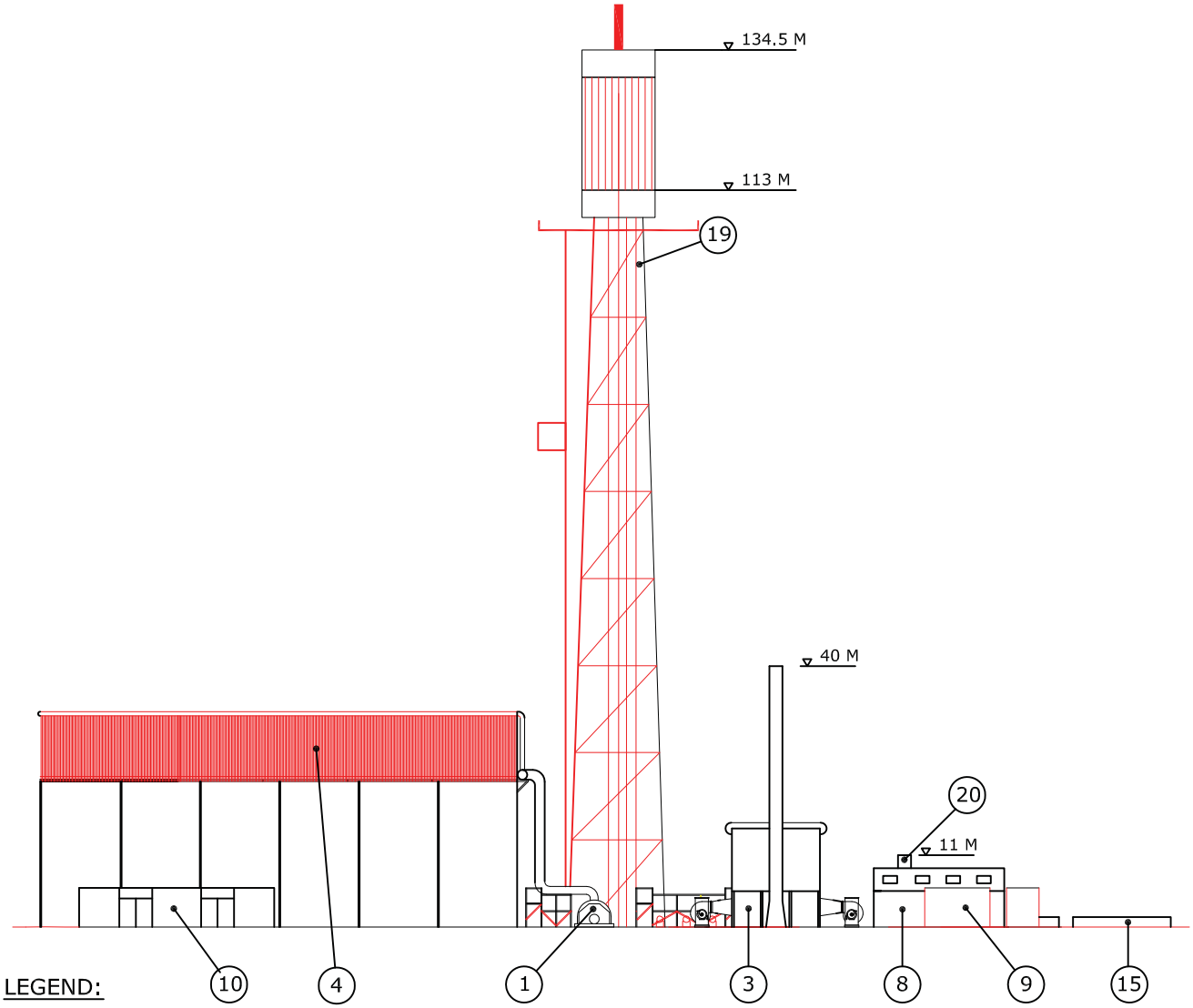
VISUAL RESOURCES - FIGURE 3

Ivanpah Solar Power Project - Project Layout



SOURCE: DATA RESPONSE (DR) SET2A, DR 130-2, “PLAN of Development sitegeneral arrangement plan, _IVAN-0-DW-048-111-001.”

VISUAL RESOURCES - FIGURE 4
Ivanpah Solar Power Project - Project Elevations



LEGEND:

1- TURBINE
2- GENERATOR
3- BOILER
4- AIR COOLED CONDENSER
5- FEED WATER PREHEATER
6- DEAERATOR
7- STEAM DISTRIBUTOR
8- WATER TREATMENT PLANT ,ADMINISTRATION & ELECTRICAL BUILDING
9- WATER STORAGE TANKS
10- MAINTENANCE WING
11-SWITCH YARD
12-TURBINE LUBRICATION SYSTEM
13-PIPE BRIDGE
14-GAS PIPE
15-EVAPORATION PITS
16-[RESERVED]
17-EMERGENCY GENERATOR
18-DIESEL FIRE PUMP
19- REHEATER TOWER
20- EMERGENCY GENERATOR EXHAUST

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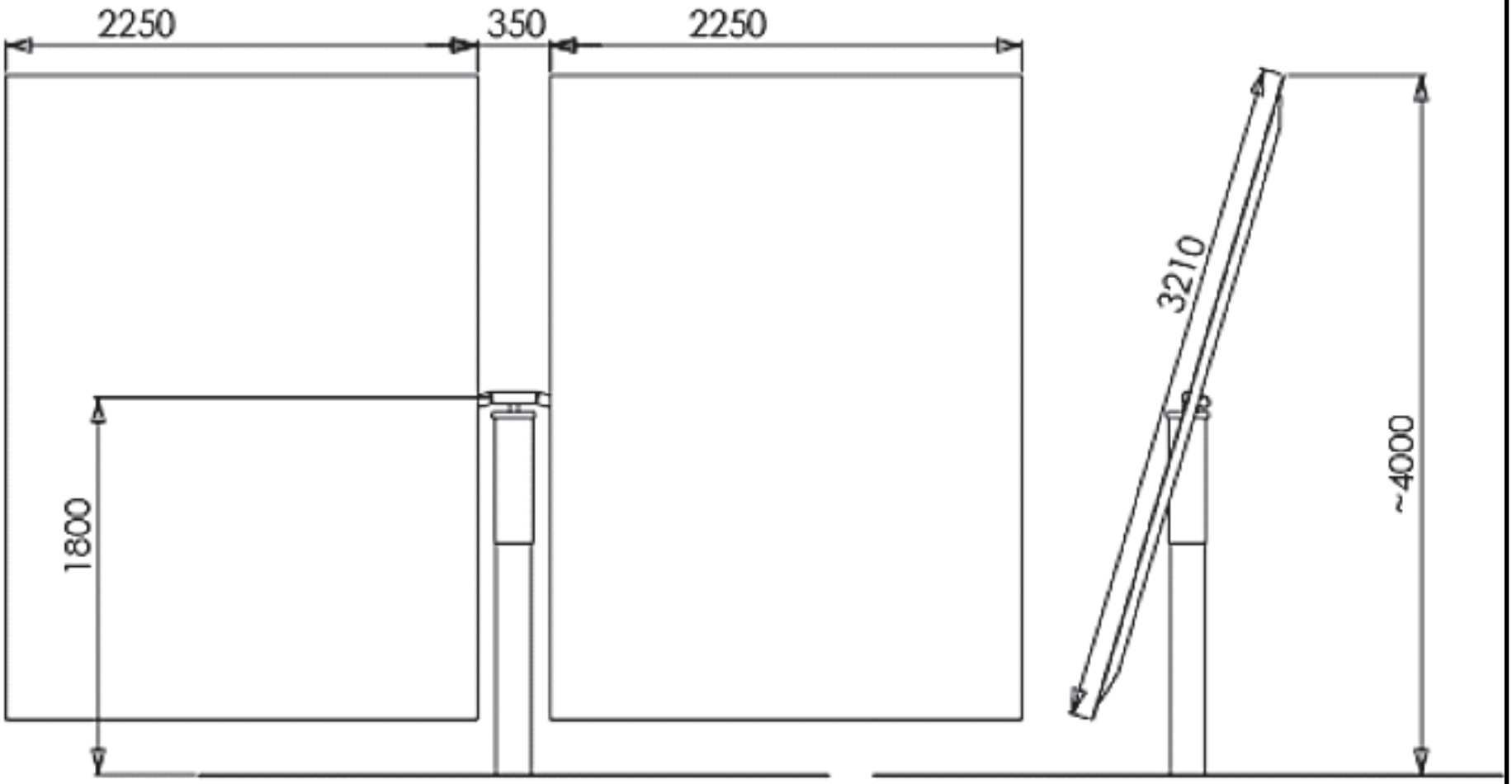
SOURCE: AFC Figure 2.2-C

VISUAL RESOURCES - FIGURE 5

Ivanpah Solar Power Project - Mirror Elevations



Double-mirror heliostat

Note: Units are in millimeters.

SOURCE: DR SET 1D # 102-1R

VISUAL RESOURCES - FIGURE 6

Ivanpah Solar Power Project - Simulation From Golf Course Hole 1

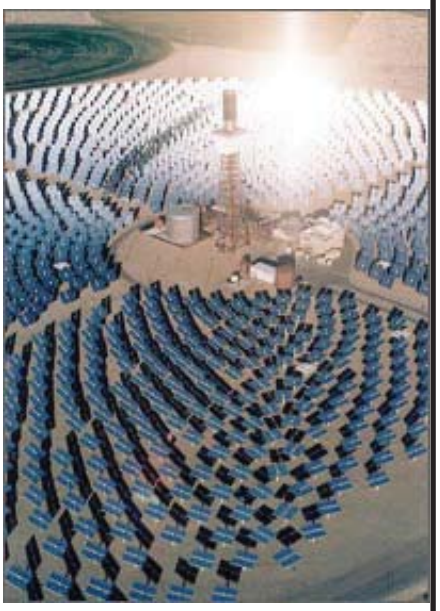
SOURCE: DR1D #102 Figure 5.13-9bR

VISUAL RESOURCES - FIGURE 7

Ivanpah Solar Power Project - Solar Thermal Project Example Photos

A.

B.



C.

D.

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SOURCE: WK Figure 7

VISUAL RESOURCES - FIGURE 8

Ivanpah Solar Power Project - Simulation From Golf Course Hole 8

SOURCE: DR 1D #102 Figure 5.13-10bR

VISUAL RESOURCES - FIGURE 9

Ivanpah Solar Power Project - Simulation Ivanpah 2, 3 From I-15, Yates Well Road, 2.5 Miles

SOURCE: DR 1D #102 Figure DR97-1BR

VISUAL RESOURCES - FIGURE 10

Ivanpah Solar Power Project - Simulation Ivanpah 1 FR I-15, Yates Well Road, 1 Mile

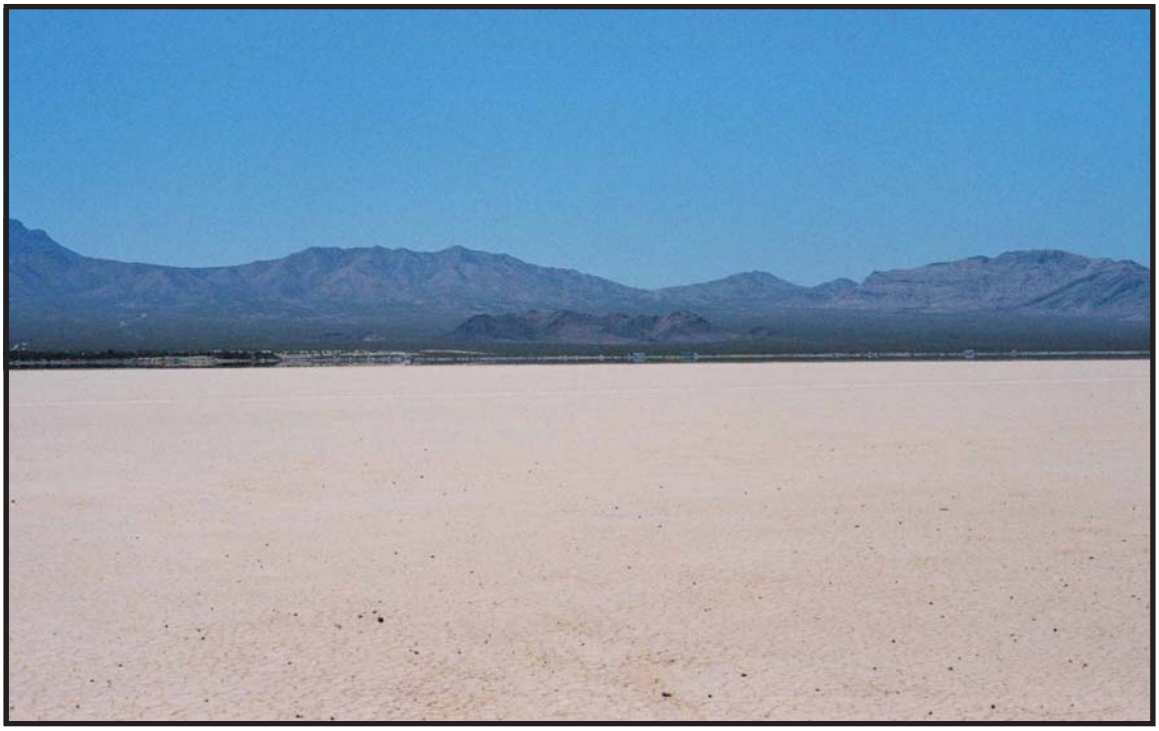
SOURCE: DR 1D #102 Figure DR97-2BR

VISUAL RESOURCES - FIGURE 11
Ivanpah Solar Power Project - I-15 FR Nipton Road, 4 Miles

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, DECEMBER 2008
SOURCE: DR SET 2C #148 Figure DR148-3, DR 2C #148 Figure DR 147-4

VISUAL RESOURCES - FIGURE 12

Ivanpah Solar Power Project - Ivanpah 2, 3 From East Side of Lake



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: DR 2C #147 FIgure DR 148-4, Figure DR 147-5

VISUAL RESOURCES - FIGURE 13

Ivanpah Solar Power Project - Ivanpah 2, 3 From West Side of Lake

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: DR 2C #147 Figure DR 148-5, Figure DR 147-6

VISUAL RESOURCES - FIGURE 14

Ivanpah Solar Power Project - View From Whiskey Pete's

SOURCE: DR 2C #148 Figure DR 148-6

VISUAL RESOURCES - FIGURE 15
Ivanpah Solar Power Project - View From Umberci Mine

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SOURCE: DR 2C #148 Figure DR 148-1, Figure DR 147-2

VISUAL RESOURCES - FIGURE 16

Ivanpah Solar Power Project - View From Benson Mine/Mojave Preserve

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SOURCE: DR 2C #148 Figure DR 148-2, Figure DR 147-3

WASTE MANAGEMENT

Ellie Townsend-Hough

SUMMARY OF CONCLUSIONS

Management of the waste generated during construction and operation of the Ivanpah Solar Electric Generating System (ISEGS) would not result in any significant adverse impacts 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 Preliminary Staff Assessment (PSA) presents an analysis of issues associated with wastes generated from the proposed construction and operation of the ISEGS. The technical scope of this analysis encompasses solid wastes existing on site and those to be generated during facility construction and operation. Management and discharge of wastewater is addressed in the **Soil and Water Resources** section of this document. Additional information related to waste management may also be covered in the **Worker Safety** and **Hazardous Materials Management** sections of this document.

The Energy Commission staff's objectives in conducting this waste management analysis are to ensure that:

- the management of project wastes would be in compliance with all applicable laws, ordinances, regulations, and standards (LORS). Compliance with LORS ensures that wastes generated during the construction 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.
- upon project completion, the site is managed in such a way that project wastes and waste constituents would not pose a significant risk to humans or the environment.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following federal, state, and local environmental laws, ordinances, regulations, and standards (LORS) have been established to ensure the safe and proper management of both solid and hazardous wastes in order to protect human health and the environment. Project compliance with the various LORS is a major component of staff's determination regarding the significance and acceptability of the ISEGS with respect to management of waste.

WASTE MANAGEMENT Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
Title 42, United States Code, §§ 6901, et seq. Solid Waste Disposal Act of 1965 (as amended and revised by the Resource Conservation and Recovery Act of 1976, et al.)	The Solid Waste Disposal Act, as amended and revised by the Resource Conservation and Recovery Act (RCRA) et al., establishes requirements for the management of solid wastes (including hazardous wastes), landfills, underground storage tanks, and certain medical wastes. The statute also addresses program administration, implementation, and delegation to states, enforcement provisions, and responsibilities, as well as research, training, and grant funding provisions. RCRA Subtitle C establishes provisions for the generation, storage, treatment, and disposal of hazardous waste, including requirements addressing: • generator record keeping practices that identify quantities of hazardous wastes generated and their disposition; • waste labeling practices and use of appropriate containers; • use of a manifest when transporting wastes; • submission of periodic reports to the United States Environmental Protection Agency (U.S. EPA) or other authorized agency; and • corrective action to remediate releases of hazardous waste and contamination associated with RCRA-regulated facilities. RCRA Subtitle D establishes provisions for the design and operation of solid waste landfills. RCRA is administered at the federal level by U.S. EPA and its 10 regional offices. The Pacific Southwest regional office (Region 9) implements U.S. EPA programs in California, Nevada, Arizona, and Hawaii.
Title 42, United States Code, §§ 9601, et seq. Comprehensive Environmental Response, Compensation and Liability Act	The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as Superfund, establishes authority and funding mechanisms for cleanup of uncontrolled or abandoned hazardous waste sites, as well as cleanup of accidents, spills, or emergency releases of pollutants and contaminants into the environment. Among other things, the statute addresses: • reporting requirements for releases of hazardous substances; • requirements for remedial action at closed or abandoned hazardous waste sites and brownfields; • liability of persons responsible for releases of hazardous substances or waste; and • requirements for property owners/potential buyers to conduct “all appropriate inquiries” into previous ownership and uses of the property to 1) determine if hazardous substances have been or may have been released at the site and 2) establish that the owner/buyer did not cause or contribute to the release. A Phase I Environmental Site Assessment is commonly used to satisfy CERCLA “all appropriate inquiries” requirements.
Title 40, Code of	These regulations were established by U.S. EPA to implement the

Federal Regulations (CFR), Subchapter I – Solid Wastes	provisions of the Solid Waste Disposal Act and RCRA (described above). Among other things, the regulations establish the criteria for classification of solid waste disposal facilities (landfills), hazardous waste characteristic criteria and regulatory thresholds, hazardous waste generator requirements, and requirements for management of used oil and universal wastes. • Part 246 addresses source separation for materials recovery guidelines. • Part 257 addresses the criteria for classification of solid waste disposal facilities and practices. • Part 258 addresses the criteria for municipal solid waste landfills. • Parts 260 through 279 address management of hazardous wastes, used oil, and universal wastes (i.e., batteries, mercury-containing equipment, and lamps). U.S. EPA implements the regulations at the federal level. However, California is an authorized state so the regulations are implemented by state agencies and authorized local agencies in lieu of U.S. EPA.
Title 49, CFR, Parts 172 and 173 Hazardous Materials Regulations	U.S. Department of Transportation established standards for transport of hazardous materials and hazardous wastes. The standards include requirements for labeling, packaging, and shipping of hazardous materials and hazardous wastes, as well as training requirements for personnel completing shipping papers and manifests. Section 172.205 specifically addresses use and preparation of hazardous waste manifests in accordance with Title 40, CFR, Section 262.20.
Clean Water Act (CWA)	Controls discharge of wastewater to the surface waters of the U.S. Ivanpah SEGS will discharge sanitary wastewater to an onsite package water treatment system that will comply with CWA requirements.
State	
California Health and Safety Code, Chapter 6.5, §§ 25100, et seq. Hazardous Waste Control Act of 1972, as amended	This California law creates the framework under which hazardous wastes must be managed in California. The law provides for the development of a state hazardous waste program that administers and implements the provisions of the federal RCRA program. It also provides for the designation of California-only hazardous wastes and development of standards (regulations) that are equal to or, in some cases, more stringent than federal requirements. The California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) administers and implements the provisions of the law at the state level. Certified Unified Program Agencies (CUPAs) implement some elements of the law at the local level.
Title 22, California Code of Regulations (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, CFR include: • Identification and Listing of Hazardous Waste (Chapter 11, §§ 66261.1, et seq.) • Standards Applicable to Generators of Hazardous Waste (Chapter 12, §§ 66262.10, et seq.) • Standards Applicable to Transporters of Hazardous Waste (Chapter 13, §§ 66263.10, et seq.) • Standards for Universal Waste Management (Chapter 23, §§ 66273.1, et seq.) • Standards for the Management of Used Oil (Chapter 29, §§ 66279.1, et seq.) • Requirements for Units and Facilities Deemed to Have a Permit by Rule (Chapter 45, §§ 67450.1, et seq.) The Title 22 regulations are established and enforced at the state level by DTSC. Some generator standards are also enforced at the local level by CUPAs.
California Health and Safety Code, Chapter 6.11 §§ 25404–25404.9 Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program)	The Unified Program consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities of the six environmental and emergency response programs listed below. • Aboveground Storage Tank Program • Business Plan Program • California Accidental Release Prevention (CalARP) Program • Hazardous Material Management Plan / Hazardous Material Inventory Statement Program • Hazardous Waste Generator / Tiered Permitting Program • Underground Storage Tank Program The state agencies responsible for these programs set the standards for their programs while local governments implement the standards. The local agencies implementing the Unified Program are known as Certified Unified Program Agencies (CUPAs). San Diego County Department of Environmental Health is the area CUPA. Note: The Waste Management analysis only considers application of the Hazardous Waste Generator/Tiered Permitting element of the Unified Program. Other elements of the Unified Program may be addressed in the **Hazardous Materials** and/or **Worker Health and Safety** analysis sections.
Title 27, CCR, Division 1, Subdivision 4, Chapter 1, §§ 15100, et seq. Unified Hazardous Waste and Hazardous	While these regulations primarily address certification and implementation of the program by the local CUPAs, the regulations do contain specific reporting requirements for businesses. • Article 9 – Unified Program Standardized Forms and Formats (§§ 15400–15410). • Article 10 – Business Reporting to CUPAs (§§ 15600–15620).

Materials Management Regulatory Program	
Public Resources Code, Division 30, §§ 40000, et seq. California Integrated Waste Management Act of 1989.	The California Integrated Waste Management Act of 1989 (as amended) establishes mandates and standards for management of solid waste. Among other things, the law includes provisions addressing solid waste source reduction and recycling, standards for design and construction of municipal landfills, and programs for county waste management plans and local implementation of solid waste requirements.
Title 14, CCR, Division 7, § 17200, et seq. California Integrated Waste Management Board	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. • Chapter 3 – Minimum Standards for Solid Waste Handling and Disposal. • Chapter 3.5 – Standards for Handling and Disposal of Asbestos Containing Waste. • Chapter 7 – Special Waste Standards. • Chapter 8 – Used Oil Recycling Program. • Chapter 8.2 – Electronic Waste Recovery and Recycling.
California Health and Safety Code, Division 20, Chapter 6.5, Article 11.9, §25244.12, et seq. Hazardous Waste Source Reduction and Management Review Act of 1989 (also known as SB 14).	This law was enacted to expand the state's hazardous waste source reduction activities. Among other things, it establishes hazardous waste source reduction review, planning, and reporting requirements for businesses that routinely generate more than 12,000 kilograms (~ 26,400 pounds) of hazardous waste in a designated reporting year. The review and planning elements are required to be done on a 4-year cycle, with a summary progress report due to DTSC every 4th year.
Title 22, CCR, § 67100.1 et seq. Hazardous Waste Source Reduction and Management Review.	These regulations further clarify and implement the provisions of the Hazardous Waste Source Reduction and Management Review Act of 1989 (noted above). The regulations establish the specific review elements and reporting requirements to be completed by generators subject to the act.
California Fire Code	Controls storage of hazardous materials and wastes and the use and storage of flammable/combustible liquids. Waste will be accumulated and stored in accordance with Fire Code requirements. Permits for storage containers will be obtained, as needed, from the San Bernardino County Fire Department.
Local	
Policy	

San Bernardino County, Countywide Integrated Waste Management Plan	This document sets forth the county's goals, policies, and programs for reducing dependence on landfill solid wastes and increasing source reduction, recycling, and reuse of products and waste, in compliance with the CIWMA. The plan also addresses the siting and development of recycling and disposal facilities and programs within the county.

SETTING

The proposed ISEGS is a three-phase 400-megawatt (MW) solar energy generating facility (BSE2007A, p. 5.14-1). The proposed project is made up of three solar thermal power plants, based on distributed power tower and heliostat (mirror) technology. The heliostat (mirror) fields focus solar energy on power tower receivers near the center of each heliostat array. The facility would be located on a 4,065 acre parcel in southern California's Mojave Desert, near the Nevada border, to the west of Ivanpah Dry Lake in Ivanpah Valley (BSE2007a, page 5.4-4). The project would be located in San Bernardino County, California, on undeveloped federal land managed by the Bureau of Land Management (BLM) (BSE2007c, p. 1-1).

The applicant proposes to develop the ISEGS project in three phases which are designed to generate a total of 400 megawatts (MW) of electricity. The first two phases of the project, Ivanpah 1 and 2, are designed to provide 100 MW of electricity and would occupy approximately 914 acres and 921 acres respectively; the 200 MW phase, Ivanpah 3, would require occupy approximately 1,843 acres. All three phases would share an administration building, an operation and maintenance building, substation, and detention ponds which would be located in between Ivanaph 1 and 2, requiring an additional area of approximately 66 acres. Another 316 acres is needed for construction staging activities. Established dirt roads account for an additional 5 acres. ISEGS total project footprint amounts to approximately 4,065 acres (approximately 6.4 square miles).

Rows of heliostats (mirrors) would be used to concentrate solar energy on distributed power towers, which converts water to steam. Each Phase would include a power block containing a Rankine-cycle reheat steam turbine, solar reheat tower, package boiler, air-cooled condenser, deaerator, water storage tanks, emergency generator, diesel fire pump and a switchyard (page 1-2). The power plant would be operated from just after sunrise to sunset, and during times when the insolation is high enough to keep the turbines online (BSE 2007a, p 1-2).

Natural gas for the project would be obtained by a new 5.3-mile long natural gas pipeline connection to the Kern River Gas Transmission Line, less than a half a mile to the north of the project site. Raw water for the project would be supplied by two groundwater wells east of Ivanpah 2. The water would be treated and used as boiler make-up water and to wash the heliostats. The plant would use a dry-cooling condenser to save water in the site's desert environment (BSE2007a, pages 1-2, 1-3 and 5.14-2).

For onsite processing of domestic wastewater, each phase would include a small package sewage system, including a larger system located at the Administration/warehouse building. Sewage sludge would be removed from the site by a sanitary service. Recycled water from the sewage treatment plants would be used for landscaping (BSE2007a, p. 5.14-2)

Hazardous and non-hazardous solid and liquid waste, including wastewater, would be generated at the ISEGS project during construction and operation of the power plant. Waste would be recycled where practical and nonrecyclable waste would be deposited in a Class III landfill. The hazardous waste generated during this phase of the project would consist of electrical equipment, used oils, universal wastes, solvents, and empty hazardous waste materials (BSE2007a, section 5.14.1.2). Universal wastes are hazardous wastes that contain mercury, lead, cadmium, copper, and other substances hazardous to human and environmental health. Examples of universal wastes are batteries, fluorescent tubes, and some electronic devices.

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.

Existing Project Site Conditions and Potential for Contamination from Prior Activities

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) 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

[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.

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 a proposed project, Energy Commission staff will review the project's Phase I ESA and work with the appropriate oversight agencies as necessary to determine if additional site characterization work is needed and if any mitigation is necessary at the site to ensure protection of human health and the environment from any hazardous substance releases or contamination identified.

Impacts from Generation and Management of Wastes during Construction and Operation

Regarding the management of project-related wastes generated during construction and operation of the proposed project, staff reviewed the applicant's proposed solid and hazardous waste management methods and determined if the methods proposed are consistent with the LORS identified for waste disposal and recycling. The federal, state, and local LORS represent a comprehensive regulatory system designed to protect human health and the environment from impacts associated with management of both non-hazardous and hazardous wastes. Absent any unusual circumstances, staff considers project compliance with LORS to be sufficient to ensure that no significant impacts would occur as a result of project waste management.

Staff then reviewed the capacity available at off-site treatment and disposal sites and determines whether or not the proposed power plant's waste would have a significant impact on the volume of waste a facility is permitted to accept. Staff used a waste volume threshold equal to 10 percent of a disposal facility's remaining permitted capacity to determine if the impact from disposal of project wastes at a particular facility would be significant.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Existing Site Conditions

A Phase I ESA of the proposed project site, dated August 2007, was prepared by CH2MHILL in accordance with the American Society for Testing and Materials Standard Practice E 1527-00 for ESAs. The Phase I ESA is included as Appendix 5.14A in Volume 2 of the project AFC (BSE2007c, Appendix 5.14A).

The Phase I ESA conducted for the proposed ISEGS site did not identify any recognized environmental conditions associated with the proposed project site and linear facility corridors. A recognized environmental condition is the presence or likely presence of any hazardous substances or petroleum products on a property under the conditions that indicated an existing release, past release, or a material threat of a release of any hazardous

substance or petroleum products into structures on the property or in the ground, groundwater, or surface water of the property.

The ISEGS site and linear features are located on undeveloped federal land under the jurisdiction of Bureau of Land Management (BLM). The project site is bounded on the north, south, and west by undeveloped land. A golf course is located to the immediate east of the ISEGS site. Overhead electrical transmission lines run within the property (BSE2007c, p. 5-1). Staff has proposed Conditions of Certification **WASTE-1** and **WASTE-2** to mitigate any previously unrecognized conditions that may be encountered during construction and operation. These proposed conditions of certification require that a registered professional geologist or engineer with experience in remedial investigation and feasibility studies be available for consultation during soil excavation and grading activities. This would be adequate to address identification and investigation of any soil or groundwater contamination that may be encountered.

Construction Impacts and Mitigation

Site preparation and construction of the proposed power plant and associated facilities would generate both nonhazardous and hazardous wastes in solid and liquid forms (BSE2007a, § 5.14.4.1). Before construction can begin, the project owner would be required to develop and implement a Construction Waste Management Plan, per proposed Condition of Certification **WASTE-3**.

Non-Hazardous Wastes

Non-hazardous solid wastes generated during construction would include approximately 280 tons of scrap wood, concrete, steel/metal, paper, glass, scrap metals and plastic waste (BSE2007a, § 5.14.4.1.1). All non-hazardous wastes would be recycled to the extent possible and non-recyclable wastes would be collected by a licensed hauler and disposed in a solid waste disposal facility, in accordance with Title 14, California Code of Regulations, sections 17200 et seq.

Non-hazardous liquid wastes would also be generated during construction, including sanitary wastes, dust suppression, drainage, and equipment wash water. Sanitary wastes would be collected in portable, self-contained toilets and pumped periodically for disposal at an appropriate facility. Potentially contaminated equipment wash water would be contained at designated wash areas and transported to a sanitary wastewater treatment facility. Please see the **Soil and Water Resources** section of this document for more information on the management of project wastewater.

Hazardous Wastes

The generation of hazardous wastes anticipated during construction includes over 100 5-gallon empty hazardous material containers which would include 4,300 pounds of solvents, waste paint, and adhesives; 3,000 pounds of oil absorbents, used oil, oily rags; and varying amounts of batteries, waste oil filters, etc. Table 5.14-2 contains a detailed list of wastes that would be generated during construction. The amount of waste would be minor if handled in the manner identified in the AFC (BSE2007a, § 5.14.4.1.1).

The project owner 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-4**. 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. Wastes would be accumulated on site for less than 90 days and then properly manifested, transported, and disposed at a permitted hazardous waste management facility by licensed hazardous waste collection and disposal companies. Staff reviewed the disposal methods described in AFC section 5.14.4.1.1 and concluded that all wastes would be disposed of in accordance with all applicable LORS. Should any construction waste management-related enforcement action be taken or initiated by a regulatory agency, the project owner would be required by proposed Condition of Certification **WASTE-5** to notify the Energy Commission's Compliance Project Manager (CPM) whenever the owner becomes aware of any such action.

In the event that construction excavation, grading, or trenching activities for the proposed project encounter potentially contaminated soils and/or specific handling, disposal, and other precautions that may be necessary pursuant to hazardous waste management LORS, staff finds that proposed Conditions of Certification **WASTE-1** and **WASTE-2** would be adequate to address any soil contamination contingency that may be encountered during construction of the project and would ensure compliance with LORS. Absent any unusual circumstances, staff considers project compliance with LORS to be sufficient to ensure that no significant impacts would occur as a result of project waste management activities.

Operation Impacts and Mitigation

The proposed ISEGS would generate non-hazardous and hazardous wastes in both solid and liquid forms under normal operating conditions. Table 5.14-3 of the project AFC gives a summary of the operation waste streams, expected waste volumes and generation frequency, and management methods proposed. Before operations can begin, the project owner would be required to develop and implement an Operation Waste Management Plan pursuant to proposed Condition of Certification **WASTE-6**.

Non-Hazardous Solid Wastes

The generation of 240 tons per year of non-hazardous solid wastes expected during project operation include routine maintenance wastes (such as used air filters, spent deionization resins, sand and filter media) as well as domestic and office wastes (such as office paper, newsprint, aluminum cans, plastic, and glass) (BSE 2007a page 5.14-5). All non-hazardous wastes would be recycled to the extent possible, and non-recyclable wastes would be regularly transported off site to a local solid waste disposal facility (BSE2007a, § 5.14.4.1.2).

Non-Hazardous Liquid Wastes

Non-hazardous liquid wastes would be generated during facility operation and are discussed in the **Soil and Water Resources** section of this document.

Hazardous Wastes

The project owner/operator would be considered the generator of hazardous wastes at the site during facility operations. The project would generate approximately four tons of hazardous waste. Therefore, the project owner's unique hazardous waste generator identification number, obtained prior to construction in accordance with proposed Condition of

Certification **WASTE-4**, would be retained and used for hazardous waste generated during facility operation.

The generation of hazardous wastes expected during routine project operation includes used hydraulic fluids, oils, greases, oily filters and rags, 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 would help keep spill wastes to a minimum. However, to ensure proper cleanup and management of any contaminated soils or waste materials generated from hazardous materials spills, staff proposes Condition of Certification **WASTE-7** requiring the project owner/operator to report, clean up, and remediate as necessary, any hazardous materials spills or releases in accordance with all applicable federal, state, and local requirements. More information on hazardous material management, spill reporting, containment, and spill control and countermeasures plan provisions for the project are provided in the **Hazardous Material Management** section of the PSA.

The amount of hazardous wastes generated during the operation of ISEGS 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 at authorized disposal facilities in accordance with established standards applicable to generators of hazardous waste (Title 22, CCR, §§ 66262.10 et seq.). Should any operations waste management-related enforcement action be taken or initiated by a regulatory agency, the project owner would be required by proposed Condition of Certification **WASTE-5 t**o notify the CPM whenever the owner becomes aware of any such action.

Impact on Existing Waste Disposal Facilities

Non-Hazardous Solid Wastes

During construction of the proposed project, approximately 280 tons of solid waste will be generated and recycled or disposed of in a Class III landfill (BSE2007a, § 5.14.4.2.1). The non-hazardous solid wastes generated yearly at ISEGS will also be recycled, if possible, or disposed in a Class III landfill.

Table 5.14-4 of the project AFC identifies three waste disposal facilities that could potentially take the non-hazardous construction and operation wastes generated by the ISEGS: the Sloan Transfer facility in Sloan, Nevada; Apex Regional Landfill in Las Vegas, Nevada and Barstow Sanitary Landfill in Barstow, California. The remaining capacity for the disposal facilities is over 5 million cubic yards. The total amount of non-hazardous waste generated from the project is estimated to be less than 300 cubic yards of solid waste from construction, and approximately 250 cubic yards per year from operation. This would contribute less than 1 percent of the available landfill capacity. Staff finds that disposal of the solid wastes generated by the ISEGS can occur without significantly impacting the capacity or remaining life of any of these facilities.

Hazardous Wastes

Section 5.14.4.2.2 of the project AFC discusses the two Class I landfills that are open in California: the Clean Harbor Landfill (Buttonwillow) in Kern County and the Chemical Waste Management Landfill (Kettleman Hills) in Kings County. The Kettleman Hills facility also accepts Class II and Class III wastes. In total, there is in excess of 11 million cubic yards of remaining hazardous waste disposal capacity at these landfills, with approximately 30 years of remaining operating lifetimes.

Hazardous wastes generated during construction and operation would be recycled to the extent possible and practical. Those wastes that cannot be recycled would be transported off site to a permitted treatment, storage, or disposal facility. The 4 tons of hazardous waste from the ISEGS requiring off-site disposal would be far less than staff's threshold of significance and would therefore not significantly impact the capacity or remaining life of the Class I waste facilities.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).

There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables which can be found in the **Cumulative Scenario** section of this document.

- Cumulative Impacts Figure 1, Regional Renewable Applications
- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts related to waste management could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts can occur within the Ivanpah Valley if implementation of the ISEGS Project could combine with those of other local or regional projects. Cumulative impacts could also occur as a result of development of some of the many proposed solar and wind

development projects that have been or are expected to be under consideration by the BLM and the Energy Commission in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

The geographic extent for the analysis of the cumulative impacts associated with the ISEGS project includes San Bernardino County, California and Clark County, Nevada. This geographic scope is appropriate because waste generated by the ISEGS facility would be disposed of in one or both of these counties.

Cumulative Impact Analysis

Local Projects

The ISEGS facility would generate nonhazardous solid waste that would add to the total waste generated in San Bernardino County, California and Clark County, Nevada. Nonhazardous solid waste generated by all of the past, present, and reasonably foreseeable projects presented in Cumulative Impacts Table 2 and Cumulative Impacts Table 3 would also be disposed of within these counties. However, project wastes would be generated in modest quantities, waste recycling would be employed wherever practical, and sufficient capacity is available at several treatment and disposal facilities to handle the volumes of wastes that would be generated by the project. Most of the reasonably foreseeable projects identified in Cumulative Impacts Table 3 are of similar or smaller scale than the ISEGS project and would therefore be expected to generate a similar or smaller volume of nonhazardous waste as the ISEGS project. The total amount of available solid waste landfill capacity in San Bernardino County as of June 2009 is 222 million cubic yards according to the San Bernardino County Solid Waste Management Division (Rozzi 2008). The Nevada Division of Environmental Protection Solid Waste Management Plan reports that Clark County, where the cites of Las Vegas and Sloan are located, has landfill capacity of 935 million cubic yards (Campbell 2008). Therefore, even if all 17 of these reasonably foreseeable projects were constructed, staff concludes that the waste generated by the ISEGS would not result in significant cumulative waste management impacts.

As stated above, the 4 tons of hazardous waste from the ISEGS requiring off-site disposal would be far less than staff's threshold of significance and would therefore not significantly impact the capacity or remaining life of the Class I waste facilities. The hazardous waste, in addition to hazardous wastes that would potentially be generated by the reasonably foreseeable projects would not result in significant cumulative waste management impacts.

Regional Projects

Implementation of the multiple solar and wind projects proposed to be developed in southeastern California, southern Nevada, and western Arizona would result in an increase in generation of hazardous and nonhazardous solid and liquid waste and would add to the total quantity of waste generated in the states of California and Nevada. However, project wastes would be generated in modest quantities, waste recycling would be employed wherever practical, and sufficient capacity is available at several treatment and disposal facilities to handle the volumes of wastes that would be generated by the project. Therefore, impacts of the ISEGS, when combined with impacts of the future solar and wind development projects currently proposed within southeastern California, southern Nevada, and western Arizona,

would not result in significant and unavoidable cumulative impacts with regard to waste management.

Cumulative Impact Conclusion

As proposed, the amount of non-hazardous and hazardous wastes generated during construction and operation of the ISEGS would add to the total quantity of waste generated in the states of California and Nevada. However, project wastes would be generated in modest quantities, waste recycling would be employed wherever practical, and sufficient capacity is available at several treatment and disposal facilities to handle the volumes of wastes that would be generated by the project. Therefore, staff concludes that the waste generated by the ISEGS would not result in significant cumulative waste management impacts either locally or regionally.

COMPLIANCE WITH LORS

Energy Commission staff concludes that the proposed ISEGS would comply with all applicable LORS regulating the management of hazardous and non-hazardous wastes during both facility construction and operation. The applicant is required to recycle and/or dispose hazardous and non-hazardous wastes at facilities licensed or otherwise approved to accept the wastes. Because hazardous wastes would be produced during both project construction and operation, the ISEGS would be required to obtain a hazardous waste generator identification number from U.S. EPA. The ISEGS would also be required to properly store, package, and label all hazardous waste; use only approved transporters; prepare hazardous waste manifests; keep detailed records; and appropriately train employees, in accordance with state and federal hazardous waste management requirements.

CONCLUSIONS

Consistent with the three main objectives for staff's waste management analysis (as noted in the Introduction section of this analysis), staff provides the following conclusions:

After review of the 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 nonrecyclable 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 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 **7**. These conditions would require the project owner to do all of the following:

- Prepare Construction Waste Management and Operation Waste Management Plans detailing the types and volumes of wastes to be generated and how wastes will be managed, recycled, and/or disposed of after generation (**WASTE-3** and **6**).

- Obtain a hazardous waste generator identification number (**WASTE-4**).
- Ensure the project site is investigated and any contamination identified is remediated as necessary, with appropriate professional and regulatory agency oversight (**WASTE-1, 2, and 7**).
- Report any waste management-related LORS enforcement actions and how violations will be corrected (**WASTE-5**).
- Ensure that all spills or releases of hazardous substances are reported and cleaned-up in accordance with all applicable federal, state, and local requirements (**WASTE-7**).

The existing available capacity for the Class III landfills that may be used to manage nonhazardous project wastes exceeds 1 billion cubic yards. The total amount of nonhazardous wastes generated from construction and operation of ISEGS would contribute less than 0.1 percent of 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 Class I disposal facilities that could be used for hazardous wastes generated by the construction and operation of ISEGS have a remaining capacity in excess of 68 million cubic yards (Campbell 2008). The total amount of hazardous wastes generated by the SGGS project would contribute less than 0.02 percent of the remaining permitted capacity. Therefore, impacts from disposal of ISEGS generated hazardous wastes would also have a less than significant impact on the remaining capacity at Class I landfills.

Staff concludes that management of the waste generated during construction and operation of the ISEGS 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 ISEGS AFC and staff's proposed conditions of certification are implemented.

PROPOSED CONDITIONS OF CERTIFICATION

WASTE-1 The project owner shall provide the resume of an experienced and qualified professional engineer or professional geologist, who shall be available for consultation during site characterization (if needed), demolition, excavation, and grading activities, to the CPM for review and approval. The resume shall show experience in remedial investigation and feasibility studies.

The professional engineer or professional geologist shall be given authority by the project owner to oversee any earth moving activities that have the potential to disturb contaminated soil and impact public health, safety and the environment.

Verification: At least 30 days prior to the start of site mobilization, the project owner shall submit the resume to the CPM for review and approval.

WASTE-2 If potentially contaminated soil is 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, representatives of Department of Toxic Substances Control, 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 the Department of Toxic Substances Control 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-3 The project owner shall prepare a Construction Waste Management Plan for all wastes generated during construction of the facility and shall submit the plan to the 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; 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/source reduction plans.

Verification: The project owner shall submit the Construction Waste Management Plan to the CPM for approval no less than 30 days prior to the initiation of construction activities at the site.

WASTE-4 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 construction and operations.

Verification: The project owner shall keep a copy of the identification number on file at the project site and provide the number to the CPM in the next Monthly Compliance Report.

WASTE-5 Upon becoming aware of any impending waste management-related enforcement action by any local, state, or federal authority, the project owner shall notify the CPM of any such action taken or proposed to be taken against the project itself, or against any waste hauler or disposal facility or treatment operator with which the owner contracts.

Verification: The project owner shall notify the CPM in writing within 10 days of becoming aware of an impending enforcement action. The CPM shall notify the project owner of any changes that will be required in the way project-related wastes are managed.

WASTE-6 The project owner shall prepare an Operation Waste Management Plan for all wastes generated during operation of the facility 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 assure correct classification, methods of transportation, disposal requirements and sites, and recycling and waste minimization/source reduction plans;
- information and summary records of conversations with the local Certified Unified Program Agency and the Department of Toxic Substances Control regarding any waste management requirements necessary for project activities. Copies of all required waste management permits, notices, and/or authorizations shall be included in the plan and updated as necessary;
- a detailed description of how facility wastes will be managed and any contingency plans to be employed, in the event of an unplanned closure or planned temporary facility closure; and
- a detailed description of how facility wastes will be managed and disposed upon closure of the facility.

Verification: The project owner shall submit the Operation Waste Management Plan to the CPM for approval no less than 30 days prior to the start of project operation. The project owner shall submit any required revisions to the CPM within 20 days of notification from the CPM that revisions are necessary.

The project owner shall also document in each Annual Compliance Report the actual volume of wastes generated and the waste management methods used during the year; provide a comparison of the actual waste generation and management methods used to those proposed in the original Operation Waste Management Plan; and update the Operation Waste Management Plan as necessary to address current waste generation and management practices.

WASTE-7 The project owner shall ensure that all spills or releases of hazardous substances, hazardous materials, or hazardous 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 occur on the project property or related pipeline and transmission corridors. The documentation shall include, at a minimum, the following information: location of release; date and time of release; reason for release; volume released; amount of contaminated soil/material generated; how release was managed and material cleaned up; if the release was reported; to whom the release was reported; release corrective action and cleanup requirements placed by regulating agencies;

level of cleanup achieved and actions taken to prevent a similar release or spill; and disposition of any hazardous wastes and/or contaminated soils and materials that may have been generated by the release. Copies of the unauthorized spill documentation shall be provided to the CPM within 30 days of the date the release was discovered.

REFERENCES

BSE2007a – Bright Source Energy/Solar Partners I, LLC/J.Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Dated on 8/28/2007. Submitted to CEC/Docket Unit on 8/31/2007.

BSE2007c – Bright Source Energy/Solar Partners I, LLC/J. Woolard (tn: 42176). Appendix 5.14A, Phase I ESA Report. Dated on 8/28/2007. Submitted to CEC/Docket Unit on 8/31/2007.

California Integrated Waste Management Board (CIWMB). 2008. Construction/Demolition and Inert Debris Tools and Resources. Solid Waste Cleanup Program Weights and Volumes for Project Estimates http://www.ciwmb.ca.gov/leatraining/Resources/CDI/Tools/Calculations.htm.

Campbell, Dennis, 2008. Solid Waste Compliance, Environmental Health Division, Southern Nevada Health District, Personal Communication with Ellen Townsend Hough. September 4, 2008.

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WORKER SAFETY AND FIRE PROTECTION

Geoff Lesh, PE and Rick Tyler

SUMMARY OF CONCLUSIONS

Staff concludes that if the applicant for the proposed Ivanpah Solar Electric Generating System (ISEGS) provides project construction safety and health and project operations and maintenance safety and health programs, as required by conditions of certification **WORKER SAFETY -1, -2, -3, -4, -5,** and **-6**, the project would incorporate sufficient measures to both ensure adequate levels of industrial safety and comply with applicable laws, ordinances, regulations, and standards (LORS). These proposed conditions of certification ensure that these programs, proposed by the applicant, will be reviewed by the appropriate agencies before they are implemented. The conditions also require verification that the proposed plans adequately ensure worker safety and fire protection and comply with applicable LORS.

Staff also concludes that the proposed project would not have significant impacts on local fire protection services. The fire risks at the proposed facility do not pose significant added demands on local fire protection services. Staff also concludes that the San Bernardino County Hazmat Team and the San Bernardino County Fire Department (SBCFD) are adequately equipped and staffed to respond to hazardous materials incidents at the proposed facility with an adequate response time, given the remote location of this project (Crawford 2008).

INTRODUCTION

Worker safety and fire protection are regulated through federal, state, and local LORS. Industrial workers at the facility both operate equipment and handle hazardous materials daily, and could face hazards resulting in accidents and serious injury. Protection measures are employed to eliminate or reduce these hazards or minimize their 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 ISEGS applicant and determine whether the applicant has proposed adequate measures to:

- Comply with applicable safety LORS;
- Protect workers during the construction and operation of the facility;
- Protect against fire; and
- Provide adequate emergency response procedures.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

Worker Safety and Fire Protection Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal	
29 U.S. Code sections 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).
29 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 §1910.1 to 1910.1500.
State	
8 CCR all applicable sections (Cal/OSHA regulations)	Requires that all employers follow these regulations as they pertain to the work involved. This includes regulations pertaining to safety matters during the construction, commissioning, and operation of power plants, as well as safety around electrical components, fire safety, and hazardous materials usage, storage, and handling.
24 CCR section 3, et seq.	Incorporates the current edition of the International Building Code.
Health and Safety Code sections 25500 to 25541	Requires a Hazardous Materials Business plan detailing emergency response plans for hazardous materials emergencies at a facility.
Local (or locally enforced)	
	San Bernardino County does not have additional LORS that apply to Hazardous Materials Handling, but administers the State of California programs as the CUPA.
2007 Edition of California Fire Code and all applicable NFPA standards (24 CCR Part 9)	NFPA standards are incorporated into the California State Fire Code. The fire code contains general provisions for fire safety, including road and building access, water supplies, fire protection and life safety systems, fire-resistive construction, storage of combustible materials, exits and emergency escapes, and fire alarm systems.
Title 24, California Code of Regulations (24 CCR § 3, et	The California Building Code is comprised of 11 parts containing building design and construction requirements as they relate to fire, life, and structural safety. It incorporates current editions of the

seq.)	International Building Code, including the electrical, mechanical, energy, and fire codes applicable to the project.

SETTING

Fire support services to the site will be under the jurisdiction of the San Bernardino County Fire Department (SBCFD). Station 53 is 40 miles from the project site, located at 65 Kingston Circle, Baker, California, and would be the first responder to ISEGS, with a response time of approximately 45 minutes. San Bernardino County Fire Department also has a Mutual Aid Agreement with Clark County (Nevada) Fire Department for responses requiring more assistance.

In San Bernardino County, hazardous materials permits and spills are handled and investigated by SBCFD. Because of the highly remote and rural area of ISEGS, services are limited and spread out. San Bernardino County Firefighters receive specialized training to address emergency responses to industrial hazards. The response time to the project site, with full resources capabilities including for large-scale hazardous materials spills, would be 3 to 4 hours. Hazardous materials service is provided out of the SBCFD station in the town of Fontana, Station #78.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Two issues are assessed in **WORKER SAFETY AND FIRE PROTECTION**:

1. The potential for impacts on the safety of workers during demolition, construction, and operation activities; and

2. Fire prevention/protection, emergency medical response, and hazardous materials spill response during demolition, construction, and operations.

Worker safety is essentially a LORS compliance matter and if all LORS are followed, workers will be adequately protected. Thus, the standard for staff's review and determination of significant impacts on worker health is whether the applicant has demonstrated adequate knowledge of and commitment to implementation of all pertinent and relevant Cal-OSHA standards.

Staff reviews and evaluates the on-site fire-fighting systems proposed by the applicant, as well as the time needed for off-site local fire departments to respond to a fire, medical, or hazardous material emergency at the ISEGS site. If on-site systems do not follow established codes and industry standards, staff recommends additional measures. Staff reviews local fire department capabilities and response times, and interviews local fire officials to determine if they feel they are adequately staffed, 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 additional resources to the fire department.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Worker Safety

Industrial environments are potentially dangerous during both construction and operation. Workers at the proposed project will be exposed to loud noises, moving equipment, trenches, and confined space entry and egress. Workers may sustain falls, trips, burns, lacerations, and other injuries. They may be exposed to falling equipment or structures, chemical spills, hazardous waste, fires, explosions, and electrical sparks or electrocution. It is important that ISEGS has well-defined policies and procedures, training, and hazard recognition and control to minimize these 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 will be prepared by the applicant to minimize worker hazards during construction and operation of the project. “Safety and Health Program,” for staff, refers to measures that will be taken to ensure compliance with the applicable LORS during the construction and operation of the project.

Construction Safety and Health Program

ISEGS includes the construction and operation of a hybrid, combined-cycle, natural gas-fired power plant and solar thermal generating equipment. For the Power Block, workers will be exposed to hazards typical of construction and operation of a gas-fired simple-cycle facility, while the solar component will present similar construction risks and minimal operational risks to workers.

Construction safety orders are published at Title 8 of the California Code of Regulations, section 1502 et seq. These requirements are promulgated by Cal/OSHA and apply to the construction phase of the project. The construction safety and health program will include the following:

- Construction injury and illness prevention program (8 CCR § 1509);
- Construction fire prevention plan (8 CCR § 1920);
- Personal protective equipment program (8 CCR §§ 1514 - 1522); and
- Emergency action program and plan.

Additional programs under General Industry Safety Orders (8 CCR §§ 3200 to 6184), Electrical Safety Orders (8 CCR §§2299 to 2974) and Unfired Pressure Vessel Safety Orders (8 CCR §§ 450 to 544) will 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;
- Hazardous waste program;
- Hot work safety program;
- Permit-required confined space entry program; and
- Demolition procedure (if applicable).

The AFC includes adequate outlines for each of the above programs (BSE2007a, section 5.16.4.4.1). Prior to the project's start of construction, detailed programs and plans will be provided pursuant to Condition of Certification **WORKER SAFETY-1**.

Operations and Maintenance Safety and Health Program

Prior to the start-up of ISEGS, an operations and maintenance safety and health program will be prepared. This program will include the following programs and plans:

- Injury and illness prevention program (8 CCR § 3203);
- Fire prevention program (8 CCR § 3221);
- Personal protective equipment program (8 CCR §§ 3401 to 3411); and
- Emergency action plan (8 CCR § 3220).

In addition, the requirements under General Industry Safety Orders (8 CCR §§ 3200 to 6184), Electrical Safety Orders (8 CCR §§2299 to 2974) and Unfired Pressure Vessel Safety Orders (8 CCR §§ 450 to 544) will apply to this project. Written safety programs for ISEGS, which the applicant will develop, will ensure compliance with those requirements.

The AFC includes adequate outlines for an injury and illness prevention program, an emergency action plan, a fire prevention program, and a personal protective equipment program (BSE2007a, section 5.16.4.4.2). Prior to operation of ISEGS, all detailed programs and plans will be provided 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. The major items required in both Safety and Health Programs are as follows:

Injury and Illness Prevention Program (IIPP)

The IIPP will include the following components (BSE2007a, section 5.16.4.4):

- Identify persons with the authority and responsibility for implementing the program;
- Establish the safety and health policy of the plan;
- Define work rules and safe work practices for construction activities;
- Establish a system for ensuring that employees comply with safe and healthy work practices;
- Establish a system to facilitate employer-employee communication;
- Develop procedures for identifying and evaluating workplace hazards and establish necessary program(s);
- Establish methods for correcting unhealthy/unsafe conditions in a timely manner;
- Determine and establish training and instruction requirements and programs;
- Specify safety procedures; and
- Provide training and instruction.

Fire Prevention Plan

The California Code of Regulations requires an operations fire prevention plan (8 CCR § 3221). The AFC outlines a proposed fire prevention plan that is acceptable to staff (ISEGS007a, section 6.18.3.1). The plan will include the following:

- Determine general program requirements;
- Determine fire hazard inventory, including ignition sources and mitigation;
- Develop good housekeeping practices and proper materials storage;
- Establish employee alarms and/or communication system(s);
- Provide portable fire extinguishers at appropriate site locations;
- Locate fixed fire fighting equipment in suitable areas;
- Specify fire control requirements and procedures;
- Establish proper flammable and combustible liquid storage facilities;
- Identify the location and use of flammable and combustible liquids;
- Provide proper dispensing and determine disposal requirements for flammable liquids;

- Establish and determine training and instruction requirements and programs; and
- Identify contacts for information on plan contents.

Staff proposes that the applicant submit a final fire prevention plan to the California Energy Commission compliance project manager (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 in the environment, or from chemicals or mechanical irritants, could cause injury or impair bodily function through absorption, inhalation, or physical contact (8 CCR sections 3380 to 3400). The ISEGS operational environment will require PPE.

All safety equipment must meet National Institute of Safety and Health (NIOSH) or American National Standards Institute (ANSI) standards and will carry markings, numbers, or certificates of approval. Respirators must meet NIOSH and Cal/OSHA standards. Each employee must be provided with the following information about protective clothing and equipment:

- Proper use, maintenance, and storage;
- When protective clothing and equipment are used;
- Benefits and limitations; and
- When and how protective clothing and equipment are replaced.

The PPE program ensures that employers comply with applicable requirements for PPE and provides employees with the information and training necessary to protect them from potential hazards in the workplace, and will be required as per proposed Conditions of Certification **WORKER SAFETY-1 and -2**.

Emergency Action Plan

California regulations require an emergency action plan (8 CCR § 3220). The AFC contains a satisfactory outline for an emergency action plan (BSE2007a, section 5.16.4.4).

The outline lists the following features:

- Establishes emergency procedures for the protection of personnel, equipment, the environment, and materials;
- Identifies fire and emergency reporting procedures;
- Determines response actions for accidents involving personnel and/or property;
- Develops response and reporting requirements for bomb threats;
- Specifies site assembly and emergency evacuation route procedures;
- Defines natural disaster responses (for example, earthquakes, high winds, and flooding);

- Establishes reporting and notification procedures for emergencies (including on-site, off-site, local authorities, and/or state jurisdictions);
- Determines alarm and communication systems needed for specific operations;
- Includes a spill response, prevention, and countermeasure (SPCC) plan;
- Identifies emergency personnel (response team) responsibilities and notification roster;
- Specifies emergency response equipment and strategic locations; and
- Establishes and determines training and instruction requirements and programs.

An emergency action plan will be required as per proposed Conditions of Certification **WORKER SAFETY-1 and -2**

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 operations safety programs will address safe work practices in 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 staff assessment.

In addition, the project owner would be required to provide personnel protective equipment and exposure monitoring for workers involved in activities where contaminated soil and/or contaminated groundwater exist, per staff's proposed Conditions of Certification **WORKER SAFETY-1** and**-2**.

These proposed conditions of certification ensure that workers are properly protected from any hazardous wastes presently at the site.

Safety Training Programs

Employees will 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 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 regularly inspect the solar array for broken or non-functioning mirrors by driving up and down dirt paths between the rows of mirrors and even under the mirrors. Cleaning and servicing 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 exposure to herbicides. Therefore, to ensure that workers are indeed protected, staff has proposed additional requirements found in

Conditions of Certification **WORKER SAFETY-6**. This requirement consists of the following provisions:

- 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.

A BMP requiring proper herbicide storage and application, as recommended in Condition of Certification **WORKER SAFETY-6,** 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 one of the greatest challenges today in occupational safety and health. The following facts are reported by NIOSH:

- More than seven 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 1980-1993, an average of 1,079 construction workers were killed on the job each year, with more fatal injuries than any other industry;
- Falls caused 3,859 construction worker fatalities, or 25.6% of the total, between 1980 and 1993;
- 15% of workers' compensation costs are spent on construction-related injuries;
- Ensuring safety and health in construction is a complex task involving short-term work sites, changing hazards, and multiple operations and crews working in close proximity to one another;
- In 1990, Congress directed NIOSH to conduct research and training to reduce diseases and injury 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 well documented. These hazards increase in complexity in the multi-employer worksites typical of large, complex industrial projects like gas-fired 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 workers. This has been evident in the audits of power plants recently conducted by the staff. 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 to improve their safety and health performance; to assist them in striving to eliminate the four major construction hazards (falls,

electrical, caught in/between, and struck-by hazards) that 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 subcontractors that have exemplary safety and health programs.

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” appears in many OSHA and Cal-OSHA standards, documents, and directives. A “Competent Person” is 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 project 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 projects like gas-fired power plants.

Accidents, fires, and a worker death have occurred at Energy Commission-certified power plants in the recent past because of both the failure to recognize and control safety hazards and the inability to adequately monitor 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 include, but are not limited to, safety oversights like:

- 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 the commissioning team, and then to operations;
- Dangerous placement of hydraulic elevated platforms under one another;
- Inappropriate placement of fire extinguishers near hotwork;
- Dangerous placement of numerous power cords in standing water on the site, increasing the risk of electrocution;
- 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 that address the proper procedures to follow in the event of the discovery of suspicious packages or objects either onsite or offsite.

In order to reduce and/or eliminate these hazards, it is necessary for the Energy Commission to require 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 the operations staff. These requirements are outlined in Condition of Certification **WORKER SAFETY-4**. A Safety Monitor, hired by the project owner but reporting to the Chief Building Official (CBO) and the Compliance Project Manager (CPM), will serve as an extra set of eyes to ensure that safety procedures and practices are fully implemented during construction at all power plants certified by the Energy Commission. During audits conducted by staff, most site safety professionals welcomed the audit team and actively engaged them 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 provides a "fresh perspective" of the site.

Fire Hazards

During construction and operation of the proposed ISEGS there is the potential for both small fires and major structural fires. Electrical sparks, combustion of fuel oil, natural gas, hydraulic fluid, mineral oil, insulating fluid at the project power plant switchyard or flammable liquids, explosions, and overheated equipment, may cause small fires. Major structural fires in areas without automatic fire detection and suppression systems are unlikely at power plants. Fires and explosions of natural gas or other flammable gasses or liquids are rare. Compliance with all LORS will be adequate to ensure protection from all fire hazards.

Staff reviewed the information provided in the AFC and spoke to a representative of the SBCFD to determine if available fire protection services and equipment would adequately protect workers, and to further determine the project's impact on fire protection services in the area. The project will rely on both onsite fire protection systems and local fire protection services. The onsite 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. Clark County (Nevada) Fire Department would be called upon if needed, and as available, through a Mutual Aid Agreement with SBCFD (BSE2007a, section 5.16.4.6) (Crawford 2008).

Construction

During construction, portable fire extinguishers will be located and maintained throughout the site; safety procedures and training will also be implemented (BSE2007a, section 5.16.4.4.1). Station #53 of the SBCFD in Baker, California, will provide fire protection backup for larger fires that cannot be extinguished using the project's portable suppression equipment (BSE2007a, section 5.16.4.6).

Operation

The information in the AFC indicates that the project intends to meet the fire protection and suppression requirements of the California Fire Code, all applicable recommended NFPA standards (including Standard 850, which addresses fire protection at electric generating plants), and all Cal-OSHA requirements. Fire suppression elements in the proposed plant will include both fixed and portable fire extinguishing systems.

In addition to the fixed fire protection system, smoke detectors, flame detectors, high-temperature detectors, appropriate class of service portable extinguishers, and fire hydrants must be located throughout the facility at code-approved intervals. These systems are standard requirements of the fire code, NFPA and staff has determined that they will ensure adequate fire protection.

The applicant would be required by conditions of certification **WORKER SAFETY-1** and**-2** to provide a final fire protection and prevention program to both staff and the SBCFD prior to the construction and operation of the project in order to confirm the adequacy of proposed fire protection measures.

Emergency Medical Services Response

A statewide survey was conducted by staff to determine the frequency of incidents requiring emergency medical services (EMS) and off-site fire-fighters for natural gas-fired power plants in California. The purpose of this analysis was to determine what impact, if any, power plants might have on local emergency services. Staff concludes that incidents at power plants requiring fire or EMS responses are infrequent and represent an insignificant impact on local fire departments. 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 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 defibrillator often called an Automatic External Defibrillator or 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 including airports, factories, and government buildings, all of which maintain on-site cardiac defibrillation devices. Therefore, staff concludes that with the availability of modern cost-effective AED devices, it is proper in a power plant environment to maintain these devices on-site in order to treat cardiac arrythmias resulting from industrial accidents or other non-work related causes. Therefore, an additional condition of certification, **WORKER SAFETY-5**, is proposed so that a portable AED will be located on site, and workers trained in its use.

CUMULATIVE IMPACTS AND MITIGATION

Staff reviewed the construction and operation of ISEGS could have on the fire and emergency service capabilities of the SBCFD. Staff agrees with the applicant that combined impacts would not be significant and that existing local services would adequately provide emergency services.

CONCLUSIONS

Staff concludes that if the applicant for the proposed ISEGS project provides project construction safety and health and project operations and maintenance safety and health programs, as required by conditions of certification **WORKER SAFETY -1**, and **-2**; and fulfills the requirements of conditions of certification **WORKER SAFETY-3** through**-6**, ISEGS would incorporate sufficient measures to ensure adequate levels of

industrial safety and comply with applicable LORS. Staff also concludes that the proposed project would not have significant impacts on local fire protection services.

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 Emergency Action Plan; and
- A Construction Fire Prevention Plan.

The Personal Protective Equipment Program, the Exposure Monitoring Program, and the Injury and Illness Prevention Program shall be submitted to the CPM for review and approval concerning compliance of the program with all applicable Safety Orders. The Construction Emergency Action Plan and the Fire Prevention Plan shall be submitted to the San Bernardino County Fire Department for review and comment prior to submittal to the CPM for approval.

Verification: At least thirty (30) days prior to the start of construction, the project owner shall submit to the CPM for review and approval a copy of the Project Construction Safety and Health Program. The project owner shall provide a copy of a letter to the CPM from the San Bernardino County Fire Department stating the Fire Department's comments on the Construction Fire Prevention Plan and Emergency Action Plan.

WORKER SAFETY-2 The project owner shall submit to the CPM a copy of the Project Operations and Maintenance Safety and Health Program containing the following:

- An Operation Injury and Illness Prevention Plan;
- An Emergency Action Plan;
- Hazardous Materials Management Program;
- Fire Prevention Program (8 CCR § 3221); and;
- Personal Protective Equipment Program (8 CCR §§ 3401-3411).

The Operation Injury and Illness Prevention Plan, Emergency Action Plan, and Personal Protective Equipment Program shall be submitted to the CPM for review and approval concerning compliance of the program with all applicable Safety Orders. The Operation Fire Prevention Plan and the Emergency Action Plan shall also be submitted to the San Bernardino County Fire Department for review and comment.

Verification: At least thirty (30) days prior to the start of first-fire or commissioning, the project owner shall submit to the CPM for approval a copy of the Project Operations and Maintenance Safety and Health Program. The project owner shall provide a copy of a letter to the CPM from the San Bernardino County Fire Department stating the Fire Department's comments on the Operations Fire Prevention Plan and Emergency Action Plan.

WORKER SAFETY-3 The project owner shall provide a site Construction Safety Supervisor (CSS) who, by way of training and/or experience, is knowledgeable of power plant construction activities and relevant laws, ordinances, regulations, and standards, is capable of identifying workplace hazards relating to the construction activities, and has authority to take appropriate action to assure compliance and mitigate hazards. The CSS shall:

- Have over-all 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, emergency response reports for injuries, and inform the CPM of safety-related incidents; and
- Assure that all the plans identified in Worker Safety 1 and 2 are implemented.

Verification: At least thirty (30) days prior to the start of site mobilization, the project owner shall submit to the CPM the name and contact information for the Construction Safety Supervisor (CSS). The contact information of any replacement (CSS) shall be submitted to the CPM within one business day.

The CSS shall submit in the Monthly Compliance Report a monthly safety inspection report to include:

- 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 Worker Safety 3, implements all appropriate Cal/OSHA and 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 thirty (30) days prior to the start of construction, the project owner shall provide proof of its agreement to fund the Safety Monitor services to the CPM for review and approval.

WORKER SAFETY-5 The project owner shall ensure that a portable automatic external defibrillator (AED) is located on site during construction and operations and shall implement a program to ensure that workers are properly trained in its use and that the equipment is properly maintained and functioning at all times. During construction and commissioning, the following persons shall be trained in its use and shall be on-site whenever the workers that they supervise are on-site: the Construction Project Manager or delegate, the Construction Safety Supervisor or delegate, and all shift foremen. During operations, all power plant employees shall be trained in its use. The training program shall be submitted to the CPM for review and approval.

Verification: At least thirty (30) days prior to the start of site mobilization the project owner shall submit to the CPM proof that a portable AED exists on site and a copy of the training and maintenance program for review and approval.

WORKER SAFETY-6 The project owner shall prepare and implement a Best Management Practices (BMPs) for the storage and application of herbicides used to control weeds beneath and around the solar array. These plans shall be submitted to the CPM for review and approval.

Verification: At least thirty (30) days prior to the start of site mobilization, the project owner shall submit to the CPM for review and approval a copy of the Best Management Practices (BMPs) for the storage and application of herbicides.

REFERENCES

BSE2007a – Bright Source Energy/ Solar Partners I, LLC/ J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Submitted to CEC/Docket Unit on 8/31/2007.

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California Fire Code 2007 Title 24 Part 9. Published by the International Code Council, Whittier, CA 90601-2256

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USOSHA (United States Occupational Safety and Health Administration). 1993. *Process Safety Management / Process Safety Management Guidelines For Compliance*. U.S. Department of Labor, Washington, DC.

ENGINEERING ASSESSMENT

FACILITY DESIGN

Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

The California Energy Commission staff concludes that the design, construction, and eventual closure of the Ivanpah Solar Electric Generating System (ISEGS) project and its linear facilities would likely comply with applicable engineering laws, ordinances, regulations, and standards. The proposed conditions of certification, below, would ensure compliance with these laws, ordinances, regulations, and standards.

INTRODUCTION

Facility design encompasses the civil, structural, mechanical, and electrical engineering design of the project. The purpose of this analysis is to:

- verify that the laws, ordinances, regulations, and standards (LORS) that apply to the engineering design and construction of the project have been identified;
- verify that both the project and its ancillary facilities are sufficiently described, including proposed design criteria and analysis methods, in order to provide reasonable assurance that the project will be designed and constructed in accordance with all applicable engineering LORS, in a manner that also ensures the public health and safety;
- determine whether special design features should be considered during final design to address conditions unique to the site that could influence public health and safety; and
- describe the design review and construction inspection process and establish the conditions of certification used to monitor and ensure compliance with the engineering LORS, in addition to any special design requirements.

Subjects discussed in this analysis include:

- identification of the engineering LORS that apply to facility design;
- evaluation of the applicant's proposed design criteria, including identification of criteria essential to public health and safety;
- proposed modifications and additions to the application for certification (AFC) necessary for compliance with applicable engineering LORS; and
- conditions of certification proposed by staff to ensure that the project will be designed and constructed to assure public health and safety and comply with all applicable engineering LORS.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Lists of LORS applicable to each engineering discipline (civil, structural, mechanical, and electrical) are described in the AFC (BSE 2007a, Appendix 2.0). Key LORS are listed in **Facility Design Table 1** below.

Facility Design Table 1
Key Engineering Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health standards
State	2007 California Building Standards Code (CBSC) (also known as Title 24, California Code of Regulations)
Local	San Bernardino County regulations and ordinances
General	American National Standards Institute (ANSI) American Society of Mechanical Engineers (ASME) American Welding Society (AWS) American Society for Testing and Materials (ASTM)

SETTING

The ISEGS would be built on 3,744 acres located in Southern California's Mojave Desert, in San Bernardino County, approximately 3.1 miles west of the California/Nevada border. The site lies in seismic zone 3. For more information on the site and related project description, please see the **Project Description** section of this document. Additional engineering design details are contained in the AFC, Appendix 2.0 (BSE 2007a; CH2ML2008g).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The purpose of this analysis is to ensure that the project would be built to applicable engineering codes and assure public health and life safety. This analysis verifies that applicable engineering LORS have been identified and that the project and its ancillary facilities have been described in adequate detail. It also evaluates the applicant's proposed design criteria, describes the design review and construction inspection process, and establishes conditions of certification that would monitor and ensure compliance with engineering LORS and any other special design requirements. These conditions allow both the California Energy Commission (Energy Commission) compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme that will verify compliance with these LORS.

SITE PREPARATION AND DEVELOPMENT

Staff has evaluated the proposed design criteria for grading, flood protection, erosion control, site drainage, and site access, in addition to the criteria for designing and constructing linear support facilities such as natural gas and electric transmission interconnections. The applicant proposes the use of accepted industry standards (see BSE 2007a, Appendix 2.0, for a representative list of applicable industry standards), design practices, and construction methods in preparing and developing the site. Staff concludes that this project, including its linear facilities, would most likely comply with all applicable site preparation LORS, and proposes conditions of certification (see below and the **Geology and Paleontology** section of this document) to ensure that compliance.

MAJOR STRUCTURES, SYSTEMS, AND EQUIPMENT

Major structures, systems, and equipment are defined as structures and their associated components or equipment that are necessary for power production; are costly or time consuming to repair or replace; are used for the storage, containment, or handling of hazardous or toxic materials; or could become potential health and safety hazards if not constructed according to applicable engineering LORS. Major structures and equipment are identified in the proposed Condition of Certification **GEN-2,** below.

ISEGS would be designed and constructed to the 2007 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Building Standards Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and other applicable codes and standards in effect when the design and construction of the project actually begin. If the initial designs are submitted to the chief building official (CBO) for review and approval after the update to the 2007 CBSC takes effect, the 2007 CBSC provisions would be replaced with the updated provisions.

Certain structures in a power plant may be required, under the CBC, to undergo dynamic lateral force (structural) analysis; others may be designed using the simpler static analysis procedure. In order to ensure that structures are analyzed according to their appropriate lateral force procedure, staff has included Condition of Certification **STRUC-1**, below, which, in part, requires the project CBO's review and approval of the owner's proposed lateral force procedures before construction begins.

PROJECT QUALITY PROCEDURES

The project's AFC (BSE 2007a, § 2.3.2.5) describes a quality program intended to inspire confidence that its systems and components will be designed, fabricated, stored, transported, installed, and tested in accordance with all appropriate power plant technical codes and standards. Compliance with design requirements would be verified through specific inspections and audits. Implementation of this quality assurance/quality control (QA/QC) program would ensure that ISEGS is actually designed, procured, fabricated, and installed as described in this analysis.

COMPLIANCE MONITORING

Under section 104.1 in Appendix Chapter 1 of the CBC, the CBO is authorized and directed to enforce all provisions of the CBC. The Energy Commission itself serves as the building official and has the responsibility to enforce the code for all of the energy facilities it certifies. In addition, the Energy Commission has the power to interpret the CBC and adopt and enforce both rules and supplemental regulations that clarify application of the CBC's provisions.

The Energy Commission's design review and construction inspection process conforms to CBC requirements and ensures that all facility design conditions of certification are met. As provided by section 103.3 in Appendix Chapter 1 of the CBC, the Energy Commission appoints experts to perform design review and construction inspections and act as delegate CBOs on behalf of the Energy Commission. These delegates typically include the local building official and/or independent consultants hired to provide technical expertise that is not provided by the local official alone. The applicant, through permit fees provided by the CBC, section 108 in Appendix Chapter 1, pays the cost of these reviews and inspections. While building permits in addition to Energy Commission certification are not required for this project, the applicant, consistent with CBC section 108, would pay in lieu of CBC permit fees to cover the costs of these reviews and inspections.

Engineering and compliance staff would invite San Bernardino County or a third-party engineering consultant to act as CBO for this project. When an entity has been assigned CBO duties, Energy Commission staff would complete a memorandum of understanding (MOU) with that entity to outline both its roles and responsibilities and those of its subcontractors and delegates.

Staff has developed proposed conditions of certification to ensure public health and safety and compliance with engineering design LORS. Some of these conditions address the roles, responsibilities, and qualifications of the engineers who would design and build the proposed project (Conditions of Certification **GEN-1** through **GEN-8**). These engineers must be registered in California and sign and stamp every submittal of design plans, calculations, and specifications submitted to the CBO. These conditions require that every element of the project's construction (subject to CBO review and approval) be approved by the CBO before it is performed. They also require that qualified special inspectors perform or oversee special inspections required by all applicable LORS.

While the Energy Commission and delegate CBO have the authority to allow some flexibility in scheduling construction activities, these conditions are written so that no element of construction (of permanent facilities subject to CBO review and approval) which could be difficult to reverse or correct could proceed without prior CBO approval. Elements of construction that are not difficult to reverse would be able to proceed without approval of the plans. The applicant would bear the responsibility to fully modify construction elements in order to comply with all design changes resulting from the CBO's subsequent plan review and approval process.

FACILITY CLOSURE

The removal of a facility from service (decommissioning) when it reaches the end of its useful life ranges from mothballing, to the removal of all equipment and appurtenant facilities and subsequent restoration of the site. Future conditions that could affect decommissioning are largely unknown at this time.

In order to ensure that decommissioning would be completed in a manner that is environmentally sound and safe and would protect the public health and safety, the applicant would submit a decommissioning plan to the Energy Commission for review and approval before the project's decommissioning begins. The plan would include a discussion of:

- proposed decommissioning activities for the project and all appurtenant facilities that were constructed as part of the project;
- all applicable LORS, local/regional plans, and proof of adherence to those applicable LORS and local/regional plans;
- the activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities; and
- decommissioning alternatives other than complete site restoration.

Satisfying the above requirements should serve as adequate protection, even in the unlikely event that the project is abandoned. Staff has proposed general conditions (see **General Conditions**) to ensure that these measures are included in the Facility Closure Plan.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments have been received from agencies or the public.

CONCLUSIONS AND RECOMMENDATIONS

1. The laws, ordinances, regulations, and standards (LORS) identified in the AFC and supporting documents directly apply to the project.

2. Staff has evaluated the proposed engineering LORS, design criteria, and design methods in the record, and concludes that the design, construction, and eventual closure of the project will likely comply with applicable engineering LORS.

3. The proposed conditions of certification will ensure that ISEGS is designed and constructed in accordance with applicable engineering LORS. This would be accomplished through design review, plan checking, and field inspections that would be performed by the CBO or other Energy Commission delegate. Staff would audit the CBO to ensure satisfactory performance.

4. Though future conditions that could affect decommissioning are largely unknown at this time, it can reasonably be concluded that if the project owner submits a decommissioning plan as required in the **General Conditions** portion of this

document prior to decommissioning, decommissioning procedures would comply with all applicable engineering LORS.

Energy Commission staff recommends that:

1. the proposed conditions of certification be adopted to ensure that the project is designed and constructed in a manner that protects the public health and safety and complies with all applicable engineering LORS;

2. the project be designed and built to the 2007 CBSC (or successor standards, if in effect when initial project engineering designs are submitted for review); and

3. the CBO reviews the final designs, checks plans, and performs field inspections during construction and that Energy Commission staff audit and monitor the CBO to ensure satisfactory performance.

CONDITIONS OF CERTIFICATION

GEN-1 The project owner shall design, construct, and inspect the project in accordance with the 2007 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and all other applicable engineering LORS in effect at the time initial design plans are submitted to the chief building official (CBO) for review and approval (the CBSC in effect is the edition that has been adopted by the California Building Standards Commission and published at least 180 days previously). The project owner shall ensure that all the provisions of the above applicable codes are enforced during the construction, addition, alteration, moving, demolition, repair, or maintenance of the completed facility (2007 CBC, Appendix Chapter 1, section 101.2, Scope). All transmission facilities (lines, switchyards, switching stations, and substations) are covered in the conditions of certification in the **Transmission System Engineering** section of this document.

In the event that the initial engineering designs are submitted to the CBO when the successor to the 2007 CBSC is in effect, the 2007 CBSC provisions shall be replaced with the applicable successor provisions. Where, in any specific case, different sections of the code specify different materials, methods of construction, or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

The project owner shall ensure that all contracts with contractors, subcontractors, and suppliers clearly specify that all work performed and materials supplied comply with the codes listed above.

Verification: Within 30 days following receipt of the certificate of occupancy, the project owner shall submit to the compliance project manager (CPM) a statement of verification, signed by the responsible design engineer, attesting that all designs, construction, installation, and inspection requirements of the applicable LORS and the Energy Commission's decision have been met in the area of facility design. The project owner shall provide the CPM a copy of the certificate of occupancy within 30 days of receipt from the CBO (2007 CBC, Appendix Chapter 1, section 110, Certificate of Occupancy).

Once the certificate of occupancy has been issued, the project owner shall inform the CPM at least 30 days prior to any construction, addition, alteration, moving, demolition, repair, or maintenance to be performed on any portion(s) of the completed facility that requires CBO approval for compliance with the above codes. The CPM will then determine if the CBO needs to approve the work.

GEN-2 Before submitting the initial engineering designs for CBO review, the project owner shall furnish the CPM and the CBO with a schedule of facility design submittals and master drawing and master specifications lists. The schedule shall contain a list of proposed submittal packages of designs, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide specific packages to the CPM upon request.

Verification: At least 60 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO and to the CPM the schedule, the master drawing and master specifications lists of documents to be submitted to the CBO for review and approval. These documents shall be the pertinent design documents for the major structures and equipment listed in **Facility Design Table 2,** below. Major structures and equipment shall be added to or deleted from the table only with CPM approval. The project owner shall provide schedule updates in the monthly compliance report.

Facility Design Table 2
Major Structures and Equipment List

Equipment/System	Quantity (Plant)
Turbine Generator Foundation and Connections	3
Boiler Structure, Foundation and Connections	10
Air Cooled Condenser Structure, Foundation and Connections	3
Feed Water Preheater Structure, Foundation and Connections	3
Deaerator Structure, Foundation and Connections	3
Steam Distributor Structure, Foundation and Connections	3
Water Treatment Plant, Administration and Electrical Building Structure, Foundation and Connections	4
Water Storage Tanks Structure, Foundation and Connections	3
Maintenance Wing Structure, Foundation and Connections	3
Turbine Lubrication System Foundation and Connections	3
Emergency Generator Foundation and Connections	3
Diesel Fire Pump Foundation and Connections	3
Reheat Tower Structure, Foundation and Connections	3
Emergency Generator Exhaust Structure, Foundation and Connections	3
Pipe Bridge Structure, Foundation and Connections	3
Solar Fields and Towers Structures, Foundations and Connections	3 Lots
Evaporation Pits	3 Lots
Drainage Systems (including sanitary drain and waste)	3 Lots
High Pressure and Large Diameter Piping and Pipe Racks	3 Lots
HVAC and Refrigeration Systems	3 Lots
Temperature Control and Ventilation Systems (including water and sewer connections)	3 Lots
Building Energy Conservation Systems	3 Lots
Switchyard, Buses, and Towers	3 Lots
Substation	1 Lot
Electrical Duct Banks	3 Lots

GEN-3 The project owner shall make payments to the CBO for design review, plan checks, and construction inspections, based upon a reasonable fee schedule to be negotiated between the project owner and the CBO. These fees may be consistent with the fees listed in the 2007 CBC (2007 CBC, Appendix Chapter 1, section 108, Fees; Chapter 1, section 108.4, Permits, Fees, Applications and Inspections), adjusted for inflation and other appropriate adjustments; may be based on the value of the facilities reviewed; may be based on hourly rates; or may be otherwise agreed upon by the project owner and the CBO.

Verification: The project owner shall make the required payments to the CBO in accordance with the agreement between the project owner and the CBO. The project

owner shall send a copy of the CBO's receipt of payment to the CPM in the next monthly compliance report indicating that applicable fees have been paid.

GEN-4 Prior to the start of rough grading, the project owner shall assign a California-registered architect, structural engineer, or civil engineer, as the resident engineer (RE) in charge of the project (2007 California Administrative Code, section 4-209, Designation of Responsibilities). All transmission facilities (lines, switchyards, switching stations, and substations) are addressed in the conditions of certification in the **Transmission System Engineering** section of this document.

The RE may delegate responsibility for portions of the project to other registered engineers. Registered mechanical and electrical engineers may be delegated responsibility for mechanical and electrical portions of the project, respectively. A project may be divided into parts, provided that each part is clearly defined as a distinct unit. Separate assignments of general responsibility may be made for each designated part.

The RE shall:

1. Monitor progress of construction work requiring CBO design review and inspection to ensure compliance with LORS;

2. Ensure that construction of all facilities subject to CBO design review and inspection conforms in every material respect to applicable LORS, these conditions of certification, approved plans, and specifications;

3. Prepare documents to initiate changes in approved drawings and specifications when either directed by the project owner or as required by the conditions of the project;

4. Be responsible for providing project inspectors and testing agencies with complete and up-to-date sets of stamped drawings, plans, specifications, and any other required documents;

5. Be responsible for the timely submittal of construction progress reports to the CBO from the project inspectors, the contractor, and other engineers who have been delegated responsibility for portions of the project; and

6. Be responsible for notifying the CBO of corrective action or the disposition of items noted on laboratory reports or other tests when they do not conform to approved plans and specifications.

The RE shall have the authority to halt construction and to require changes or remedial work if the work does not meet requirements.

If the RE or the delegated engineers are reassigned or replaced, the project owner shall submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, the resume and registration number of the RE and any other delegated engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the RE and other delegated engineer(s) within 5 days of the approval.

If the RE or the delegated engineer(s) is subsequently reassigned or replaced, the project owner has 5 days to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within 5 days of the approval.

GEN-5 Prior to the start of rough grading, the project owner shall assign at least one of each of the following California registered engineers to the project: a civil engineer; a soils, geotechnical, or civil engineer experienced and knowledgeable in the practice of soils engineering; and an engineering geologist. Prior to the start of construction, the project owner shall assign at least one of each of the following California registered engineers to the project: a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; a mechanical engineer; and an electrical engineer. (California Business and Professions Code section 6704 et seq., and sections 6730, 6731, and 6736 require state registration to practice as a civil engineer or structural engineer in California.) All transmission facilities (lines, switchyards, switching stations, and substations) are handled in "Conditions of Certification" in the **Transmission System Engineering** section of this document.

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (for example, proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California registered electrical engineer.

The project owner shall submit, to the CBO for review and approval, the names, qualifications, and registration numbers of all responsible engineers assigned to the project (2007 CBC, Appendix Chapter 1, section 104, Duties and Powers of Building Official).

If any one of the designated responsible engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned responsible engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

A. The civil engineer shall:

1. Review the foundation investigations, geotechnical, or soils reports prepared by the soils engineer, the geotechnical engineer, or by a civil engineer experienced and knowledgeable in the practice of soils engineering;

2. Design (or be responsible for the design of), stamp, and sign all plans, calculations, and specifications for proposed site work, civil works, and related facilities requiring design review and inspection by the CBO. At a minimum, these include: grading, site preparation, excavation, compaction, construction of secondary containment, foundations, erosion and sedimentation control structures, drainage facilities, underground utilities, culverts, site access roads and sanitary sewer systems; and

3. Provide consultation to the RE during the construction phase of the project and recommend changes in the design of the civil works facilities and changes to the construction procedures.

B. The soils engineer, geotechnical engineer, or civil engineer experienced and knowledgeable in the practice of soils engineering, shall:

1. Review all the engineering geology reports;

2. Prepare the foundation investigations, geotechnical, or soils reports containing field exploration reports, laboratory tests, and engineering analysis detailing the nature and extent of the soils that could be susceptible to liquefaction, rapid settlement, or collapse when saturated under load (2007 CBC, Appendix J, section J104.3, Soils Report; Chapter 18, section 1802.2, Foundation and Soils Investigations);

3. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with requirements set forth in the 2007 CBC, Appendix J, section J105, Inspections, and the 2007 California Administrative Code, section 4-211, Observation and Inspection of Construction (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both); and

4. Recommend field changes to the civil engineer and RE.

This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform to the predicted conditions used as the basis for design of earthwork or foundations (2007 CBC, Appendix Chapter 1, section 114, Stop Orders).

C. The engineering geologist shall:

1. Review all the engineering geology reports and prepare a final soils grading report; and

2. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with the requirements set forth in the 2007 California Administrative Code, section 4-211, Observation and Inspection of Construction (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both).

D. The design engineer shall:

1. Be directly responsible for the design of the proposed structures and equipment supports;

2. Provide consultation to the RE during design and construction of the project;

3. Monitor construction progress to ensure compliance with engineering LORS;

4. Evaluate and recommend necessary changes in design; and

5. Prepare and sign all major building plans, specifications, and calculations.

E. The mechanical engineer shall be responsible for, and sign and stamp a statement with, each mechanical submittal to the CBO, stating that the proposed final design plans, specifications, and calculations conform to all of the mechanical engineering design requirements set forth in the Energy Commission's decision.

F. The electrical engineer shall:

1. Be responsible for the electrical design of the project; and

2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible civil engineer, soils (geotechnical) engineer, and engineering geologist assigned to the project.

At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of construction, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible design engineer, mechanical engineer, and electrical engineer assigned to the project.

The project owner shall notify the CPM of the CBO's approvals of the responsible engineers within 5 days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has 5 days in which to submit the resume and registration number of the

newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within 5 days of the approval.

GEN-6 Prior to the start of an activity requiring special inspection, the project owner shall assign to the project a qualified and certified special inspector(s) who shall be responsible for the special inspections required by the 2007 CBC, Chapter 17, section 1704, Special Inspections; Chapter 17A, section 1704A, Special Inspections; and Appendix Chapter 1, Section 109, Inspections. All transmission facilities (lines, switchyards, switching stations, and substations) are handled in "Conditions of Certification" in the **Transmission System Engineering** section of this document.

A certified weld inspector, certified by the American Welding Society (AWS), and/or American Society of Mechanical Engineers (ASME) as applicable, shall inspect welding performed on site requiring special inspection (including structural, piping, tanks, and pressure vessels).

The special inspector shall:

1. Be a qualified person who shall demonstrate competence, to the satisfaction of the CBO, for inspection of the particular type of construction requiring special or continuous inspection;

2. Observe the work assigned for conformance with the approved design drawings and specifications;

3. Furnish inspection reports to the CBO and RE. All discrepancies shall be brought to the immediate attention of the RE for correction, then, if uncorrected, to the CBO and the CPM for corrective action (2007 CBC, Chapter 17, section 1704.1.2, Report Requirements); and

4. Submit a final signed report to the RE, CBO, and CPM, stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications, and other provisions of the applicable edition of the CBC.

Verification: At least 15 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of an activity requiring special inspection, the project owner shall submit to the CBO for review and approval, with a copy to the CPM, the name(s) and qualifications of the certified weld inspector(s) or other certified special inspector(s) assigned to the project to perform one or more of the duties set forth above. The project owner shall also submit to the CPM a copy of the CBO's approval of the qualifications of all special inspectors in the next monthly compliance report.

If the special inspector is subsequently reassigned or replaced, the project owner has 5 days in which to submit the name and qualifications of the newly assigned special inspector to the CBO for approval. The project owner shall notify the CPM of the CBO's approval of the newly assigned inspector within 5 days of the approval.

GEN-7 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the

project owner shall document the discrepancy and recommend required corrective actions (2007 CBC, Appendix Chapter 1, section 109.6, Approval Required; Chapter 17, section 1704.1.2, Report Requirements). The discrepancy documentation shall be submitted to the CBO for review and approval. The discrepancy documentation shall reference this condition of certification and, if appropriate, applicable sections of the CBC and/or other LORS.

Verification: The project owner shall transmit a copy of the CBO's approval of any corrective action taken to resolve a discrepancy to the CPM in the next monthly compliance report. If any corrective action is disapproved, the project owner shall advise the CPM, within 5 days, of the reason for disapproval and the revised corrective action to obtain CBO's approval.

GEN-8 The project owner shall obtain the CBO's final approval of all completed work that has undergone CBO design review and approval. The project owner shall request the CBO to inspect the completed structure and review the submitted documents. The project owner shall notify the CPM after obtaining the CBO's final approval. The project owner shall retain one set of approved engineering plans, specifications, and calculations (including all approved changes) at the project site or at an alternative site approved by the CPM during the operating life of the project (2007 CBC, Appendix Chapter 1, section 106.3.1, Approval of Construction Documents). Electronic copies of the approved plans, specifications, calculations, and marked-up as-builts shall be provided to the CBO for retention by the CPM.

Verification: Within 15 days of the completion of any work, the project owner shall submit to the CBO, with a copy to the CPM, in the next monthly compliance report, (a) a written notice that the completed work is ready for final inspection, and (b) a signed statement that the work conforms to the final approved plans. After storing the final approved engineering plans, specifications, and calculations described above, the project owner shall submit to the CPM a letter stating both that the above documents have been stored and the storage location of those documents.

Within 90 days of the completion of construction, the project owner shall provide to the CBO three sets of electronic copies of the above documents at the project owner's expense. These are to be provided in the form of "read only" (Adobe .pdf 6.0) files, with restricted (password-protected) printing privileges, on archive quality compact discs.

CIVIL-1 The project owner shall submit to the CBO for review and approval the following:

1. Design of the proposed drainage structures and the grading plan;
2. An erosion and sedimentation control plan;
3. Related calculations and specifications, signed and stamped by the responsible civil engineer; and

4. Soils, geotechnical, or foundation investigations reports required by the 2007 CBC, Appendix J, section J104.3, Soils Report, and Chapter 18, section 1802.2, Foundation and Soils Investigation.

Verification: At least 15 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of site grading, the project owner shall submit the documents described above to the CBO for design review and approval. In the next monthly compliance report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

CIVIL-2 The resident engineer shall, if appropriate, stop all earthwork and construction in the affected areas when the responsible soils engineer, geotechnical engineer, or the civil engineer experienced and knowledgeable in the practice of soils engineering identifies unforeseen adverse soil or geologic conditions. The project owner shall submit modified plans, specifications, and calculations to the CBO based on these new conditions. The project owner shall obtain approval from the CBO before resuming earthwork and construction in the affected area (2007 CBC, Appendix Chapter 1, section 114, Stop Work Orders).

Verification: The project owner shall notify the CPM within 24 hours, when earthwork and construction is stopped as a result of unforeseen adverse geologic/soil conditions. Within 24 hours of the CBO's approval to resume earthwork and construction in the affected areas, the project owner shall provide to the CPM a copy of the CBO's approval.

CIVIL-3 The project owner shall perform inspections in accordance with the 2007 CBC, Appendix Chapter 1, section 109, Inspections, and Chapter 17, section 1704, Special Inspections. All plant site-grading operations, for which a grading permit is required, shall be subject to inspection by the CBO.

If, in the course of inspection, it is discovered that the work is not being performed in accordance with the approved plans, the discrepancies shall be reported immediately to the resident engineer, the CBO, and the CPM (2007 CBC, Chapter 17, section 1704.1.2, Report Requirements). The project owner shall prepare a written report, with copies to the CBO and the CPM, detailing all discrepancies, non-compliance items, and the proposed corrective action.

Verification: Within 5 days of the discovery of any discrepancies, the resident engineer shall transmit to the CBO and the CPM a non-conformance report (NCR) and the proposed corrective action for review and approval. Within 5 days of resolution of the NCR, the project owner shall submit the details of the corrective action to the CBO and the CPM. A list of NCRs for the reporting month shall also be included in the following monthly compliance report.

CIVIL-4 After completion of finished grading and erosion and sedimentation control and drainage work, the project owner shall obtain the CBO's approval of the final grading plans (including final changes) for the erosion and sedimentation control work. The civil engineer shall state that the work within his/her area of responsibility was done in accordance with the final approved plans (2007 CBC, Chapter 17, section 1703.2, Written Approval).

Verification: Within 30 days (or a project owner- and CBO-approved alternative time frame) of the completion of the erosion and sediment control mitigation and drainage work, the project owner shall submit to the CBO, for review and approval, the final grading plans (including final changes) and the responsible civil engineer's signed statement that the installation of the facilities and all erosion control measures were completed in accordance with the final approved combined grading plans and that the facilities are adequate for their intended purposes, along with a copy of the transmittal letter to the CPM. The project owner shall submit a copy of the CBO's approval to the CPM in the next monthly compliance report.

STRUC-1 Prior to the start of any increment of construction of any major structure or component listed in **Facility Design Table 2** of Condition of Certification **GEN-2**, above, the project owner shall submit to the CBO for design review and approval the proposed lateral force procedures for project structures and the applicable designs, plans, and drawings for project structures. Proposed lateral force procedures, designs, plans, and drawings shall be those for the following items (from **Table 2**, above):

1. Major project structures;

2. Major foundations, equipment supports, and anchorage; and

3. Large field-fabricated tanks.

Construction of any structure or component shall not begin until the CBO has approved the lateral force procedures to be employed in designing that structure or component.

The project owner shall:

1. Obtain approval from the CBO of lateral force procedures proposed for project structures;

2. Obtain approval from the CBO for the final design plans, specifications, calculations, soils reports, and applicable quality control procedures. If there are conflicting requirements, the more stringent shall govern (for example, highest loads, or lowest allowable stresses shall govern). All plans, calculations, and specifications for foundations that support structures shall be filed concurrently with the structure plans, calculations, and specifications (2007 CBC, Appendix Chapter 1, section 109.6, Approval Required);

3. Submit to the CBO the required number of copies of the structural plans, specifications, calculations, and other required documents of the designated major structures prior to the start of on-site fabrication and installation of each structure, equipment support, or foundation (2007 California Administrative Code, section 4-210, Plans, Specifications, Computations and Other Data);

4. Ensure that the final plans, calculations, and specifications clearly reflect the inclusion of approved criteria, assumptions, and methods used to

develop the design. The final designs, plans, calculations, and specifications shall be signed and stamped by the responsible design engineer (2007 CBC, Appendix Chapter 1, section 106.3.4, Design Professional in Responsible Charge); and

5. Submit to the CBO the responsible design engineer's signed statement that the final design plans conform to applicable LORS (2007 CBC, Appendix Chapter 1, section 106.3.4, Design Professional in Responsible Charge).

Verification: At least 60 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of any increment of construction of any structure or component listed in **Facility Design Table 2** of Condition of Certification **GEN-2**, above, the project owner shall submit to the CBO the above final design plans, specifications, and calculations, with a copy of the transmittal letter to the CPM.

The project owner shall submit to the CPM, in the next monthly compliance report, a copy of a statement from the CBO that the proposed structural plans, specifications, and calculations have been approved and comply with the requirements set forth in applicable engineering LORS.

STRUC-2 The project owner shall submit to the CBO the required number of sets of the following documents related to work that has undergone CBO design review and approval:

1. Concrete cylinder strength test reports (including date of testing, date sample taken, design concrete strength, tested cylinder strength, age of test, type and size of sample, location and quantity of concrete placement from which sample was taken, and mix design designation and parameters);

2. Concrete pour sign-off sheets;

3. Bolt torque inspection reports (including location of test, date, bolt size, and recorded torques);

4. Field weld inspection reports (including type of weld, location of weld, inspection of non-destructive testing [NDT] procedure and results, welder qualifications, certifications, qualified procedure description or number [ref: AWS}); and

5. Reports covering other structural activities requiring special inspections shall be in accordance with the 2007 CBC, Chapter 17, section 1704, Special Inspections, and Section 1709.1, Structural Observations.

Verification: If a discrepancy is discovered in any of the above data, the project owner shall, within 5 days, prepare and submit an NCR describing the nature of the discrepancies and the proposed corrective action to the CBO, with a copy of the transmittal letter to the CPM (2007 CBC, Chapter 17, section 1704.1.2, Report Requirements). The NCR shall reference the condition(s) of certification and the

applicable CBC chapter and section. Within 5 days of resolution of the NCR, the project owner shall submit a copy of the corrective action to the CBO and the CPM.

The project owner shall transmit a copy of the CBO's approval or disapproval of the corrective action to the CPM within 15 days. If disapproved, the project owner shall advise the CPM, within 5 days, the reason for disapproval, and the revised corrective action to obtain CBO's approval.

STRUC-3 The project owner shall submit to the CBO design changes to the final plans required by the 2007 CBC, including the revised drawings, specifications, calculations, and a complete description of, and supporting rationale for, the proposed changes and shall give to the CBO prior notice of the intended filing (2007 CBC, Appendix Chapter 1, section 106.1, Submittal Documents; section 106.4, Amended Construction Documents; 2007 California Administrative Code, section 4-215, Changes in Approved Drawings and Specifications).

Verification: On a schedule suitable to the CBO, the project owner shall notify the CBO of the intended filing of design changes and shall submit the required number of sets of revised drawings and the required number of copies of the other above-mentioned documents to the CBO, with a copy of the transmittal letter to the CPM. The project owner shall notify the CPM, via the monthly compliance report, when the CBO has approved the revised plans.

STRUC-4 Tanks and vessels containing quantities of toxic or hazardous materials exceeding amounts specified in the 2007 CBC, Chapter 3, Table 307.1(2), shall, at a minimum, be designed to comply with the requirements of that chapter.

Verification: At least 30 days (or within a project owner- and CBO-approved alternate time frame) prior to the start of installation of the tanks or vessels containing the above-specified quantities of toxic or hazardous materials, the project owner shall submit to the CBO for design review and approval final design plans, specifications, and calculations, including a copy of the signed and stamped engineer's certification.

The project owner shall send copies of the CBO approvals of plan checks to the CPM in the following monthly compliance report. The project owner shall also transmit a copy of the CBO's inspection approvals to the CPM in the monthly compliance report following completion of any inspection.

MECH-1 The project owner shall submit, for CBO design review and approval, the proposed final design, specifications, and calculations for each plant major piping and plumbing system listed in **Facility Design Table 2**, Condition of Certification **GEN-2**, above. Physical layout drawings and drawings not related to code compliance and life safety need not be submitted. The submittal shall also include the applicable QA/QC procedures. Upon completion of construction of any such major piping or plumbing system, the project owner shall request the CBO's inspection approval of that construction (2007 CBC, Appendix Chapter 1, section 106.1, Submittal Documents;

section 109.5, Inspection Requests; section 109.6, Approval Required; 2007 California Plumbing Code, section 301.1.1, Approvals).

The responsible mechanical engineer shall stamp and sign all plans, drawings, and calculations for the major piping and plumbing systems, subject to CBO design review and approval, and submit a signed statement to the CBO when the proposed piping and plumbing systems have been designed, fabricated, and installed in accordance with all of the applicable laws, ordinances, regulations and industry standards (2007 CBC, Appendix Chapter 1, section 106.3.4, Design Professional in Responsible Charge), which may include, but are not limited to:

- American National Standards Institute (ANSI) B31.1 (Power Piping Code);
- ANSI B31.2 (Fuel Gas Piping Code);
- ANSI B31.3 (Chemical Plant and Petroleum Refinery Piping Code);
- ANSI B31.8 (Gas Transmission and Distribution Piping Code);
- Title 24, California Code of Regulations, Part 5 (California Plumbing Code);
- Title 24, California Code of Regulations, Part 6 (California Energy Code, for building energy conservation systems and temperature control and ventilation systems);
- Title 24, California Code of Regulations, Part 2 (California Building Code); and
- San Bernardino County codes.

The CBO may deputize inspectors to carry out the functions of the code enforcement agency (2007 CBC, Appendix Chapter 1, section 103.3, Deputies).

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of any increment of major piping or plumbing construction listed in **Facility Design Table 2**, Condition of Certification **GEN-2,** above, the project owner shall submit to the CBO for design review and approval the final plans, specifications, and calculations, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with applicable LORS, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's inspection approvals.

MECH-2 For all pressure vessels installed in the plant, the project owner shall submit to the CBO and California Occupational Safety and Health Administration (Cal/OSHA), prior to operation, the code certification papers and other documents required by applicable LORS. Upon completion of the installation of any pressure vessel, the project owner shall request the appropriate CBO

and/or Cal/OSHA inspection of that installation (2007 CBC, Appendix Chapter 1, section 109.5, Inspection Requests).

The project owner shall:

1. Ensure that all boilers and fired and unfired pressure vessels are designed, fabricated, and installed in accordance with the appropriate section of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, or other applicable code. Vendor certification, with identification of applicable code, shall be submitted for prefabricated vessels and tanks; and

2. Have the responsible design engineer submit a statement to the CBO that the proposed final design plans, specifications, and calculations conform to all of the requirements set forth in the appropriate ASME Boiler and Pressure Vessel Code or other applicable codes.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of on-site fabrication or installation of any pressure vessel, the project owner shall submit to the CBO for design review and approval the above-listed documents, including a copy of the signed and stamped engineer's certification, with a copy of the transmittal letter to the CPM.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's and/or Cal/OSHA inspection approvals.

MECH-3 The project owner shall submit to the CBO for design review and approval the design plans, specifications, calculations, and quality control procedures for any heating, ventilating, air conditioning (HVAC), or refrigeration system. Packaged HVAC systems, where used, shall be identified with the appropriate manufacturer's data sheets.

The project owner shall design and install all HVAC and refrigeration systems within buildings and related structures in accordance with the CBC and other applicable codes. Upon completion of any increment of construction, the project owner shall request the CBO's inspection and approval of that construction. The final plans, specifications, and calculations shall include approved criteria, assumptions, and methods used to develop the design. In addition, the responsible mechanical engineer shall sign and stamp all plans, drawings, and calculations and submit a signed statement to the CBO that the proposed final design plans, specifications, and calculations conform with the applicable LORS (2007 CBC, Appendix Chapter 1, section 109.3.7, Energy Efficiency Inspections; section 106.3.4, Design Professionals in Responsible Charge).

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of construction of any HVAC or refrigeration system, the project owner shall submit to the CBO the required HVAC and refrigeration calculations, plans, and specifications, including a copy of the signed and stamped

statement from the responsible mechanical engineer certifying compliance with the CBC and other applicable codes, with a copy of the transmittal letter to the CPM.

ELEC-1 Prior to the start of any increment of electrical construction for all electrical equipment and systems 480 volts or higher (see a representative list, below), with the exception of underground duct work and any physical layout drawings and drawings not related to code compliance and life safety, the project owner shall submit, for CBO design review and approval, the proposed final design, specifications, and calculations (2007 CBC, Appendix Chapter 1, section 106.1, Submittal Documents). Upon approval, the above-listed plans, together with design changes and design change notices, shall remain on the site or at another accessible location for the operating life of the project. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS (2007 CBC, Appendix Chapter 1, section 109.6, Approval Required; section 109.5, Inspection Requests). All transmission facilities (lines, switchyards, switching stations, and substations) are handled in ”Conditions of Certification” in the **Transmission System Engineering** section of this document.

A. Final plant design plans shall include:

1. One-line diagrams for the 13.8-kV, 4.16-kV, and 480-volt systems; and

2. System grounding drawings.

B. Final plant calculations must establish:

1. Short-circuit ratings of plant equipment;

2. Ampacity of feeder cables;

3. Voltage drop in feeder cables;

4. System grounding requirements;

5. Coordination study calculations for fuses, circuit breakers and protective relay settings for the 13.8-kV, 4.16-kV, and 480-volt systems;

6. System grounding requirements; and

7. Lighting energy calculations.

C. The following activities shall be reported to the CPM in the monthly compliance report:

1. Receipt or delay of major electrical equipment;

2. Testing or energization of major electrical equipment; and

3. A signed statement by the registered electrical engineer certifying that the proposed final design plans and specifications conform to requirements set forth in the Energy Commission decision.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of each increment of electrical construction, the project owner shall submit to the CBO for design review and approval the above-listed documents. The project owner shall include in this submittal a copy of the signed and stamped statement from the responsible electrical engineer attesting compliance with the applicable LORS and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

REFERENCES

BSE 2007a – Bright Source Energy/ Solar Partners I, LLC/ J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Submitted to CEC/Docket Unit on 8/31/2007.

CH2ML2008g – CH2ML HILL/ J. Carrier (tn: 46239). Data Responses Set 1D. Dated on 5/09/2008. Submitted to CEC / Docket Unit on 5/09/2008.

GEOLOGY AND PALEONTOLOGY

Patrick Pilling, Ph.D., P.E., G.E.

SUMMARY OF CONCLUSIONS

The proposed Ivanpah Solar Electric Generating System (ISEGS) is located in a moderately active geologic area on the west side of Ivanpah Valley, east of the Clark Mountain Range in the eastern Mojave Desert of Southern California. The main geologic hazards at this site include ground shaking; liquefaction; settlement due to compressible soils, ground water withdrawal, hydrocompaction, or dynamic compaction; and the possible presence of expansive clay soils. These potential hazards can be effectively mitigated through facility design by incorporating recommendations contained in a design-level geotechnical report as required by the California Building Code (2007) and Condition of Certification **GEO-1.** Conditions of Certification **GEN-1, GEN-5,** and **CIVIL-1** in the **Facility Design** section, should also mitigate these impacts to a less than significant level.

There are no known viable geologic or mineralogical resources at the ISEGS. Paleontological resources have been documented within 45 miles of the project, but no significant fossils were found during field explorations on the solar plant sites or near the sub-station and ancillary facilities; however, pack rat middens with plant remains were found in the carbonate bedrock outcrop west of Phase 3. If encountered, potential impacts to paleontological resources contained in these materials due to construction activities will be mitigated through worker training and monitoring by qualified paleontologists, as required by Conditions of Certification **PAL-1** through **PAL-7**.

Based on this information, the California Energy Commission (Energy Commission) believes that the potential for significant adverse cumulative impacts to the project from geologic hazards during its design life and to potential geologic, mineralogic, and paleontologic resources from the construction, operation, and closure of the proposed project, is low. It is staff's opinion that the ISEGS can be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards (LORS), and in a manner that both protects environmental quality and assures public safety, to the extent practical.

INTRODUCTION

In this section, Energy Commission staff discusses the potential impacts of geologic hazards on the proposed ISEGS as well as geologic, mineralogic, and paleontologic resources. Staff's objective is to ensure that there will be no consequential adverse impacts to significant geological and paleontological resources during the project construction, operation, and closure and that operation of the plant will not expose occupants to high-probability geologic hazards. A brief geological and paleontological overview is provided. The section concludes with staff's proposed monitoring and mitigation measures for geologic hazards and geologic, mineralogic, and palentologic resources, with the proposed conditions of certification.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Applicable LORS are listed in the application for certification (AFC) (CH2M Hill, 2007). The following briefly describes the current LORS for both geologic hazards and resources and mineralogic and paleontologic resources.

GEOLOGY AND PALEONTOLOGY Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
Antiquities Act of 1906 (16 United States Code [USC], 431-433	The proposed ISEGS is located entirely on federal (Bureau of Land Management) land. Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations [43 CFR Part 3], 'objects of antiquity' has been interpreted to include fossils by the National Park Service (NPS), the Bureau of Land Management (BLM), the Forest Service (USFS), and other Federal agencies. All design will also need to adhere to any applicable BLM design standards.
State	
California Building Code (2007)	The CBC (2007) includes a series of standards that are used in project investigation, design, and construction (including grading and erosion control). The CBC has adopted provisions in the International Building Code (IBC).
Alquist-Priolo Earthquake Fault Zoning Act, Public Resources Code (PRC), Section 2621–2630	Mitigates against surface fault rupture of known active faults beneath occupied structures. Requires disclosure to potential buyers of existing real estate and a 50-foot setback for new occupied buildings. The site is not located within a designated Alquist-Priolo Fault Zone.
The Seismic Hazards Mapping Act, PRC Section 2690–2699	Areas are identified that are subject to the effects of strong ground shaking, such as liquefaction, landslides, tsunamis, and seiches.
PRC, Chapter 1.7, Sections 5097.5, 5097.9 and 30244	Regulates removal of paleontological resources from state lands, defines unauthorized removal of fossil resources as a misdemeanor, and requires mitigation of disturbed sites.
Warren-Alquist Act, PRC, Sections 25527 and 25550.5(i)	The Warren-Alquist Act requires the Energy Commission to "give the greatest consideration to the need for protecting areas of critical environmental concern, including, but not limited to, unique and irreplaceable scientific, scenic, and educational wildlife habitats; unique historical, archaeological, and cultural sites…" With respect to paleontologic resources, the Energy Commission relies on guidelines from the Society for Vertebrate Paleontology (SVP), indicated below.

Applicable Law	Description
California Environmental Quality Act (CEQA), PRC Sections 15000 et seq., Appendix G	Mandates that public and private entities identify the potential impacts on the environment during proposed activities. Appendix G outlines the requirements for compliance with CEQA and provides a definition of significant impacts on a fossil site.
Society for Vertebrate Paleontology (SVP), 1995	The "Measures for Assessment and Mitigation of Adverse Impacts to Non-Renewable Paleontological Resources: Standard Procedures" is a set of procedures and standards for assessing and mitigating impacts to vertebrate paleontological resources. The measures were adopted in October 1995 by the SVP, a national organization of professional scientists.
Local	
San Bernardino County General Plan	Mandates compliance with a number of development standards, including safety requirements. The county also incorporates standards and provisions established by the CBC (2007).
San Bernardino County 2007 Development Code, Chapter 82.20	Defines criteria for site evaluation for paleontological and cultural resources in the county, including preliminary field surveys, monitoring during construction, and specimen recovery; also defines qualifications for professional paleontologists.

SETTING

The proposed ISEGS will be constructed in three phases on a total of approximately 4,065 acres (6.4 square miles) located approximately 4.5 miles southwest of the California/Nevada border and Primm, Nevada, and 1 to 3.5 miles west of Interstate Highway 15 in San Bernardino County, California. The proposed project is located entirely on federal land administered by the Bureau of Land Management (BLM), and is roughly 2 miles west of Ivanpah Lake, a predominantly dry playa lakebed. The power plant will be capable of generating a total 400 megawatts (MW) of electricity from the three separate electrical generating sites. Phases 1, 2 and 3 will occupy the southern, central and northern portions of the overall site, respectively. Each phase will consist of several heliostat (mirror) arrays that will focus sunlight onto power tower receivers in the center of the array. Steam produced by solar boilers will be fed to a single Rankine-cycle reheat steam turbine adjacent to each power tower. A natural gas-fired boiler will be required for start-up each morning, and to provide an alternative fuel source during periods of nominal sunlight.

A new 115/220-kilovolt (kV) substation will be constructed between Phases 1 and 2 by Southern California Edison (SCE) adjacent to existing transmission lines. New 115 kV transmission lines will connect each phase to the SCE grid. Auxiliary components include air-cooled condensers, water storage tanks, deaerators, back-up generators, and switchyards. Ancillary facilities include two water wells, wastewater collection and treatment systems, and an administration/maintenance/control building. A total of 5.3 miles of 4- to 6-inch diameter natural-gas pipeline, most of which will be installed within the project boundaries, will connect to an existing Kern River Gas Transmission line located approximately 0.5 mile north of Phase 3. A total of approximately 8 miles of

optic cable line will be installed both overhead on the existing Nipton 33-kV or 12-kV distribution line poles and through new underground conduits in two segments; between the Ivanpah substation and the Mountain Pass substation and from Mountain Pass substation to a designated local telecommunication carrier interface point approximately 1.5 miles away.

REGIONAL SETTING

The ISEGS site is located at the east end of the Mojave Desert in Southern California. The region is part of the Mojave Desert geomorphic province (Norris and Webb, 1990), and the solar plant site is in the northeast corner near the boundary with the Basin and Range geomorphic province. Mountain ranges in the Mojave Desert are composed of complexly faulted and folded crystalline, metamorphic, volcanic and carbonate basement rocks that range in age from pre-Cambrian to Mesozoic. Volcanic and sedimentary rocks deposited in the Cenozoic are common as well. Younger faulting in the eastern half of the Mojave Desert geomorphic province is characterized by generally north- to northwest-trending normal faults associated with regional extension in the Great Basin. Detachment faults, which are large-scale normal listric faults that flatten at depth, are common in the eastern Mojave Desert of California and Southern Nevada. Thick, nearly flat-lying breccia zones that juxtapose rocks on a regional scale have been identified as the deep portions of these detachment faults, and attest to the depth of erosion in the region. Localized right-lateral strike-slip movement associated with the normal faulting is common in the eastern Mojave Desert. Extensional tectonics is predominant in the Great Basin geomorphic province to the north, although some northwest-striking right-lateral strike-slip faulting, which may or may not be associated with normal faulting, is present. Rapid subsidence has occurred in pull-apart basins, such as the Death Valley depression, in response to strike-slip faulting (Norris and Webb, 1990; Wright and others, 1999). Strike-slip tectonics may also be partially responsible for the development of Shadow Valley, located southwest of the Clark Mountain Range, during the Miocene (Prave and McMackin, 1999).

Geology in the Clark Mountain Range, located west of the ISEGS site, is characteristic of both the Mojave Desert and Great Basin geomorphic provinces. A major thrust fault, the Keystone Thrust, which was active in the late Jurassic to early Cretaceous, has juxtaposed Paleozoic marine carbonate sediments over rocks typical of a continental setting (USGS, 2006). The carbonates were deposited in a miogeoclinal environment, which, along with the Mesozoic age (Cordilleran orogeny) thrust fault relationship, is characteristic of the Basin and Range geomorphic province (USGS, 2006; Norris and Webb, 1990). The southernmost occurrence of these miogeoclinal basin fill sediments that is in thrust fault contact over continental rocks occurs in the Clark Mountain Range. Mesozoic granitic, metamorphic, volcanic and sedimentary rocks in the Mojave Desert to the southwest are more typical of a magmatic arc tectonic setting.

The Clark Mountain Range, which reaches an elevation of 7,930 feet, is bounded on the west side by the Halloran Hills Detachment Fault (Fowler and Calzia, 1999). The core of the range has remained unaffected by regional extension. The Kingston Range to the west and the McCullogh Mountains to the east, however, have been affected by significant extension and detachment faulting that has been dated as Miocene age between 16.5 and 11.0 million years (Ma) (USGS, 2006). The Clark Mountain Range appears to be a high-standing, partially detachment fault-bounded, undeformed zone

that remained after major east- and west-directed detachment faulting occurred. The adjacent Ivanpah Valley, with a lakebed elevation of 2,602 feet could be primarily a product of the same relatively recent regional extension and normal listric faulting. Speculation that Shadow Valley, located on the opposite side of the Clark Mountain Range from Ivanpah Valley, is a Miocene basin that developed in partial response to strike-slip faulting (Prave and McMackin, 1999) complicates the picture. The Pahrump Valley Fault Zone and the Stateline Fault, which are interpreted to have a strike-slip sense of motion, border the east side of Ivanpah Valley. Strike-slip faulting, therefore, could be partly responsible for the formation of Ivanpah Valley, although extensional tectonics remains the primary factor.

The Cima Volcanic Field is located southwest of the ISEGS site beyond the Clark Mountain Range. The nearest cinder cone is approximately 15.5 miles away. Basaltic eruptions within the volcanic field have occurred about 330 to 480 years before present (CDMG, 1994).

PROJECT SITE DESCRIPTION

The power plant site is located on a broad alluvial bajada deposited on the eastern flank of the Clark Mountain Range. The site is situated on the west side of Ivanpah Valley, which extends northward into Las Vegas Valley. Clasts of alluvial and fluvial origin are predominantly composed of pre-Cambrian to Mesozoic granitic, metamorphic and carbonate rocks derived from sources located roughly 1 to 2.5 miles to the west and north (CDMG, 1961; CDMG, 1967; USGS, 2006).The Quaternary sediments overlie rocks of similar age and composition to the source rocks in the Clark Mountain Range. Outcrops of carbonate and metamorphic rocks to the west of Phase 3 and northeast of Phase 2, respectively, indicate that alluvial fan thickness is relatively thin in the area. However, boreholes in Phase 2, which were advanced to depths up to 80 feet, did not encounter bedrock (Terracon, 2007). Subsurface information is not available in the vicinity of Phases 1 and 3.

The Quaternary alluvium mapped across all phases of the proposed solar plant can be grouped into two major categories based on composition of the sand and gravel clasts. Sediments composed of fine sand to boulders derived from multiple sources, including granitic, metamorphic and carbonate rocks, are present at the surface in the northern half of Phase 1 and the northwest half of Phase 3 (USGS, 2006). All other areas are mapped as alluvium that contains coarse sand to fine gravel of predominantly granitic composition (grus). Young alluvium of both types is late Pleistocene to Holocene in age and characterized by poorly cemented and consolidated sediments with poorly developed soil horizons and desert pavement. Older young alluvium (latest Pleistocene to early Holocene) is slightly more weathered than young alluvium and contains localized weak soil and desert varnish development. Intermediate alluvial fan deposits occur only in the northwest corner of Phase 3, and are middle to late Pleistocene in age. The sediments are composed of silt, sand, gravel, cobbles and boulders, and are moderately to strongly weathered with a dark brown surface clayey horizon. Desert pavement is moderately to well developed, and desert varnish is moderate to strong. (USGS, 2006).

Two exploratory borings were advanced within the limits of Phase 2 to depths of 80 feet (Terracon, 2007). Medium dense to very dense granular soils, including silty sand with

gravel and silty gravel with sand, were the predominant materials encountered. Clayey sand occurred only locally, in B-1 (7 to 15 feet) and B-2 (3 to 4 feet). All soils are typical alluvial fan sediments. No fine-grained or clay soils typical of deposition in a lacustrine environment were observed. The lowest blow count recorded was 21 blows/foot, and all but four blow counts were above 30 blows/foot, indicative of generally dense granular soils. Sieve analyses yielded 8.4 to 16.4 percent non-plastic fines and 3.8 to 20.3 percent gravel in silty sands. Ground water was not encountered in either boring.

Two small bedrock hills are located adjacent to Phases 2 and 3. All literature sources agree that the small ridge of carbonate rocks to the west of Phase 3 is Paleozoic in age, and the hills composed of metamorphic rocks to the northeast of Phase 2 are early pre-Cambrian to Cambrian in age (CDMG, 1961; CDMG, 1967; CH2M Hill, 2007). Jennings (CDMG, 1961) maps the carbonate rocks as undivided marine limestone and dolomite of either the Riggs Formation, which occurs only in the Silurian Hills to the northwest beyond the Clark Mountain Range, or the early Cambrian to Devonian Goodsprings Dolomite. Exposures of the Goodsprings Dolomite, which is described as a dark gray, fine-grained, thick-bedded and locally mottled dolomite (CDMG, 1961; CDMG, 1967), are abundant in the Clark Mountain Range several miles north of the project site (CDMG, 1967). The unit generally lacks fossils, except for echinoderm plates. The Geologic Hazards section of the AFC (CH2M Hill, 2007) also refers to the carbonate bedrock adjacent to Phase 3 as Goodsprings Dolomite. However, the Paleontological Resources section interprets the rocks to be part of the Bonanza King Formation, which is similarly fine-grained, thick-bedded and devoid of fossils, based on field examination of the outcrops (CH2M Hill, 2007). The Cambrian Bonanza King Formation does occupy the same relative stratigraphic position as the Goodsprings Dolomite (CDMG, 1967; Miller and Walker, 2002).

McCleod (2007) speculates that the carbonate bedrock belongs to the Mississippian age Monte Cristo Limestone or Pennsylvanian age Bird Spring Formation. Both units are mapped in the Clark Mountain Range to the north (CDMG, 1961; CDMG, 1967). The basal portions of the Bird Spring Formation and certain members of the Monte Cristo Limestone contain abundant marine fossils. The lack of fossils in the outcrop near the project site makes positive determination of the age and formation of the rocks difficult.

The east half of the Clark Mountain Range is mapped as much older pegmatite dikes and gneisses of granitic composition that could be Archean in age (CDMG, 1961; CDMG, 1967). The hills northeast of Phase 2 are composed of gray quartzites and other metamorphic rocks that are undifferentiated in most literature sources. The rocks are tentatively assigned to the lower Cambrian Zabriskie Quartzite in the Paleontological Resources section of the AFC (CH2M Hill, 2007) based on field observations. Although the unit is not mapped in the Clark Mountain Range in the vicinity of the project, the Tapeats Sandstone is a red quartzite of Cambrian age mapped north of the nearby Mesquite Pass (CDMG, 1967). The Tapeats Sandstone occupies the same stratigraphic position as the Zabriskie Quartzite (CDMG, 1967; Miller and Walker, 2002).

Several active and potentially active faults related to regional strike-slip faulting to the west and north, as well as to extensional tectonics in the Great Basin and eastern

Mojave Desert, are present within 100 miles of the ISEGS project area. EQFAULT™ Version 3.00, a computer program for the deterministic estimation of peak site acceleration using three-dimensional articulated planar elements (faults), was used to model seismogenic sources (Blake, 2006a). The site latitude and longitude inputs were 35.5588 degrees and -115.4672 degrees, respectively, which is centrally located in Phase 2. The search radius was 100 miles. The attenuation relationship used was that recommended by Boore, et al. (1997) for Site Class D. The various faults are listed in **GEOLOGY AND PALEONTOLOGY Table 2** - Active Faults in the Project Area, along with the distance from the project site and maximum earthquake magnitude. The peak acceleration and estimated intensity the site would experience during a maximum magnitude earthquake on each fault is also given. The fault locations can be found on the Fault Activity Map of California (CDMG, 1994).

GEOLOGY AND PALEONTOLOGY Table 2
Active Faults in the Project Area

Fault Name, Zone or System	Approximate Distance (mi [km])	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Surface Acceleration (g)	Estimated Site Intensity (Modified Mercali Scale)
Death Valley (South)	51.3 (82.5)	7.1	0.080	VII
Garlock (East)	51.3 (82.6)	7.5	0.098	VII
Owl Lake	67.0 (107.9)	6.5	0.047	VI
Pisgah-Bullion Mountain – Mesquite Lake	76.8 (123.6)	7.3	0.065	VI
Death Valley (Graben)	79.6 (128.1)	7.1	0.069	VI
Panamint Valley	80.9 (130.2)	7.4	0.065	VI
Calico – Hidalgo	84.1 (135.4)	7.3	0.060	VI
Landers	92.3 (148.6)	7.3	0.056	VI
Emerson South – Copper Mountain	93.3 (150.1)	7.0	0.047	VI
Gravel Hills – Harper Lake	94.4 (151.9)	7.1	0.050	VI
Blackwater	94.6 (152.3)	7.1	0.049	VI
Johnson Valley (Northern)	97.9 (157.6)	6.7	0.039	V
Tank Canyon	98.7 (158.9)	6.4	0.040	V
Lenwood-Lockhart-Old Woman Springs	99.2 (159.6)	7.5	0.059	VI

GEOLOGY AND PALEONTOLOGY Table 2 presents only the active faults with Holocene age (less than 10,000 years) activity. One northwest-striking fault, the Stateline Fault, has had movement in the early to middle Pleistocene (700,000 to 1,600,000 years) (CDMG, 1994). The fault is located approximately 4.5 miles to the northeast, and closely follows the California-Nevada border. The Stateline Fault is the southern segment of the Pahrump Valley Fault Zone, which has been interpreted to be a right-lateral strike-slip structure with some vertical movement (USGS, 2006). The fault borders the east side of Ivanpah Valley, and crosses the valley north of the solar plant site. No other fault with Pleistocene activity is present within 35 miles of the proposed solar plant. Numerous older bedrock faults are mapped in all mountain ranges, including the Clark Mountain Range, in the eastern Mojave Desert, but are not considered to be active. The Ivanpah Fault, which is shown by the CDMG (1961 and 1994) to be concealed beneath Quaternary sediments of Ivanpah Valley, is located roughly 4,500 to

5,500 feet southwest of the site. The fault separates predominantly pre-cambrian granitic and metaporphic rocks in the western portion of the Clark Mountain Range from Paleozoic carbonates in the eastern half (CDMG, 1961; CDMG, 1967). Several bedrock faults have also mapped on the small metamorphic rock outcrop just northeast of Phase 2 (CDMG, 1961).

Ground water depth anywhere on the ISEGS site is not precisely known. The only local information available indicates that groundwater does not occur within 80 feet of the existing ground surface at two boring sites within the limits of Phase 2 (Terracon, 2007). It is recommended that the areas of the project that lack subsurface information be investigated to establish depths to ground water and bedrock, as well as other geologic conditions, per CBC (2007) requirements and proposed Condition of Certification **GEO-1**. Data from wells within Ivanpah Valley, which was obtained from the California Department of Water Resources (CDWR, 2004), show high historic ground water levels at 367, 90, 24 and 85 feet in the south central, central, western margin and north central parts of the basin, respectively. Levels have fluctuated between 6 and 8.5 feet since about 1916-1917.

Regional subsidence due to ground water withdrawal has been reported, and evidence of subsidence is present at the site in the form of sinkholes. Continued regional pumping of ground water, as well as ground water withdrawal anticipated as a part of this project, will result in additional subsidence that will need to be mitigated through facility design.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section considers two types of impacts. The first is geologic hazards, which could impact the proper functioning of the proposed facility and create life/safety concerns. The second is the potential impacts the proposed facility could have on existing geologic, mineralogic, and paleontologic resources in the area.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Federal agencies are required to review major federal actions such as the ISEGS project under the National Environmental Policy Act (NEPA). This document has been prepared in consultation with the Bureau of Land Management (BLM) to also address federal environmental issues. The BLM and CEC will conduct a joint environmental review of the project in a single NEPA/California Environmental Quality Act (CEQA) process. This project will also be reviewed by BLM staff pursuant to the Federal Land Policy and Management Act of 1976 (FLPMA). The FLPMA establishes the agency's multiple-use mandate to serve present and future generations.

The Antiquities Act of 1906 (16 United States Code [USC]) requires that objects of antiquity be taken into consideration for federal projects and the California Environmental Quality Act, Appendix G, also requires the consideration of paleontological resources. The California Building Standards Code (CBSC) and CBC (2007) provide geotechnical and geological investigation and design guidelines, which engineers must follow when designing a facility. As a result, the criteria used to assess the significance of a geologic hazard include evaluating each hazard's potential impact

on the design and construction of the proposed facility. Geologic hazards include faulting and seismicity, liquefaction, dynamic compaction, hydrocompaction, subsidence, expansive soils, landslides, tsunamis, and seiches.

The California Environmental Quality Act (CEQA) guidelines, Appendix G, provide a checklist of questions that lead agencies typically address.

- Section (V) (c) includes guidelines that determine if a project will either directly or indirectly destroy a unique paleontological resource or site, or a unique geological feature.
- Sections (VI) (a), (b), (c), (d), and (e) focus on whether or not the project would expose persons or structures to geologic hazards.
- Sections (X) (a) and (b) concern the project's effects on mineral resources.

Staff has reviewed geologic and mineral resource maps for the surrounding area, as well as site-specific information provided by the applicant, to determine if geologic and mineralogic resources exist in the area. When available, staff also reviewed the operating procedures of the proposed facility in particular ground water extraction and mass grading to determine if those operations could adversely affect geologic and mineralogic resources.

Staff also reviewed existing paleontologic information and requested or reviewed records searches from the San Bernardino County Museum and the Natural History Museum of Los Angeles for the surrounding area. The University of California Museum of Paleontology (at Berkeley) online database that provides a general listing of fossil records by county and geographic location (UCMP, 2007) was also consulted. Site-specific information generated by the applicant for the ISEGS was also reviewed. All research was conducted in accordance with accepted assessment protocol (SVP, 1995) to determine whether any known paleontologic resources exist in the general area. If present or likely to be present, conditions of certification which outline required procedures to mitigate impacts to potential resources, and proposed as part of the projects approval.

DIRECT/INDIRECT IMPACTS AND MITIGATION

The main geologic hazards at this site include ground shaking; liquefaction; settlement due to compressible soils, ground water withdrawal, hydrocompaction, or dynamic compaction; and the possible presence of expansive clay soils. The potential hazards can be effectively mitigated through facility design as required by the California Building Code (2007) and proposed Condition of Certification **GEO-1**. Proposed Conditions of Certification **GEN-1, GEN-5, and CIVIL-1** in the **Facility Design** section are also intended to mitigate these impacts to a less than significant level.

No viable geologic or mineralogic resources are known to exist within 6,000 feet of the ISEGS site and gas pipeline route. The ISEGS site is mapped as Mineral Resource Zone 4 (CDMG, 1987). MRZ-4 refers to "areas where geologic information does not rule out either the presence or absence of industrial mineral resources". The carbonate bedrock outcrop just west of Phase 3 is designated as MRZ-3a, which is an "area underlain by geologic terranes within which undiscovered industrial mineral resources

similar to known deposits in the same producing district or region may reasonably expected to exist (hypothetical resources). Such areas may include prospects of undetermined significance". These carbonate rocks could be encountered at shallow depths in Phase 3. Numerous mines have produced a variety of precious metals, base metals, rare earth elements and industrial minerals from the Clark Mountain Range. The nearest prospects and historic workings are located approximately 8,000 feet northwest of Phase 3 and 12,500 feet southwest of Phases 2 and 3 (CDMG, 1987). Base metal and limestone prospects are also located roughly 6,000 feet northwest of the northern end of the proposed gas pipeline. A pit is located 7,500 feet east of Phase 1, and is the closest known source of borrow material (USGS, 1985). The nearest oil and gas fields are located at least 75 miles west and southwest of Barstow, California, which is roughly 100 miles to the southwest of the project site (CDC, 2001).

Young to intermediate (middle Pleistocene to Holocene) age alluvial fan sediments represent all soils that are mapped at the surface of the ISEGS site. These deposits are considered to have a low paleontological sensitivity due to the high energy environment of deposition and/or are too young to yield fossils of scientific significance. The possibility of impacting significant paleontological resources during grading and trenching in such materials is low (McLeod, 2007; Scott, 2007). Quaternary lacustrine sediments are considered to have a high paleontological sensitivity because significant vertebrate and plant fossils have been recovered from deposits east of the project site around Ivanpah Lake and roughly 30 miles to the northwest near Tecopa, California (McLeod, 2007; Scott, 2007); however, it is unlikely that lake bed sediments are present beneath the site within the anticipated depths of grading and trenching such that the potential to impact significant paleontological resources in these materials is also low. The carbonate bedrock west of Phase 3 is assigned a high paleontological sensitivity rating, based on the presence of Late Quaternary packrat middens that occupy solution cavities in the outcrops and the occurrence of time-restrictive marine fauna in late Cambrian rocks in the Clark Mountain Range (UCMP, 2007; CH2M Hill, 2007; Scott, 2007). Since shallow carbonate bedrock may be present in the western portion of Phase 3 and could be encountered during project excavation in this area, the potential for impacting significant paleontological resources is high in this area. The Pre-Cambrian metamorphic rocks in the bedrock outcrops northeast of Phase 2 is considered to have negligible paleontological sensitivity.

Based on the above discussion, SVP criteria, and the confidential paleontological report appended to the AFC, staff considers the probability that paleontological resources will be encountered during grading and excavation in the western portion of Phase 3 to be high. Proposed Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate potential impacts to paleontological resource to less than significant levels. These conditions essentially require a worker education program in conjunction with the monitoring of earthwork activities by a qualified professional paleontologist (paleontologic resource specialist; PRS).

The proposed conditions of certification allow the Energy Commission's compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with LORS applicable to geologic hazards and the protection of geologic, mineralogic, and paleontologic resources.

Based on the information below, it is staff's opinion that the potential for significant adverse impacts to the project from geologic hazards, and to potential geologic, mineralogic, and paleontologic resources from the proposed project, is low.

GEOLOGIC HAZARDS

The AFC (CH2M Hill, 2007) provides documentation of potential geologic hazards at the ISEGS plant site, although no site-specific subsurface information was available for Phases 1 and 3 at the time the AFC was submitted. Review of the AFC, coupled with staff's independent research, indicates that the possibility of geologic hazards significantly affecting the operation of the plant site during its practical design life is low. However, geologic hazards, such as strong ground shaking during seismic events; liquefaction; settlement due to compressible soils, ground water withdrawal, hydrocompaction, or dynamic compaction; and expansive clay soils must be addressed in a project geotechnical report per CBC (2007) requirements and proposed Condition of Certification **GEO-1**.

Staff's independent research included the review of available geologic maps, reports, and related data of the ISEGS plant site. Geological information was available from the California Geological Survey (CGS), (CDMG), and other governmental organizations.

Faulting and Seismicity

Energy Commission staff reviewed the CDMG publication *Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions* (1994) and Alquist-Priolo Special Studies Zone mapping and reports (CDMG, 2003; CGS, 2002; and Hart and Bryant, 1999). No active faults are shown on published maps as crossing the boundary of new construction on the proposed ISEGS site or in the vicinity of the proposed gas pipeline. The closest mapped active faults to the plant site are the Death Valley Fault Zone and Garlock Fault located approximately 51 miles to the west. Movement on the north-northwest-striking Death Valley Fault is normal, related to extensional tectonics in the Great Basin, coupled with right-lateral strike-slip, related to San Andreas-style transform faulting. The Garlock Fault is a major east-west-striking, left-lateral strike-slip fault, also associated with regional transform faulting to the west. One northwest-striking fault, the Stateline Fault, has had movement in the early to middle Pleistocene (700,000 to 1,600,000 years) (CDMG, 1994). The fault is located approximately 4.5 miles to the northeast, and closely follows the California-Nevada border.

GEOLOGY AND PALEONTOLOGY Table 2 lists all Holocene age faults within 100 miles of the solar plant site. The majority, including the Pisgah-Bullion Mountain-Mesquite Lake, Calico-Hidalgo, Landers, Emerson-Copper Mountain, Gravel Hills-Harper Lake, Blackwater, Johnson Valley, and Lenwood-Lockhart-Old Woman Springs Faults, are right-lateral strike-slip faults similar in style and orientation to the San Andreas Fault. These structures are located in the western Mojave Desert. The Panamint Valley Fault is located east of the Death Valley Fault Zone, and sense-of-movement and orientation are similar. The Owl Lake Fault, which strikes northeast, and the Tank Canyon Fault, which is a north-striking reverse fault, appear to be associated with the regional left-lateral Garlock Fault.

The Garlock Fault is the only structure designated as a Type A fault (CDMG, 1994; ICBO, 1998). All others listed in Table 1 are Type B. Type A faults have slip-rates of ≥5 mm/yr and are capable of producing an earthquake of magnitude 7.0 or greater. Type B faults have slip-rates of 2 to 5 mm/yr and are capable of producing an earthquake of magnitude 6.5 to 7.0.

The Alquist-Priolo Act of 1973 and subsequent California state law (California Code of Regulations, 2001) require that all occupied structures be set back 50 feet or more from the surface trace of an active fault. Since no active faults have been documented within the ISEGS power plant site, setbacks for occupied structures will not be required.

Estimates of potential seismic ground motion generated using the Seismic Hazard Curves, Response Parameters and Design Parameters software found at the United States Geological Survey website (http://eartquake.usgs.gov/research/hazmaps/design) indicate that the peak bedrock ground acceleration is expected to be 0.15g at the site. The resulting deterministic peak surface accelerations on the site for each fault are summarized in **GEOLOGY AND PALEONTOLOGY Table 3** – Estimated Deterministic Peak Surface Accelerations.

GEOLOGY AND PALEONTOLOGY Table 3
Estimated Deterministic Peak Surface Accelerations

Latitude North	Longitude West	Date	Depth (km)	Earthquake Magnitude	Peak Site Surface Acc. (g)	Site Modified Mercali Scale Intensity	Approx. Distance (mi [km])	Location of Epicenter
35.967	114.817	05/04/1939	0.0	5.0	0.035	V	46.1 (74.1)	Boulder City, NV
34.711	116.027	09/26/1965	8.3	5.0	0.026	V	66.5 (107.1)	S. Bristol Mtns., CA
34.860	116.390	10/21/1999	4.0	5.0	0.025	V	71.0 (114.2)	Hector, CA
34.860	116.410	10/22/1999	1.0	5.0	0.025	V	71.8 (115.6)	Hector, CA
34.983	116.550	04/10/1947	0.0	6.2	0.046	VI	72.8 (117.2)	East of Barstow, CA
34.950	116.533	04/10/1947	0.0	5.0	0.024	V	73.6 (118.0)	East of Barstow, CA
34.967	116.550	04/10/1947	0.0	5.1	0.026	V	73.5 (118.2)	East of Barstow, CA
34.967	116.550	04/11/1947	0.0	5.0	0.024	V	73.5 (118.2)	East of Barstow, CA
34.800	116.410	10/21/1999	1.0	5.0	0.024	V	74.7 (120.2)	Hector, CA
34.680	116.280	10/16/1999	8.0	5.8	0.036	V	76.1 (122.4)	Southeast of Hector Mine, CA
34.533	115.983	07/18/1946	0.0	5.6	0.032	V	76.6 (123.3)	N. Bullion Mtns., CA
34.830	116.520	09/26/1929	0.0	5.1	0.024	V	77.8 (125.3)	Hector, CA
34.594	116.271	10/16/1999	0.0	7.1	0.068	VI	80.6 (129.7)	Southeast of Hector Mine, CA
34.583	116.319	07/05/1992	0.0	5.4	0.027	V	82.8 (133.2)	Southeast of Hector, CA
34.712	116.503	09/25/1965	10.6	5.2	0.025	V	82.7 (133.1)	South of Hector, CA
34.970	116.819	03/18/1997	1.0	5.1	0.023	IV	86.4 (139.0)	Calico Mtns., CA
34.333	115.800	12/22/1943	0.0	5.5	0.028	V	86.7 (139.5)	Bullion Mtns., CA
34.442	116.248	10/16/1999	1.0	5.7	0.030	V	88.9 (143.0)	Southeast of Hector Mine, CA

Latitude North	Longitude West	Date	Depth (km)	Earthquake Magnitude	Peak Site Surface Acc. (g)	Site Modified Mercali Scale Intensity	Approx. Distance (mi [km])	Location of Epicenter
36.000	117.000	11/04/1908	0.0	6.5	0.045	VI	91.1 (146.6)	Southwest of Death Valley, CA
36.000	117.000	11/10/1916	0.0	5.5	0.027	V	91.1 (146.6)	South of Death Valley, CA
36.705	116.293	06/29/1992	8.0	5.4	0.025	V	91.6 (147.3)	Lathrop Wells, NV
34.516	116.495	06/01/1975	4.5	5.2	0.023	IV	92.5 (148.9)	South of Hector, CA
34.250	116.167	03/20/1945	0.0	5.0	0.019	IV	98.7 (158.8)	East of Landers, CA

EQSEARCH Version 3.00 software was used to search an abbreviated and modified version of the published CGS earthquake catalog for California in order to obtain the information presented in **GEOLOGY AND PALEONTOLOGY Table 3** (Blake, 2006a). The site latitude and longitude inputs were 35.5588 degrees and -115.4672 degrees, respectively, which is centrally located in Phase 2. The range of historic earthquake magnitudes selected was 5.0 to 9.0, and the search radius was 100 miles. The location of each seismic event was obtained from the USGS 7.5 Minute Topographic Map Series and the California Historical Earthquake Online Database (http://www.consrv.ca.gov/cgs/rghm/quakes/historical/).

Twenty-three historic earthquakes of Magnitude 5.0 (M5.0) or greater have occurred on active faults between 51 and 100 miles of the site (CGS, 2007). Only three of these, with epicenters located near the Hector Mine (M7.1), southwest of Death Valley (M6.5) and east of Barstow (M6.2), were of Magnitude 6.0 or greater. Nearly all of the faults are predominantly associated with strike-slip faulting. The earthquakes in the Death Valley region resulted from a combination of extensional and strike-slip faulting. The earthquake at Lathrop Wells, Nevada occurred in the vicinity of an east-west-striking left-lateral strike-slip fault within the poorly understood Southern Nevada Seismic Zone that extends eastward across Nevada from the Death Valley area (NBMG, 1998).

The appropriate soil profile for Phase 2 is Type D based on information contained in the project geotechnical report (Terracon, 2007). Depth to bedrock is expected to vary across the site, so the soil profile is also assumed to be Type D for Phases 1 and 3. A design-level geotechnical report, as required by **GEO-1**, is needed to confirm the soil profile and provide appropriate seismic design parameters.

The estimated peak horizontal bedrock acceleration for the power plant is 0.084 times the acceleration of gravity (0.084g) based on a 10 percent probability of exceedence in 50 years, while the estimated peak horizontal bedrock acceleration is 0.152 times the acceleration of gravity (0.152g) based on a 2 percent probability of exceedence in 50 years (CBC, 2007).

The potential of surface rupture on a fault at the energy facility footprint is considered to be very low, since no faults are known to have ruptured the ground surface of the proposed energy facility location.

Liquefaction

Liquefaction is a condition where in a cohesionless soil may lose shear strength because of sudden increase in pore water pressure caused by an earthquake. Medium dense to very dense sandy and gravelly soils encountered in borings in Phase 2, coupled with a ground water table that is below 80 feet, would indicate no potential for liquefaction; however, no subsurface information was presented in the AFC for Phases 1 and 3 of the ISEGS site such that liquefaction potential for these areas of the project should be addressed in a project-specific geotechnical report as required by the CBC (2007) and proposed Condition of Certification **GEO-1**.

Dynamic Compaction

Dynamic compaction of soils results when relatively unconsolidated granular materials experience vibration associated with seismic events. The vibration causes a decrease in soil volume, as the soil grains tend to rearrange into a more dense state (an increase is soil density). The decrease in volume can result in settlement of overlying structural improvements. Medium dense to very dense granular soils encountered in borings in Phase 2 are not likely to be susceptible to dynamic compaction during an earthquake. It is not possible to assess the potential for dynamic compaction in Phases 1 and 3 without site-specific geotechnical exploration. The potential for and mitigation of the effects of dynamic compaction of site soils during an earthquake should be addressed in a project-specific geotechnical report as required by the CBC (2007) and proposed Condition of Certification **GEO-1**. Common mitigation methods include deep foundations (driven piles; drilled shafts) for severe conditions, geogrid reinforced fill pads for moderate severity and over-excavation and replacement for areas of minimal hazard.

Hydrocompaction

Hydrocompaction (also known as hydro-collapse) is generally limited to young soils that were deposited rapidly in a saturated state, most commonly by a flash flood. The soils dry quickly, leaving an unconsolidated, low density deposit with a high percentage of voids. Foundations built on these types of compressible materials can settle excessively, particularly when landscaping irrigation dissolves the weak cementation that is preventing the immediate collapse of the soil structure. Medium dense to very dense sands and gravels present in borings in Phase 2 are not generally susceptible to hydrocompaction. It is not possible to assess the potential for hydrocompaction in Phases 1 and 3 without site-specific geotechnical exploration. The potential for and mitigation of the effects of hydrocompaction of site soils should be addressed in a project-specific geotechnical report as required by the CBC (2007) and proposed Condition of Certification **GEO-1**. Typical mitigation measures would include over-excavation/replacement, mat foundations or deep foundations, depending on severity and foundation loads.

Subsidence

Consolidation settlement may occur when areas containing compressible soils are subjected to surcharge loads. Although consolidation testing was not performed on soil samples from borings in Phase 2, the coarse-grained soils encountered are not considered highly sensitive to surcharge loading. It is not possible to assess the potential for consolidation settlement in Phases 1 and 3 without site-specific geotechnical exploration. The potential for and mitigation of the effects of consolidation

settlement at the site should be addressed in a project-specific geotechnical report as required by the CBC (2007) and proposed Condition of Certification **GEO-1**. Mitigation is normally accomplished by over-excavation and replacement of the surifical materials, or by incorporating deep foundations for deeper deposits.

Regional ground subsidence is typically caused by petroleum or ground water withdrawal that increases the effective unit weight of the soil profile, which in turn increases the effective stress on the deeper soils. This results in consolidation or settlement of the soils. No known petroleum or gas fields are located within hundreds of miles of the project site (CDC, 2001) such that subsidence due to petroleum withdrawal is not anticipated. However, regional subsidence due to ground water withdrawal may be occurring, and possible evidence of subsidence has been found on the playa surface to the east of the project site in the form of sinkholes and possible degradation of a portion of the Interstate Highway 15 road base. Continued regional pumping of ground water, as well as ground water withdrawal anticipated as a part of this project, will likely result in additional subsidence that will need to be addressed in the design-level geotechnical report required by proposed Condition of Certification **GEO-1** and mitigated through facility design.

Expansive Soils

Soil expansion occurs when clay-rich soils with an affinity for water exist in-place at a moisture content below their plastic limit. The addition of moisture from irrigation, capillary tension, water line breaks, etc. causes the clay soils to collect water molecules in their structure, which in turn causes an increase in the overall volume of the soil. This increase in volume can correspond to movement of overlying structural improvements. Although expansion testing was not performed on soil samples from borings in Phase 2, the coarse-grained, generally non-plastic soils encountered are not considered to be expansive. It is not possible to assess the potential for expansive soils in Phases 1 and 3 without site-specific geotechnical exploration. The potential for and mitigation of the effects of expansive soils on the site should be addressed in a project-specific geotechnical report as required by the CBC (2007) and proposed Condition of Certification **GEO-1**. Mitigation is normally accomplished by over-excavation and replacement of the expansive soils. For deep-seated conditions, deep foundations are commonly used. Lime-treatment (chemical modification) is often used to mitigate expansive clays in pavement areas.

Landslides

Landslide potential at the ISEGS site is negligible since the proposed energy facility is located on a broad, gently east-sloping alluvial fan.

Flooding

The Federal Emergency Management Agency (FEMA) has identified the ISEGS site and gas pipeline route as lying in a Zone D, which is an area in which flood hazards are undetermined (FEMA, 1997).

Tsunamis and Seiches

The proposed ISEGS power plant site is not located near a large body of water that could be inundated by a tsunami or seiche, such as a lake or open ocean. As a result, there is no potential for a tsunami or seiche to affect the facility.

GEOLOGIC, MINERALOGIC, AND PALEONTOLOGIC RESOURCES

Energy Commission staff has reviewed applicable geologic maps and reports for this area (CDC, 2001; CDMG, 1961; CDMG, 1967; CDMG, 1987; CDMG, 1990; CDMG, 1998; CDMG, 1999; CH2M Hill, 2007; McCleod, 2007; Scott, 2007; Terracon, 2007; and UCMP, 2007). Staff did not identify any geological resources at the energy facility location or along the gas pipeline route. The material resource (borrow pit) is located approximately 7,500 feet east of Phase 1 (USGS, 1985). Numerous mines have produced a variety of precious metals, base metals, rare earth elements and industrial minerals from the Clark Mountain Range. Prospects and old workings are present at least 6,000 feet north and east of the solar plant site and proposed gas pipeline (CDMG, 1987; CDMG, 1998). The nearest known petroleum or gas fields are well over 100 miles to the west and southwest (CDC, 2001). Potentially extractable limestone deposits are indicated for the carbonate bedrock outcrop located just west of Phase 3, although similar rocks are more abundant and accessible in the Clark Mountain Range to the north (CDMG, 1987). Given the extent of the alluvial fan deposits on the east flank of the Clark Mountain Range, the potential for this site to have economically valuable sand and gravel or other mineral deposits that are unique to the region is considered to be low.

Regarding paleontological resources, Energy Commission staff has reviewed the paleontological resources assessment in Section 5.8 of the AFC (CH2M Hill, 2007) and the paleontologic records search attached in Appendix 5.8A (Scott, 2007). Staff has also reviewed the paleontological literature and records search conducted by the Natural History Museum of Los Angeles County (McCleod, 2007), as well as the online records database maintained by the University of California, Museum of Paleontology (UCMP, 2007). Based on a review of this information, no paleontological resources have been documented on the ISEGS plant site or at the proposed lay down area.

Young to intermediate (middle Pleistocene to Holocene) age alluvial fan sediments represent all soils that are mapped at the surface of the ISEGS site. These deposits are considered to have a low paleontological sensitivity due to the high energy environment of deposition and/or are too young to yield fossils of scientific significance. The possibility of impacting significant paleontological resources during grading and trenching is low (McLeod, 2007; Scott, 2007). Quaternary lacustrine sediments, however, are considered to have a high paleontological sensitivity because significant vertebrate and plant fossils have been recovered from deposits to the east around Ivanpah Lake and roughly 30 miles to the northwest near Tecopa, California.

The extent and distribution of lakebed sediments associated with Ivanpah Lake relative to the solar plant site is difficult to determine. No fine-grained or clay soils were encountered in the two 80-foot deep borings at Phase 2. The nearest mapped surface exposure of lacustrine sediments, which are latest Pleistocene to Holocene in age, is roughly 1.35 miles east of Phase 1 (USGS, 2006). The lowest elevation on the solar plant site is approximately 2,765 feet above MSL, which is nearly 130 feet above the

highest exposure of Quaternary lakebed sediments (approximate elevation 2,638 feet) and 163 feet above the floor of Ivanpah Lake (elevation 2,602 feet). The Nevada Bureau of Mines and Geology (NBMG, 1979) has determined that precipitation rates were not high enough to overcome rapid evaporation rates that persisted in the Southern Nevada group of pluvial lakes, of which Ivanpah Lake is a part, during the Wisconsinan pluvial period (late Pleistocene beginning 72,000 years ago). Establishment of perennial lakes of significant depths for significant periods of time was unlikely under these environmental conditions. The lack of ancient shoreline features in Ivanpah Valley supports this conclusion (NBMG, 1979). Therefore, the probability of impacting significant paleontological resources in Quaternary lakebed sediments is considered to be low since the lakebed deposits are present at approximate depths of 130 feet below the lowest existing ground surface at the site.

The Pre-Cambrian metamorphic rocks in the bedrock outcrops northeast of Phase 2 is considered to have negligible paleontological sensitivity. However, the carbonate bedrock west of Phase 3 is assigned a high paleontological sensitivity rating, based on the presence of Late Quaternary packrat middens that occupy solution cavities observed during the site investigation conducted for the AFC (CH2M Hill, 2007). Packrat middens are known to contain paleobotanical material as old as 40,000 years that is well preserved in the dry Mojave Desert climate (CH2M Hill, 2007; Spaulding, 1990). One midden contained remains of juniper or cedar twigs (*Juniperus* sp.), greasebush leaves (*Forsellesia nevadensis*), snowberry twigs and fruit (*Symphoricarpos longiflorus* sp.), and globemallow epidermis (*Sphaeralcea* sp.), most of which are indicative of present-day higher elevation woodland environments. The University of California Museum of Paleontology also possesses 8 specimens of a marine branched thrombolite (*Favosamaceria cooperi*) collected from a location somewhere in the Clark Mountain Range (UCMP, 2007). The thrombolite, which is a plant species similar to stromatolites, is restricted to the Late Cambrian *Saukia* Trilobite Zone (Shapiro and Awramik, 2006). Many sources agree that the carbonates adjacent to Phase 3 are probably Cambrian in age (CDMG, 1961; CH2M Hill, 2007). Although no fossils were observed in the limestone/dolomite outcrops, the potential to impact significant paleontological resources is still considered to be high in excavations that might encounter shallow carbonate bedrock, particularly on the west side of Phase 3. These excavations could uncover packrat middens buried by young alluvium or time-restricted late Cambrian thrombolites in the carbonate rock.

Several paleontological sites are documented in Quaternary lacustrine sediments within 45 miles of the ISEGS project area. The San Bernardino County Museum collection contains remains of tortoise (*Gopherus* sp.), kangaroo rat (*Dipodomys* sp.), wood rat (*Neotoma* sp.), and other small vertibrates from a locality between 1 and 2 miles southeast of the site on the west side of Ivanpah Lake (Scott, 2007). The site also yielded hackberry seed (*Celtus* sp.) and tufa deposited in the lake. The Natural History Museum of Los Angeles collection includes several paleontological remains from similar lakebed sediments near Tecopa, California, approximately 45 miles to the northwest. The fossil specimens consist of mastadon (*Mammut*), mammoth (*Mammuthus*), rhinoceros (*Rhinocerotidae*), horse (*Equus*), [rpngjprn antelope (*Antilocapridae*), and camels (*Camelops* and *Capricamelus gettyi*) (McCleod, 2007). *Capricamelus gettyi* is a species of short-legged camel named from specimens found at the Tecopa lakebed site.

Construction Impacts and Mitigation

The design-level geotechnical investigation required for the project by the CBC (2007) and proposed Condition of Certification **GEO-1** should provide standard engineering design recommendations for mitigation of potential geologic hazards that include strong ground shaking; liquefaction; settlement due to compressible soils, ground water withdrawal, hydrocompaction, or dynamic compaction; and the possible presence of expansive clay soils.

As noted above, no viable geologic or mineralogic resources are known to exist within 6,000 feet of the ISEGS construction site or gas pipeline, although numerous base metal, precious metal and industrial mineral occurrences are present within 20 miles. Significant paleontological resources, specifically pack rat middens, have been documented in nearby Paleozoic carbonate bedrock that is likely to be encountered during construction of the power plant and linear facilities. The nearest vertebrate fossil locality is 1 to 2 miles away and was recovered from Quaternary lacustrine sediments, although the potential to encounter similar sediments during grading and trenching is low. The young to intermediate age alluvium that underlies the majority of the site, as well as Pre-Cambrian metamorphic rocks located just northeast of Phase 2, are considered to be of low to negligible sensitivity with respect to containing significant paleontologic resources. Construction of the proposed project will include grading, foundation excavation, utility trenching and possibly drilled shafts. Staff considers the probability of encountering paleontological resources to be generally high on portions of the plant site, particularly the west side of Phase 3, based on the soils profile, SVP assessment criteria, and the near surface occurrence of the sensitive geologic units. The potential for encountering fossils hosted in Quaternary lake bed sediments, will increase with the depth of cut. Excavations for ancillary facilities and new pipelines and on-site excavations deeper than 5 feet may have a higher probability of encountering potentially high sensitivity materials, although sensitive materials could occur nearer the surface.

Proposed Conditions of Certification **PAL-1 to PAL-7** are designed to mitigate any paleontological resource impacts, as discussed above, to a less than significant level. Essentially, these conditions require a worker education program in conjunction with monitoring of earthwork activities by qualified professional paleontologists (paleontologic resource specialist; PRS). Earthwork is halted any time potential fossils are recognized by either the paleontologist or the worker. When properly implemented, the conditions of certification yield a net gain to the science of paleontology since fossils that would not other wise have been discovered can be collected, identified, studied, and properly curated. A paleontological resource specialist is retained, for the project by the applicant, to produce a monitoring and mitigation plan, conduct the worker training, and provide the on the monitoring. During the monitoring, the PRS can and often does petition the CEC for a change in the monitoring protocol. Most commonly, this is a request for lesser monitoring after sufficient monitoring has been performed to ascertain that there is little change of finding significant fossils. In other cases, the PRS can propose increased monitoring due to unexpected fossil discoveries or in response to repeated out-of-compliance incidents by the earthwork contractor.

Based upon the literature and archives search, field surveys, and compliance documentation for the ISEGS, the applicant has proposed monitoring and mitigation

measures to be followed during the construction of the ISEGS. Energy Commission staff believes that the facility can be designed and constructed to minimize the effect of geologic hazards at the site during project design life and that impacts to vertebrate fossils encountered during construction of the power plant and associated linears would be mitigated to a level of insignificance.

Operation Impacts and Mitigation

Operation of the proposed plant facilities should not have any adverse impact on geologic, mineralogic, or paleontologic resources. Potential geologic hazards, including strong ground shaking; liquefaction; settlement due to compressible soils, ground water withdrawal, hydrocompaction, or dynamic compaction, and the possible presence of expansive clay soils can be effectively mitigated through facility design (See proposed **Conditions of Certification GEO-1,** and **GEN-1, GEN-5**, and **CIVIL-1** in the **Facility Design** section) such that these potential hazards should not affect operation of the facility.

ALTERNATIVES

The ISEGS site and the Broadwell Lake and Siberia alternative sites are located in areas mapped as Pleistocene to Holocene Age alluvium. The Broadwell Lake alternative site, however, includes the Broadwell playa lakebed. The likelihood of encountering Quaternary lakebed sediments at the Broadwell Lake alternative site increases with decreasing distance from the playa lake. Geologic hazards associated with such fine-grained lakebed deposits include the potential for compressible soils and expansive clay soils. These materials may also require separation from overlying structural improvements. No known geologic resources exist at either site, and mineral resources in the surrounding hills are similar in both areas.

The severity and frequency of ground shaking associated with earthquake activity has the potential to be significantly higher at both alternative sites. The table below compares the seismic parameters of all sites. More stringent design criteria may be required for both alternative sites per a design-level geotechnical report and CBC (2007) standards. A fault that has had Pleistocene-age movement, the Ludlow Fault, passes directly through the center of both alternative site envelopes. The active Pisgah-Bullion faults, located 14.7 miles west and 13.9 miles southwest of the Broadwell Lake and Siberia alternative sites, respectively, produced the M7.3 Landers earthquake in 1992 and the M7.1 Hector Mine earthquake in 1999. Surface rupture is associated with both earthquakes, although neither occurred within either alternative site envelope. Pleistocene age cinder cones are within 20 miles of the sites.

GEOLOGY AND PALEONTOLOGY Table 4
Comparison of Seismic Parameters at the Alternative Sites and the ISEGS Site

Seismic Parameter	Broadwell Lake	Siberia	Ivanpah
Bedrock PGE (2% in 50 years)	0.42 g	0.44 g	0.15 g
Bedrock PGE (10% in 50 years)	0.21g	0.23 g	0.08g
Number of active faults within 100 miles	34	37	14
Seismic Parameter	**Broadwell Lake**	**Siberia**	**Ivanpah**
Closest active fault	14.7 miles	13.9 miles	51.3 miles
Max. PGE at site if max. earthquake on	0.21g	0.22 g	0.10g

active fault (Site Class D)			
Number of M5.0 earthquakes within 100 miles	83	94	23
Closest M5.0 earthquake	10.8 miles	6.5 miles	46.1 miles
Max. PGE site has experienced during historic earthquakes	0.19g	0.25 g	0.07g

No known geological resources exist on the Broadwell Lake site. Mineral resources in the surrounding hills are similar to those found in the Ivanpah area.

The paleontological sensitivity and potential to encounter significant paleontological resources in Quaternary alluvium at both alternative sites and the ISEGS site is similar. The paleontological sensitivity of lakebed deposits associated with Broadwell dry lake, however, may be high. The potential to impact these highly sensitive sediments increases with decreasing distance from the playa lake. The bedrock in the surrounding hills consists of Mesozoic granites, Miocene volcanics and Tertiary intrusives, all of which have a negligible paleontological sensitivity. The potential to impact sensitive bedrock at depth at both alternative sites is negligible, unlike the ISEGS site.

With the exception of stronger ground shaking, the alternative sites are subject to geologic hazards of the same magnitude as the ISEGS site. Strong ground shaking could be effectively mitigated through facility design. The potential to encounter geologic resources and significant paleontological resources at both alternative sites is similar to the ISEGS site. Therefore, the Conditions of Certification provided below would also be applicable to both alternative sites.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulations, Title 14, Section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR §1508.7).
There is the potential for substantial future development in the Ivanpah Valley area and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables which are located in the **Cumulative Scenario**section of this document.

- Cumulative Impacts Figure 1, Regional Renewable Applications
- Cumulative Impacts Figure 2, Regional Renewable Applications (Detail)
- Cumulative Impacts Figure 3, Ivanpah Valley Existing and Future/Foreseeable Projects
- Cumulative Impacts Table 1, Renewable Energy Projects in the CDD
- Cumulative Impacts Table 2, Existing Development in the Ivanpah Valley
- Cumulative Impacts Table 3, Future Foreseeable Projects in the Ivanpah Valley Area.

The analysis in this section first defines the geographic area over which cumulative impacts to geology or paleontology could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the ISEGS project along with the listed local and regional projects.

Geographic Extent

Cumulative impacts can occur if implementation of the ISEGS project could combine with those of other local or regional projects. Cumulative impacts would occur locally if ISEGS project impacts combined with impacts of projects located within the Ivanpah Valley. Cumulative impacts could also occur as a result of development of some of the many proposed solar and wind development projects that have been or are expected to be under consideration by the BLM and the Energy Commission in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

However, with the exception of geologic subsidence, cumulative impacts related to geology only have the potential to occur within the boundaries of the project site itself. This is because geologic materials occur at specific locales and are unaffected by activities not acting on them directly and any impacts of the ISEGS project would be site-specific. Therefore the geographic extent for cumulative impacts associated with geology is the project location itself (including all linear facilities).

The geographic extent for the analysis of local cumulative impacts associated with the ISEGS project includes the Ivanpah Valley Basin. Regional cumulative impacts for this analysis are impacts that would occur as a result of implementation of future solar and wind development projects that are currently proposed on over one million acres of the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona. Therefore, the geographic extent for the analysis of regional cumulative impacts is defined as the desert areas of southeastern California, southern Nevada, and western Arizona, as shown on **Cumulative Impacts Figure 1** (Regional Renewable Applications).

Cumulative Impact Analysis – Local Projects

Most cumulative impacts related to geology and paleontology only have the potential to occur within boundaries of the project site itself because geologic materials occur at specific locales and are unaffected by activities not acting on them directly. Most geologic impacts of the ISEGS project would be site-specific and would therefore not have the potential to combine with impacts from other projects.

However, subsidence due to groundwater withdrawal has been reported in the ISEGS project area, and evidence of subsidence is present at the site in the form of sinkholes. This subsidence is a result of pumping groundwater for uses including past and current residential and commercial development within the Ivanpah Valley. Because this existing subsidence is the result of multiple projects, it is considered to be an existing significant cumulative impact. Continued regional pumping of ground water from past and reasonably foreseeable projects in the Ivanpah Valley, including groundwater withdrawal anticipated as a part of the ISEGS project, will result in additional subsidence. Although mitigation has been proposed to reduce the ISEGS project's contribution to this impact, the withdrawal of any groundwater in the Ivanpah Valley would contribute to additional subsidence. Therefore, the contribution of the ISEGS

project to subsidence in the Ivanpah Valley, when combined with impacts of past, present, and reasonably foreseeable projects, would be cumulatively considerable.

As discussed above, no paleontological resources have been documented on the ISEGS project site or at the proposed lay down area. However, based on the geology of the site and because paleontologic resources have been discovered on sites within two miles of the ISEGS project, the probability of encountering paleontological resources is considered to be generally high on portions of the ISEGS site. For the same reasons, it is likely that paleontologic resources have been uncovered during construction of past projects in the Ivanpah Valley and will likely be uncovered during construction of at least some of the reasonably foreseeable projects . However, the ISEGS project includes conditions of certification that would require a worker education program in conjunction with monitoring of earthwork activities by qualified professional paleontologists, which would require that earthwork be halted any time potential fossils are recognized by either the paleontologist or the worker. When properly implemented, the conditions of certification yield a net gain to the science of paleontology since fossils that would not otherwise have been discovered can be collected, identified, studied, and properly curated. It is reasonable to assume that the reasonably foreseeable projects would include similar measures to identify, study, and curate any paleontologic resources discovered during construction. Therefore, implementation of past, present, and reasonably foreseeable projects would likely result in a net gain to the science of paleontology and would not combine to result in cumulatively considerable impacts to paleontologic resources.

No known viable mineral resources are located within 6,000 feet of the ISEGS site and gas pipeline route. The ISEGS site is mapped by the CDMG as MRZ-4, with areas where geologic information does not rule out either the presence or absence of industrial mineral resources. The project will not, however, reduce or prevent access to presently unknown mineral resources.

Cumulative Impact Analysis - Regional Projects

Because no impacts from geologic hazards, or to mineralogic or paleontological resources have been identified for the ISEGS project, there would be no potential for these impacts to combine on a regional level.

As discussed above, no paleontological resources have been documented on the ISEGS project site or at the proposed lay down area. However, based on the geology of the site and because paleontologic resources have been discovered on sites within two miles of the ISEGS project, the probability of encountering paleontological resources is considered to be generally high on portions of the ISEGS site. Additionally, because many other paleontologic resources occur throughout the Mojave Desert, it is likely that paleontologic resources will be uncovered during construction of at least some of the reasonably foreseeable renewable energy projects shown on Figure 1 and Figure 2. However, as discussed above for local cumulative impacts, the ISEGS project includes measures such as monitoring earthwork activities by qualified professional paleontologists, and identifying, studying, and properly curating any paleontologic resources discovered. It is reasonable to assume that the reasonably foreseeable projects shown on Figure 1 and Figure 2 would include similar measures to identify, study, and curate any paleontologic resources discovered during construction.

Therefore, implementation of the ISEGS project and the reasonably foreseeable renewable energy projects proposed within southeastern California, southern Nevada, and western Arizona, would likely result in a net gain to the science of paleontology. Therefore, impacts of the ISEGS project would not have the potential to combine with impacts of the reasonably foreseeable renewable energy projects proposed within southeastern California, southern Nevada, and western Arizona to result in cumulative impacts to known paleontological resources.

Cumulative Impact Conclusion

Impacts of the ISEGS project would combine with impacts of past, present, and reasonably foreseeable projects to result in a cumulatively considerable impact to subsidence within the Ivanpah Valley. Impacts of the ISEGS project would not have the potential to combine with impacts of past, present, and reasonably foreseeable projects to result in any other significant contributions to local or regional cumulative impacts.

Impacts of the ISEGS project would not have the potential to combine with impacts of past, present, and reasonably foreseeable projects to result in a significant contribution to either local or regional cumulative impacts to minerologic and/or paleontologic resources.

FACILITY CLOSURE

Facility closure activities are not expected to impact geologic or mineralogic resources since no such resources are known to exist at either the project location or along its proposed linears. In addition, the decommissioning and closure of the project should not negatively affect geologic, mineralogic, or paleontologic resources since the majority of the ground disturbed during plant decommissioning and closure would have been already disturbed, and mitigated as required, during construction and operation of the project.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff has not received any agency or public comments regarding geologic hazards, mineral resources, or paleontology at this time.

CONCLUSIONS

The applicant will be able to comply with applicable LORS, provided that the proposed conditions of certification are followed. The design and construction of the project should have no adverse impact with respect to geologic, mineralogic, and paleontologic resources. Staff proposes to ensure compliance with applicable LORS through the adoption of the proposed conditions of certification listed below.

PROPOSED CONDITIONS OF CERTIFICATION

The proposed ISEGS is situated in an active geologic environment. Strong ground shaking potential must be mitigated through foundation and structural design as required by the CBC (2007). Settlement due to compressible soils, ground water

withdrawal, hydrocompaction, or dynamic compaction, as well as potential impacts due to expansive soils and possible liquefaction, must be mitigated in accordance with a design-level geotechnical investigation as required by the CBC (2007), proposed Condition of Certification **GEO-1**, and proposed Conditions of Certification **GEN-1, GEN-5, and CIVIL-1** under **Facility Design**. Paleontological resources have been documented in the general area of the project and in sediments similar to those that are present near the site. The potential impacts to paleontological resources due to construction activities will be mitigated as required by proposed Conditions of Certification **PAL-1 to PAL-7**.

The proposed conditions of certification allow the Energy Commission Compliance Project Manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with applicable LORS for geologic hazards and geologic, mineralogic, and paleontologic resources.

GEO-1 The Soils Engineering Report required by Section 1802A of the 2007 CBC should specifically include laboratory test data, associated geotechnical engineering analyses, and a thorough discussion of the potential for liquefaction; settlement due to compressible soils, ground water withdrawal, hydrocompaction, or dynamic compaction; and the possible presence of expansive clay soils. The report should also include recommendations for ground improvement and/or foundation systems necessary to mitigate these potential geologic hazards, if present.

Verification: The project owner shall include in the application for a grading permit a copy of the Soils Engineering Report which addresses the potential for liquefaction; settlement due to compressible soils, ground water withdrawal, hydrocompaction, or dynamic compaction; and the possible presence of expansive clay soils, and a summary of how the results of the analyses were incorporated into the project foundation and grading plan design for review and comment by the Chief Building Official (CBO). A copy of the Soils Engineering Report, application for grading permit and any comments by the CBO are to be provided to the CPM at least 30 days prior to grading.

PAL-1 The project owner shall provide the Compliance Project Manager (CPM) with the resume and qualifications of its Paleontological Resource Specialist (PRS) for review and approval. If the approved PRS is replaced prior to completion of project mitigation and submittal of the Paleontological Resources Report, the project owner shall obtain CPM approval of the replacement PRS. The project owner shall keep resumes on file for qualified Paleontological Resource Monitors (PRMs). If a PRM is replaced, the resume of the replacement PRM shall also be provided to the CPM.

The PRS resume shall include the names and phone numbers of references. The resume shall also demonstrate to the satisfaction of the CPM the appropriate education and experience to accomplish the required paleontological resource tasks.

As determined by the CPM, the PRS shall meet the minimum qualifications for a vertebrate paleontologist as described in the Society of Vertebrate

Paleontology (SVP) guidelines of 1995. The experience of the PRS shall include the following:

1. Institutional affiliations, appropriate credentials, and college degree;

2. Ability to recognize and collect fossils in the field;

3. Local geological and biostratigraphic expertise;

4. Proficiency in identifying vertebrate and invertebrate fossils; and

5. At least three years of paleontological resource mitigation and field experience in California and at least one year of experience leading paleontological resource mitigation and field activities.

The project owner shall ensure that the PRS obtains qualified paleontological resource monitors to monitor as he or she deems necessary on the project. Paleontologic Resource Monitors (PRMs) shall have the equivalent of the following qualifications:

- BS or BA degree in geology or paleontology and one year of experience monitoring in California; or
- AS or AA in geology, paleontology, or biology and four years' experience monitoring in California; or
- Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in California.

Verification: (1) At least 60 days prior to the start of ground disturbance, the project owner shall submit a resume and statement of availability of its designated PRS for on-site work.

(2) At least 20 days prior to ground disturbance, the PRS or project owner shall provide a letter with resumes naming anticipated monitors for the project, stating that the identified monitors meet the minimum qualifications for paleontological resource monitoring required by the condition. If additional monitors are obtained during the project, the PRS shall provide additional letters and resumes to the CPM. The letter shall be provided to the CPM no later than one week prior to the monitor's beginning on-site duties.

(3) Prior to the termination or release of a PRS, the project owner shall submit the resume of the proposed new PRS to the CPM for review and approval.

PAL-2 The project owner shall provide to the PRS and the CPM, for approval, maps and drawings showing the footprint of the power plant, construction lay down areas, and all related facilities. Maps shall identify all areas of the project where ground disturbance is anticipated. If the PRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the PRS and CPM. The site grading plan and plan and profile drawings for the utility lines would be acceptable for this purpose. The plan drawings should show the location, depth, and extent of all ground disturbances and be

at a scale of 1 inch = 40 feet to 1 inch = 100 feet range. If the footprint of the project or its linear facilities change, the project owner shall provide maps and drawings reflecting those changes to the PRS and CPM.

If construction of the project proceeds in phases, maps and drawings may be submitted prior to the start of each phase. A letter identifying the proposed schedule of each project phase shall be provided to the PRS and CPM. Before work commences on affected phases, the project owner shall notify the PRS and CPM of any construction phase scheduling changes.

At a minimum, the project owner shall ensure that the PRS or PRM consults weekly with the project superintendent or construction field manager to confirm area(s) to be worked the following week, and until ground disturbance is completed.

Verification: (1) At least 30 days prior to the start of ground disturbance, the project owner shall provide the maps and drawings to the PRS and CPM.

(2) If there are changes to the footprint of the project, revised maps and drawings shall be provided to the PRS and CPM at least 15 days prior to the start of ground disturbance.

(3) If there are changes to the scheduling of the construction phases, the project owner shall submit a letter to the CPM within 5 days of identifying the changes.

PAL-3 The project owner shall ensure that the PRS prepares, and the project owner submits to the CPM for review and approval, a paleontological resources monitoring and mitigation plan (PRMMP) to identify general and specific measures to minimize potential impacts to significant paleontological resources. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for monitoring, collecting, and sampling activities, and may be modified with CPM approval. This document shall be used as the basis of discussion when on-site decisions or changes are proposed. Copies of the PRMMP shall reside with the PRS, each monitor, the project owner's on-site manager, and the CPM.

The PRMMP shall be developed in accordance with the guidelines of the Society of Vertebrate Paleontology (SVP, 1995) and shall include, but not be limited, to the following:

1. Assurance that the performance and sequence of project-related tasks, such as any literature searches, pre-construction surveys, worker environmental training, fieldwork, flagging or staking, construction monitoring, mapping and data recovery, fossil preparation and collection, identification and inventory, preparation of final reports, and transmittal of materials for curation will be performed according to PRMMP procedures;

2. Identification of the person(s) expected to assist with each of the tasks identified within the PRMMP and the conditions of certification;

3. A thorough discussion of the anticipated geologic units expected to be encountered, the location and depth of the units relative to the project when known, and the known sensitivity of those units based on the occurrence of fossils either in that unit or in correlative units;

4. An explanation of why, how, and how much sampling is expected to take place and in what units. Include descriptions of different sampling procedures that shall be used for fine-grained and coarse-grained units;

5. A discussion of the locations of where the monitoring of project construction activities is deemed necessary, and a proposed plan for monitoring and sampling;

6. A discussion of procedures to be followed in the event of a significant fossil discovery, halting construction, resuming construction, and how notifications will be performed;

7. A discussion of equipment and supplies necessary for collection of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits;

8. Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum, which meet the Society of Vertebrate Paleontology's standards and requirements for the curation of paleontological resources;

9. Identification of the institution that has agreed to receive data and fossil materials collected, requirements or specifications for materials delivered for curation, and how they will be met, and the name and phone number of the contact person at the institution; and

10. A copy of the paleontological conditions of certification.

Verification: At least 30 days prior to ground disturbance, the project owner shall provide a copy of the PRMMP to the CPM. The PRMMP shall include an affidavit of authorship by the PRS, and acceptance of the PRMMP by the project owner evidenced by a signature.

PAL-4 Prior to ground disturbance and for the duration of construction activities involving ground disturbance, the project owner and the PRS shall prepare and conduct weekly CPM-approved training for the following workers: project managers, construction supervisors, foremen and general workers involved with or who operate ground-disturbing equipment or tools. Workers shall not excavate in sensitive units prior to receiving CPM-approved worker training. Worker training shall consist of an initial in-person PRS training during the project kick-off, for those mentioned above. Following initial training, a CPM-approved video or in-person training may be used for new employees. The training program may be combined with other training programs prepared for cultural and biological resources, hazardous materials, or other areas of interest or concern. No ground disturbance shall occur prior to CPM approval

of the Worker Environmental Awareness Program (WEAP), unless specifically approved by the CPM.

The WEAP shall address the possibility of encountering paleontological resources in the field, the sensitivity and importance of these resources, and legal obligations to preserve and protect those resources.

The training shall include:

1. A discussion of applicable laws and penalties under the law;

2. Good quality photographs or physical examples of vertebrate fossils for project sites containing units of high paleontologic sensitivity;

3. Information that the PRS or PRM has the authority to halt or redirect construction in the event of a discovery or unanticipated impact to a paleontological resource;

4. Instruction that employees are to halt or redirect work in the vicinity of a find and to contact their supervisor and the PRS or PRM;

5. An informational brochure that identifies reporting procedures in the event of a discovery;

6. A WEAP certification of completion form signed by each worker indicating that he/she has received the training; and

7. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

Verification: (1) At least 30 days prior to ground disturbance, the project owner shall submit the proposed WEAP, including the brochure, with the set of reporting procedures for workers to follow.

(2) At least 30 days prior to ground disturbance, the project owner shall submit the script and final video to the CPM for approval if the project owner is planning to use a video for interim training.

(3) If the owner requests an alternate paleontological trainer, the resume and qualifications of the trainer shall be submitted to the CPM for review and approval prior to installation of an alternate trainer. Alternate trainers shall not conduct training prior to CPM authorization.

(4) In the monthly compliance report (MCR, the project owner shall provide copies of the WEAP certification of completion forms with the names of those trained and the trainer or type of training (in-person or video) offered that month. The MCR shall also include a running total of all persons who have completed the training to date.

PAL-5 The project owner shall ensure that the PRS and PRM(s) monitor consistent with the PRMMP all construction-related grading, excavation, trenching, and augering in areas where potential fossil-bearing materials have been

identified, both at the site and along any constructed linear facilities associated with the project. In the event that the PRS determines full-time monitoring is not necessary in locations that were identified as potentially fossil-bearing in the PRMMP, the project owner shall notify and seek the concurrence of the CPM.

The project owner shall ensure that the PRS and PRM(s) have the authority to halt or redirect construction if paleontological resources are encountered. The project owner shall ensure that there is no interference with monitoring activities unless directed by the PRS. Monitoring activities shall be conducted as follows:

1. Any change of monitoring from the accepted schedule in the PRMMP shall be proposed in a letter or email from the PRS and the project owner to the CPM prior to the change in monitoring and will be included in the monthly compliance report. The letter or email shall include the justification for the change in monitoring and be submitted to the CPM for review and approval.

2. The project owner shall ensure that the PRM(s) keep a daily monitoring log of paleontological resource activities. The PRS may informally discuss paleontological resource monitoring and mitigation activities with the CPM at any time.

3. The project owner shall ensure that the PRS notifies the CPM within 24 hours of the occurrence of any incidents of non-compliance with any paleontological resources conditions of certification. The PRS shall recommend corrective action to resolve the issues or achieve compliance with the conditions of certification.

4. For any significant paleontological resources encountered, either the project owner or the PRS shall notify the CPM within 24 hours, or Monday morning in the case of a weekend event where construction has been halted because of a paleontological find.

The project owner shall ensure that the PRS prepares a summary of monitoring and other paleontological activities placed in the monthly compliance reports. The summary will include the name(s) of PRS or PRM(s) active during the month, general descriptions of training and monitored construction activities, and general locations of excavations, grading, and other activities. A section of the report shall include the geologic units or subunits encountered, descriptions of samplings within each unit, and a list of identified fossils. A final section of the report will address any issues or concerns about the project relating to paleontologic monitoring, including any incidents of non-compliance or any changes to the monitoring plan that have been approved by the CPM. If no monitoring took place during the month, the report shall include an explanation in the summary as to why monitoring was not conducted.

Verification: The project owner shall ensure that the PRS submits the summary of monitoring and paleontological activities in the MCR. When feasible, the CPM shall be

notified 10 days in advance of any proposed changes in monitoring different from the plan identified in the PRMMP. If there is any unforeseen change in monitoring, the notice shall be given as soon as possible prior to implementation of the change.

PAL-6 The project owner, through the designated PRS, shall ensure that all components of the PRMMP are adequately performed including collection of fossil materials, preparation of fossil materials for analysis, analysis of fossils, identification and inventory of fossils, the preparation of fossils for curation, and the delivery for curation of all significant paleontological resource materials encountered and collected during project construction.

Verification: The project owner shall maintain in his/her compliance file copies of signed contracts or agreements with the designated PRS and other qualified research specialists. The project owner shall maintain these files for a period of three years after project completion and approval of the CPM-approved paleontological resource report (see **PAL-7**). The project owner shall be responsible for paying any curation fees charged by the museum for fossils collected and curated as a result of paleontological mitigation. A copy of the letter of transmittal submitting the fossils to the curating institution shall be provided to the CPM.

PAL-7 The project owner shall ensure preparation of a Paleontological Resources Report (PRR) by the designated PRS. The PRR shall be prepared following completion of the ground-disturbing activities. The PRR shall include an analysis of the collected fossil materials and related information, and submit it to the CPM for review and approval.

The report shall include, but is not limited to, a description and inventory of recovered fossil materials; a map showing the location of paleontological resources encountered; determinations of sensitivity and significance; and a statement by the PRS that project impacts to paleontological resources have been mitigated below the level of significance.

Verification: Within 90 days after completion of ground-disturbing activities, including landscaping, the project owner shall submit the PRR under confidential cover to the CPM.

Certification of Completion
Worker Environmental Awareness Program
ISEGS (07-AFC-5)

This is to certify these individuals have completed a mandatory California Energy Commission-approved Worker Environmental Awareness Program (WEAP). The WEAP includes pertinent information on cultural, paleontological, and biological resources for all personnel (that is, construction supervisors, crews, and plant operators) working on site or at related facilities. By signing below, the participant indicates that he/she understands and shall abide by the guidelines set forth in the program materials. Include this completed form in the Monthly Compliance Report.

No.	Employee Name	Title/Company	Signature
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Cultural Trainer: _____ Signature:_____ Date: ___/___/____

PaleoTrainer: _____ Signature:_____ Date: ___/___/____

Biological Trainer: _____Signature:_____Date:___/___/____

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POWER PLANT EFFICIENCY

Shahab Khoshmashrab and Steve Baker

SUMMARY OF CONCLUSIONS

The Ivanpah Solar Electric Generating System (Ivanpah SEGS), if constructed and operated as proposed, would generate 400 megawatts (MW) (maximum net output) of electricity. This project would consist of two 100 MW plants (Ivanpah 1 and Ivanpah 2) and one 200 MW plant (Ivanpah 3), employing advanced solar power and modern steam turbine technologies. The Ivanpah SEGS would use solar energy to generate up to 95 percent of its capacity, and natural gas to generate up to five percent of its capacity.

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

The Ivanpah SEGS, if constructed and operated as proposed, would occupy over nine acres per MW of power output, a figure double that of some other solar power technologies. Employing a less land-intensive solar technology, such as the AUSRA Compact Linear Fresnel Reflector technology or linear parabolic trough technology, would reduce these impacts by approximately 50 percent. It has not been determined how great a difference in land use would constitute a significant impact.

INTRODUCTION

FOSSIL FUEL USE EFFICIENCY

One of the responsibilities of the California Energy Commission (Energy Commission) is to make findings on whether the energy use by a power plant, including the proposed Ivanpah SEGS power plant, would result in significant adverse impacts on the environment, as defined in the California Environmental Quality Act (CEQA). If the Energy Commission finds that the Ivanpah SEGS' energy consumption creates a significant adverse impact, it must further determine if feasible mitigation measures could eliminate or minimize that impact. In this analysis, staff addresses the inefficient and unnecessary consumption of energy.

In order to support the Energy Commission's findings, this analysis will:

- examine whether the facility would likely present any adverse impacts upon energy resources;
- examine whether these adverse impacts are significant; and if so,
- examine whether feasible mitigation measures or alternatives could eliminate those adverse impacts or reduce them to a level of insignificance.

SOLAR LAND USE EFFICIENCY

Solar thermal power plants typically consume much less fossil fuel (usually in the form of natural gas) than other types of thermal power plants. Therefore, common measures of power plant efficiency such as those described above are less meaningful. So far as Energy Commission staff can determine, methods for determining the efficiency of a solar power plant have yet to be standardized; research has uncovered no meaningful attempt to quantify efficiency. The solar power industry appears to have begun discussing the issue, but a consensus is forthcoming (CEC 2008n). In the absence of accepted standards, staff proposes the following approach.

Solar thermal power plants convert the sun's energy into electricity in three basic steps:

- Mirrors and/or collectors capture the sun's rays.
- This solar energy is converted into heat.
- This heat is converted into electricity, typically in a heat engine such as a steam turbine generator or a Stirling Engine-powered generator.

The effectiveness of each of these steps depends on the specific technology employed; the product of these three steps determines the power plant's overall solar efficiency. The greater the project's solar efficiency, the less land the plant must occupy to produce a given power output.

The most significant environmental impacts caused by solar power plants result from occupying large expanses of land. Even in a desert environment, disturbing and shading hundreds or thousands of acres of land can impact biological, cultural and paleontological resources, and can affect drainage, runoff and percolation of rainfall. The extent of these impacts is likely in direct proportion to the number of acres affected. For this reason, staff will evaluate the land use efficiency of proposed solar power plant projects. This efficiency will be expressed in terms of power produced, or MW per acre, and in terms of energy produced, or MW-hours per acre-year. Specifically:

- Power-based solar land use efficiency is calculated by dividing the maximum net power output in MW by the total number of acres impacted by the power plant, including roads and electrical switchyards and substations.
- Energy-based solar land use efficiency is calculated by dividing the annual net electrical energy production in MW-hours per year by the total number of acres impacted by the power plant. Since different solar technologies consume differing quantities of natural gas for morning warm-up, cloudy weather output leveling and heat transfer fluid freeze protection (and some consume no gas at all), this effect will be accounted for. Specifically, gas consumption will be backed out by reducing the plant's net energy output by the amount of energy that could have been produced by consuming the project's annual gas consumption in a modern combined cycle power plant. (See **EFFICIENCY Appendix A**, immediately following.) This reduced energy output will then be divided by acres impacted.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

No federal, state, or local/county laws, ordinances, regulations, and standards (LORS) apply to the efficiency of this project.

SETTING

The applicant proposes to build and operate the Ivanpah SEGS, a solar thermal power plant facility, comprised of Ivanpah 1, Ivanpah 2, and Ivanpah 3, producing a total of 400 MW (maximum net output), and employing BrightSource's Distributed Power Tower (DPT) advanced solar power technology (BSE 2007a, AFC §§1.1, 1.2, 2.1). Ivanpah 1 and Ivanpah 2 would each consist of a heliostat solar field, a solar receiver boiler, a reheat steam turbine generator, an air-cooled condenser, and associated equipment. Ivanpah 3 would consist of a heliostat solar field, four solar receiver boilers, a reheat steam turbine generator, a solar reheater boiler, an air-cooled condenser, and associated equipment (BSE 2007a, AFC §§1.2, 2.2.4).

The project's power cycle would be based on a steam cycle (also known as the Rankine cycle) with three pressure stages. Each plant would include a small package natural gas-fired start-up boiler to provide heat for plant start-up and during temporary cloud cover. The heliostat mirrors are arranged around each solar receiver boiler. Each mirror tracks the sun throughout the day and reflects the solar energy to the receiver boiler. Steam is generated in the boilers and is expanded through the steam turbine to generate electricity. No intermediate fluid is used.

The solar field and power generation equipment are started each morning after sunrise once solar radiation builds up, and are shut down in the evening when solar radiation drops below the level required for keeping the steam turbines online. As explained above, natural gas-fired boilers would be used to bring the system up to operating temperature in the morning and periodically to keep system temperatures up when clouds briefly block sunlight. Natural gas would be delivered to the Ivanpah SEGS via a new 5.3-mile-long, 4- to 6-inch diameter natural gas distribution pipeline that would provide natural gas from the Kern River Gas Transmission (KRGT) line to the project (BSE 2007a, AFC §§1.2, 2.1, 2.2.6).

ASSESSMENT OF IMPACTS — FOSSIL FUEL ENERGY USE

METHOD AND THRESHOLD FOR DETERMINING THE SIGNIFICANCE OF FOSSIL FUEL ENERGY RESOURCES

CEQA guidelines state that the environmental analysis "…shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy" (Title 14 CCR §15126.4[a][1]). Appendix F of the guidelines further suggests consideration of such factors as the project's energy requirements and energy use efficiency; its effects on local and regional energy supplies and energy resources; its requirements for additional energy supply capacity; its compliance with existing energy standards; and any alternatives that

could reduce the wasteful, inefficient, and unnecessary consumption of energy (Title 14, CCR §15000 et seq., Appendix F).

The inefficient and unnecessary consumption of energy, in the form of non-renewable fuels such as natural gas and oil, constitutes an adverse environmental impact. An adverse impact can be considered significant if it results in:

- adverse effects on local and regional energy supplies and energy resources;
- a requirement for additional energy supply capacity;
- noncompliance with existing energy standards; or
- the wasteful, inefficient, and unnecessary consumption of fuel or energy.

PROJECT ENERGY REQUIREMENTS AND ENERGY USE EFFICIENCY

The Ivanpah SEGS would burn natural gas at a nominal rate of approximately 833 million British thermal units (MMBtu) per hour, LHV, during maximum load operation, for a total annual consumption of 432,432 MMBtu LHV (BSE 2007a, AFC Tables 5.1-13, 5.1-15). Compared to a typical natural gas-fired power plant of equal capacity, this rate is very low. Further, average daily operation of the natural gas boilers would be limited to one hour. Therefore, staff considers the impact of the project's fuel consumption on energy supplies and energy efficiency to be less than significant.

ADVERSE EFFECTS ON ENERGY SUPPLIES AND RESOURCES

The applicant has described its sources of natural gas for the project (BSE 2007a, AFC §§1.2, 2.1, 2.2.6). Natural gas would be delivered to the Ivanpah SEGS via a new 5.3-mile-long, 4- to 6-inch diameter natural gas distribution pipeline that would provide natural gas from the Kern River Gas Transmission (KRGT) line to the project site. Natural gas would be used to generate only up to five percent of the project's capacity. The KRGT system is capable of delivering the gas that the Ivanpah SEGS would require; this natural gas supply constitutes a reliable source of natural gas for this project. Therefore, it appears highly unlikely that the project would create a substantial increase in natural gas demand.

ADDITIONAL ENERGY SUPPLY REQUIREMENTS

Natural gas fuel would be supplied to the project by the KRGT via a new pipeline connection (BSE 2007a, AFC §§1.2, 2.1, 2.2.6)). There appears to be little likelihood that the Ivanpah SEGS would require additional supply.

COMPLIANCE WITH ENERGY STANDARDS

No standards apply to the efficiency of the Ivanpah SEGS or other non-cogeneration projects.

ALTERNATIVES TO REDUCE WASTEFUL, INEFFICIENT, AND UNNECESSARY ENERGY CONSUMPTION

The Ivanpah SEGS could create significant adverse impacts on energy resources if alternatives reduced the project's fuel use. The evaluation of alternatives to the project (that could reduce wasteful, inefficient, or unnecessary energy consumption) requires

the examination of the project's energy consumption. Even though staff does not believe the project's fuel consumption would be significant, staff evaluates alternatives that could reduce or eliminate the use of natural gas.

Efficiency of Alternatives to the Project

The Ivanpah SEGS' objectives include the generation of electricity using BrightSource's DPT solar power technology (BSE, 2007a, AFC §6.6).

Alternative Generating Technologies

Alternative generating technologies for the Ivanpah SEGS are considered in the AFC (BSE 2007a, AFC §6.6). For purposes of this analysis, natural gas, oil, coal, nuclear, biomass, hydroelectric, and wind technologies are all considered. Given the project objectives, location, air pollution control requirements, and the commercial availability of the above technologies, staff agrees with the applicant that the selected solar thermal technology is a feasible selection.

Alternative Heat Rejection System

The applicant proposes to employ a dry cooling system (air-cooled condensers) as the means for rejecting power cycle heat from the steam turbines (BSE 2007a, AFC §§1.2, 2.1). An alternative heat rejection system would utilize evaporative cooling towers.

The local climate in the project area is characterized by high temperatures and low relative humidity (low wet-bulb temperature). In low temperatures and high relative humidity (low dry-bulb temperature), the air-cooled condenser performs relatively efficiently compared to the evaporative tower. However, at the project area (low wet-bulb temperature and high dry-bulb temperature) the air-cooled condenser performance is relatively poor compared to that of an evaporative cooling tower. Furthermore, the performance of the heat rejection system affects the performance of the steam turbine, impacting turbine efficiency. However, to conserve water in the project site's desert environment, the applicant proposes to employ dry cooling. Even though evaporative cooling can offer a higher efficiency rating for this project, staff believes the applicant's selection of dry cooling is a reasonable tradeoff as it would prevent potentially significant environmental impacts that could result from consumption of the large quantities of water required by wet cooling.

Staff, therefore, believes that the Ivanpah SEGS would not constitute a significant adverse impact on fossil fuel energy resources compared to feasible alternatives.

ASSESSMENT OF IMPACTS — SOLAR LAND USE

The solar insolation falling on the earth's surface can be regarded as an energy resource. Since this energy is inexhaustible, its consumption does not present the concerns inherent in fossil fuel consumption. What is of concern, however, is the extent of land area required to capture this solar energy and convert it to electricity. Setting aside hundreds or thousands of acres of land for solar power generation removes it from alternative uses. Constructing buildings, solar collector foundations and roads can disturb and destroy cultural and paleontological resources. Shading large tracts of land can destroy its use as habitat for flora and fauna. Finally, the earthwork involved in

leveling large areas for optimum solar energy collection can disturb the drainage, runoff and percolation of rainfall.

As discussed above, Energy Commission staff is unaware of any accepted standard for evaluating the efficiency of a solar power plant such as Ivanpah SEGS. Accordingly, staff proposes to tabulate the land use efficiency of the project (described above) and compare it to similar measures for other solar power plant projects that have passed through, or are passing through, the Energy Commission's siting process.

METHOD AND THRESHOLD FOR DETERMINING THE SIGNIFICANCE OF SOLAR LAND USE ENERGY RESOURCES

Energy Commission staff proposes to compare the land use of a solar power plant project to that of other solar projects in the Energy Commission's siting process. It has not been determined how great a difference in land use would constitute a significant difference; staff proposes to compare the four solar projects currently in the process.

As this is written, there are currently four solar power plant projects in the Energy Commission siting process. These projects' power and energy output, and the extent of the land occupied by them, are summarized in **EFFICIENCY Table 1**, below. The solar land use efficiency for a typical natural gas-fired combined cycle power plant is shown only for comparison.

ADVERSE EFFECTS ON LAND USE

While the Energy Commission customarily requires full mitigation for such impacts, such mitigation is generally regarded as less effective in protecting resources than avoiding the impact entirely. A solar power project that occupies twice as much land as another project holds the potential to produce twice the environmental impacts.

PROJECT LAND USE

The Ivanpah SEGS would produce power at the rate of 400 MW net, and would generate energy at the rate of 960,000 MW-hours net per year, while occupying 3,744 acres (CH2ML2008g, pp. 2-3). It would consume 432,432 MMBtu LHV of natural gas annually. Staff calculates power-based land use efficiency thus:

Power-based efficiency: 400 MW ÷ 3,744 acres = **0.11 MW/acre** or **9.4 acres/MW**

Staff calculates energy-based land use efficiency thus:

Energy-based efficiency: 960,000 MWh/year ÷ 3,744 acres = **256 MWh/acre-year**

Natural gas proxy: 432,432 MMBtu/year ÷ 3,413 Btu/kWh = 126,701 MWh/year
126,701 MWh/year x 53.7%[1] = 68,039 MWh/year
960,000 MWh/year – 68,039 MWh/year = 891,961 MWh/year

Energy-based efficiency (net of natural gas use):

891,961 MWh/year ÷ 3,744 acres = **238 MWh/acre-year**

[1] See EFFICIENCY Appendix A, immediately following

EFFICIENCY Table 1 — Solar Land Use Efficiency

Project	Generating Capacity (MW net)	Annual Energy Production (MWh net)	Annual Fuel Consumption (MMBtu LHV)	Footprint (Acres)	Land Use Efficiency (Power-Based) (MW/acre)	Land Use Efficiency (Energy – Based) (MWh/acre-year)	
						Total	Solar Only[1]
Ivanpah SEGS (07-AFC-5)	400	960,000	432,432	3,744	0.11	256	238
Carrizo Energy (07-AFC-8)	177	375,000	0	640	0.28	586	586
Beacon Solar (08-AFC-2)	250	600,000	32,432	1,240	0.20	484	480
SES Solar Two (08-AFC-5)	750	1,620,000	0	6,500	0.12	249	249
Avenal Energy (08-AFC-1)[2]	600	3,023,388	24,792,786	25	24.0	120,936	N/A

[1] Net energy output is reduced by natural gas-fired combined cycle proxy energy output; see **EFFICIENCY Appendix A**.

[2] Example natural gas-fired combined cycle plant.

As seen in **EFFICIENCY Table 1**, Ivanpah SEGS, employing solar power tower technology, is roughly half as efficient in use of land as the Carrizo Energy Solar Farm project, which employs the AUSRA Compact Linear Fresnel Reflector technology, and the Beacon Solar Energy project, which employs linear parabolic trough technology. The Stirling Energy Systems Solar Two project matches Ivanpah SEGS in solar land use efficiency.

ALTERNATIVES TO REDUCE SOLAR LAND USE IMPACTS

Building and operating a natural gas-fired combined cycle power plant would yield much greater land use efficiency than any solar power plant; see **EFFICIENCY Table 1**. However, this would not achieve the basic project objective, to generate electricity from the renewable energy of the sun.

Building a solar power plant employing a different technology, such as the AUSRA Compact Linear Fresnel Reflector technology of the Carrizo project or the linear parabolic trough technology of the Beacon project, would double the solar land use efficiency of the Ivanpah SEGS. This would likely halve the land use-based environmental impacts brought about by the project.

CUMULATIVE IMPACTS

There are no nearby power plant projects that hold the potential for cumulative energy consumption impacts or solar land use impacts when aggregated with the project. Staff knows of no other projects that could result in such cumulative impacts.

Staff believes that the construction and operation of the project would not create indirect impacts (in the form of additional fuel consumption) that would not have otherwise occurred without this project. Because the Ivanpah SEGS would consume significantly less natural gas than a typical natural gas-fired power plant, it should compete favorably in the California power market and replace fossil fuel burning power plants. The project would therefore not impact the cumulative amount of natural gas consumed for power generation.

Employing a less land use-intensive solar collector technology, such as the AUSRA Compact Linear Fresnel Reflector technology or linear parabolic trough collector technology, would cut in half the Ivanpah SEGS project's land use-based environmental impacts.

NOTEWORTHY PUBLIC BENEFITS

The Ivanpah SEGS would employ an advanced solar thermal technology. Solar energy is renewable and unlimited. The project would have less than significant adverse impact on nonrenewable energy resources (natural gas). Consequently, the project would help in reducing California's dependence on fossil fuel-fired power plants.

CONCLUSIONS AND RECOMMENDATIONS

FOSSIL FUEL ENERGY USE

The Ivanpah SEGS, if constructed and operated as proposed, would use solar energy to generate up to 95 percent of its capacity, and natural gas to generate up to five percent of its capacity. The project would decrease reliance on fossil fuel, and would increase reliance on renewable energy resources. It would not create significant adverse effects on energy supplies or resources, would not require additional sources of energy supply, and would not consume energy in a wasteful or inefficient manner. No energy standards apply to this project. Staff therefore concludes that this project would present no significant adverse impacts on energy resources.

No cumulative impacts on energy resources are likely. Facility closure would not likely present significant impacts on electric system efficiency.

LAND USE

The Ivanpah SEGS, if constructed and operated as proposed, would occupy over nine acres per MW of power output, a figure double that of some other solar power technologies. Employing a less land-intensive solar technology, such as the AUSRA Compact Linear Fresnel Reflector technology or linear parabolic trough technology, would reduce these impacts by approximately 50 percent. It has not been determined how great a difference in land use efficiency would constitute a significant impact.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed.

REFERENCES

BSE 2007a – Bright Source Energy/ Solar Partners I, LLC/ J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Submitted to CEC/Docket Unit on 8/31/2007.

CH2ML2008g – CH2ML HILL/ J. Carrier (tn: 46239). Data Responses Set 1D. Submitted to CEC / Docket Unit on 5/9/2008.

CEC2008n – CEC / S. Baker (tn: 47155). Record of Conversation Re: Efficiency Measurement of Solar Power Plants. Dated on 2/22/2008. Submitted to CEC / Docket Unit on 7/21/2008.

EFFICIENCY Appendix A

Solar Power Plant Efficiency Calculation
Gas-Fired Proxy

In calculating the efficiency of a solar power plant, it is desired to subtract the effect of natural gas burned for morning startup, cloudy weather augmentation and Therminol freeze protection. As a proxy, we will use an average efficiency based on several recent baseload combined cycle power plant projects in the Energy Commission siting process. Baseload combined cycles were chosen because their intended dispatch most nearly mirrors the intended dispatch of solar plants, that is, operate at full load in a position high on the dispatch authority's loading order.

The most recent such projects are:

Colusa Generating Station (06-AFC-9)
- Nominal 660 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 666.3 MW @ 52.5% LHV
- Efficiency with duct burners off: 519.4 MW @ 55.3% LHV
- Efficiency (average of these two): **53.9% LHV**

San Gabriel Generating Station (07-AFC-2)
- Nominal 696 MW 2-on-1 Combined Cycle with Siemens 5000F CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 695.8 MW @ 52.1% LHV
- Efficiency with duct burners off: 556.9 MW @ 55.1% LHV
- Efficiency (average of these two): **53.6% LHV**

KRCD Community Power Plant (07-AFC-7)
- Nominal 565 MW 2-on-1 Combined Cycle with GE or Siemens F-class CGTs
- Evaporative cooling, evaporative or fogging inlet air cooling
- Efficiency with GE CGTs: 497 MW @ 54.6% LHV
- Efficiency with Siemens CGTs: 565 MW @ 56.1% LHV
- Efficiency (average of these two): **55.4% LHV**

Avenal Energy (08-AFC-1)
- Nominal 600 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, inlet air chillers
- Efficiency with duct burners on: 600.0 MW @ 50.5% LHV
- Efficiency with duct burners off: 506.5 MW @ 53.4% LHV
- Efficiency (average of these two): **52.0% LHV**

Average of these four power plants: **53.7% LHV**

POWER PLANT RELIABILITY

Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

The applicant predicts an equivalent availability factor of 92 to 98 percent, which staff believes is achievable. (The availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability.) Based on a review of the proposal, staff concludes that the Ivanpah Solar Electric Generating System (ISEGS) would be built and would operate in a manner consistent with industry norms for reliable operation. This should provide an adequate level of reliability. No conditions of certification are proposed.

INTRODUCTION

In this analysis, California Energy Commission (Energy Commission) staff addresses the reliability issues of the ISEGS project to determine if the power plant is likely to be built in accordance with typical industry norms for reliable power generation. Staff uses this norm as a benchmark because it ensures that the resulting project would not be likely to degrade the overall reliability of the electric system it serves (see the “Setting” subsection, below).

The scope of this power plant reliability analysis covers:

- equipment availability;
- plant maintainability;
- fuel and water availability; and
- power plant reliability in relation to natural hazards.

Staff examined the project design criteria to determine if the project is likely to be built in accordance with typical industry norms for reliable power generation. While the applicant has predicted an equivalent availability factor of 92 to 98 percent for the ISEGS (see below), staff uses typical industry norms as the benchmark, rather than the applicant’s projection, to evaluate the project’s reliability.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

No federal, state, or local/county laws, ordinances, regulations, or standards (LORS) apply to the reliability of this project.

SETTING

In the restructured competitive electric power industry, the responsibility for maintaining system reliability falls largely to the state’s control area operators, such as the California Independent System Operator (California ISO), that purchase, dispatch, and sell electric power throughout the state. Determining how the California ISO and other control area

operators would ensure system reliability has been an ongoing effort. Protocols have been developed and put in place that allow sufficient reliability to be maintained under the competitive market system. “Must-run” power purchase agreements and “participating generator” agreements are two mechanisms that have been employed to ensure an adequate supply of reliable power.

In September 2005, California AB 380 (Núñez, Chapter 367, Statutes of 2005) became law. This modification to the Public Utilities Code requires the California Public Utilities Commission to consult with the California ISO to establish resource adequacy requirements for all load-serving entities (basically, publicly and privately owned utility companies). These requirements include maintaining a minimum reserve margin (extra generating capacity to serve in times of equipment failure or unexpected demand) and maintaining sufficient local generating resources to satisfy the load-serving entity’s peak demand and operating reserve requirements.

In order to fulfill this mandate, the California ISO has begun to establish specific criteria for each load-serving entity under its jurisdiction. These criteria guide each load-serving entity in deciding how much generating capacity and ancillary services to build or purchase, after which the load-serving entity issues power purchase agreements to satisfy these needs. According to the AFC, the ISEGS is currently in negotiation with a major California utility company (company’s name not disclosed in the AFC) to secure a power purchase agreement.

The California ISO’s mechanisms to ensure adequate power plant reliability apparently were devised under the assumption that the individual power plants that compete to sell power into the system will each exhibit a level of reliability similar to that of power plants of past decades. However, there has been valid cause to believe that, under free market competition, financial pressures on power plant owners to minimize capital outlays and maintenance expenditures may act to reduce the reliability of many power plants, both existing and newly constructed (McGraw-Hill 1994). It is possible that, if significant numbers of power plants were to exhibit individual reliability sufficiently lower than this historical level, the assumptions used by California ISO to ensure system reliability would prove invalid, with potentially disappointing results. Accordingly, staff has recommended that power plant owners continue to build and operate their projects to the level of reliability to which all in the industry are accustomed.

As part of its plan to provide needed reliability, the applicant proposes to operate the 400-megawatt (MW) (net power output) ISEGS, a solar thermal power plant facility, comprised of two 100-MW plants (Ivanpah 1 and Ivanpah 2) and one 200-MW plant (Ivanpah 3), employing advanced solar power technology. This project, using renewable solar energy, would provide dependable power to the grid, generally during the hours of peak power consumption by the interconnecting utility(s) (BSE 2007a, AFC §§1.1, 1.2, 2.1, 2.2). This project would help serve the need for renewable energy in California, as 95 percent of the generated electricity would be produced by a reliable source of energy that is available during the hot summer afternoons, when power is needed most. Small natural gas-fired boilers would be used to bring the system up to operating temperature in the morning and periodically to keep system temperatures up when clouds briefly block the sunlight. These boilers are expected to be in use only during 5 percent of the time.

The project is expected to achieve an equivalent availability factor in the range of 92 to 98 percent (BSE 2007a, AFC §2.3.2.1). The project is anticipated to normally operate at high average annual capacity factors during periods of sunlight (BSE 2007a, AFC §2.3.21).

ASSESSMENT OF IMPACTS

METHOD FOR DETERMINING RELIABILITY

The Energy Commission must make findings as to how a project is designed, sited, and operated in order to ensure its safe and reliable operation (Title 20, CCR §1752[c]). Staff takes the approach that a project is acceptable if it does not degrade the reliability of the utility system to which it is connected. This is likely the case if a project is at least as reliable as other power plants on that system.

The availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability. Measures of power plant reliability are based upon both the plant's actual ability to generate power when it is considered to be available and upon starting failures and unplanned (or forced) outages. For practical purposes, reliability can be considered a combination of these two industry measures, making a reliable power plant one that is available when called upon to operate. Throughout its intended 50-year life, the ISEGS is expected to operate reliably. Power plant systems must be able to operate for extended periods without shutting down for maintenance or repairs. Achieving this reliability requires adequate levels of equipment availability, plant maintainability with scheduled maintenance outages, fuel and water availability, and resistance to natural hazards. Staff examines these factors for a project and compares them to industry norms. If the factors compare favorably for this project, staff will then conclude that the ISEGS would be as reliable as other power plants on the electric system and would not degrade system reliability.

EQUIPMENT AVAILABILITY

Equipment availability would be ensured by adoption of appropriate quality assurance/quality control (QA/QC) programs during the design, procurement, construction, and operation of the plant and by providing for the adequate maintenance and repair of the equipment and systems discussed below.

Quality Control Program

The applicant describes a QA/QC program (BSE 2007a, AFC §2.3.2.5) that is typical of the power industry. Equipment would be purchased from qualified suppliers based on technical and commercial evaluations. Suppliers' personnel, production capability, past performance, QA programs, and quality history would be evaluated. The project owner would perform receipt inspections, test components, and administer independent testing contracts. Staff expects that implementation of this program would result in standard reliability of design and construction. To ensure this implementation, staff has proposed appropriate conditions of certification in the section of this document entitled **Facility Design**.

PLANT MAINTAINABILITY

Equipment Redundancy

The project, as proposed in the AFC, would be able to operate only when the sun is shining. Maintenance or repairs could be done when the plant is shut down at night. This would help to enhance the project's reliability. Also, the applicant proposes to provide redundant pieces of equipment for those that are most likely to require service or repair. This redundancy would allow service or repair to be done during sunny days when the plant is in operation, if required.

The applicant plans to provide an appropriate redundancy of function for the project (BSE 2007a, AFC §2.3.2.2, Table 2.3-1). Because the project consists of three independent steam turbine generators, it is inherently reliable. A single equipment failure could not disable more than one plant, which would allow the other two plants to continue to generate at their full output. All other major plant systems are also designed with adequate redundancy to ensure their continued operation if equipment fails. Staff believes that this project's proposed equipment redundancy would be sufficient for its reliable operation.

Maintenance Program

Equipment manufacturers provide maintenance recommendations for their products, and the applicant is expected to base the project's maintenance program on those recommendations. The program would encompass both preventive and predictive maintenance techniques. Maintenance outages would probably be planned for periods of low electricity demand. Staff expects that the project would be adequately maintained to ensure an acceptable level of reliability.

FUEL AND WATER AVAILABILITY

The long-term availability of fuel and of water for cooling or process use is necessary to ensure the reliability of any power plant. The need for reliable sources of fuel and water is obvious; lacking long-term availability of either source, the service life of the plant could be curtailed, threatening both the power supply and the economic viability of the plant.

Fuel Availability

Natural gas would be delivered to the project site through a new 5.3-mile, 4- to 6-inch, gas pipeline connected to the existing Kern River Gas Transmission Company's (KRGT's) pipeline located 0.5 miles north of Ivanpah 3 (BSE 2007a, AFC §§1.2, 4.1). The KRGT pipeline system is a vital artery bringing natural gas into Utah, Nevada, and California. This system extends from the oil and gas producing fields of southwestern Wyoming through Utah and Nevada to the San Joaquin Valley near Bakersfield, California. According to KRGT, the pipeline currently has a design capacity of more than 1.7 billion cubic feet per day (KRGT 2007). The ISEGS would be a solar thermal power plant and the use of natural gas would be limited to unit warm up and brief periods of cloud cover. The use of natural gas is not anticipated to exceed 5 percent of the time. The very limited use of fuel would have minimal impact on gas supplies. Staff believes

that there will be adequate natural gas supply and pipeline capacity to meet the project's needs.

Water Supply Reliability

The ISEGS would use well water for domestic and industrial water needs. Two 100-percent capacity wells would be located to the east of Ivanpah 2 and would supply water to all three plants. The wells would be connected to the project via a 570-foot water line to Ivanpah 2, from which the line would be extended to each plant (BSE 2007a, AFC §§1.2, 2.1, 2.2.7, 2.3.2.4). To minimize water use, air-cooled condensers would be used. Package treatment plants would be used to provide potable water for drinking and sanitary uses. Staff believes these sources represent a reliable supply of water for the project. For further discussion of water supply, see the **Soil and Water Resources** section of this document.

POWER PLANT RELIABILITY IN RELATION TO NATURAL HAZARDS

Natural forces can threaten the reliable operation of a power plant. High winds, tsunamis (tidal waves), and seiches (waves in inland bodies of water) are not likely to present hazards for this project, but seismic shaking (earthquakes) and flooding could present credible threats to the project's reliable operation.

Seismic Shaking

The site lies within Seismic Zone 3 (BSE 2007a, AFC §2.3.1.1.1); see the "Faulting and Seismicity" portion of the **Geology and Paleontology** section of this document. The project will be designed and constructed to the latest appropriate LORS (BSE 2007a, AFC Appendix 2). Compliance with current seismic design LORS represents an upgrading of performance during seismic shaking compared to older facilities since these LORS have been continually upgraded. Because it would be built to the latest seismic design LORS, this project would likely perform at least as well as, and perhaps better than, existing plants in the electric power system. Staff has proposed conditions of certification to ensure this; see the section of this document entitled **Facility Design**. In light of the general historical performance of California power plants and the electrical system in seismic events, staff has no special concerns with the power plant's functional reliability during seismic events.

Flooding

The project site elevation is approximately 2,765 feet above mean sea level (BSE 2007a, AFC §5.8.3.1). According to the Federal Emergency Management Agency, the site is not within either the 100- or 500-year flood plain (BSE 2007a, AFC §§2.3.1.1.1, 5.15.3.1.3). Staff believes there are no special concerns with power plant functional reliability due to flooding. For further discussion, see **Soil and Water Resources** and **Geology and Paleontology**.

COMPARISON WITH EXISTING FACILITIES

The North American Electric Reliabiity Corporation (NERC) maintains industry statistics for availability factors (as well as other related reliability data). The NERC regularly polls North American utility companies on their project reliability through its Generating Availability Data System and periodically summarizes and publishes those statistics on

the Internet <http://www.nerc.com>. Because solar technology is relatively new, no statistics are available for solar power plants. The project's power cycle is based on steam cycle. Because natural gas is the primary type of fossil fuel used in California, staff finds it reasonable to compare the project's availability factor to the average availability factor of natural gas-fired fossil fuel units. Also, because the project's total net power output would be 400 MW, staff uses the NERC statistics for 400–599 MW units. The NERC reported an availability factor of 85.07 percent as the generating unit average for the years 2002 through 2006 for natural gas units of 400–599 MW (NERC 2007).

The project would use triple-pressure, condensing steam turbine technology. Steam turbines incorporating this technology have been on the market for many years now and are expected to exhibit typically high availability. Also, because solar-generated steam is cleaner than burnt fossil fuel (i.e., natural gas), the ISEGS steam cycle units would likely require less frequent maintenance than units that burn fossil fuel. Therefore, the applicant's expectation of an annual availability factor of 92 to 98 percent (BSE 2007a, AFC §2.3.2.1) appears reasonable when compared with the NERC figures throughout North America (see above). In fact, these machines can well be expected to outperform the fleet of various turbines (mostly older and smaller) that make up NERC statistics. Additionally, because the plant would consist of three independent steam turbine generators, maintenance could be scheduled during times of the year when the full power output is not required to meet market demand, which is typical of industry standard maintenance procedures. The applicant's estimate of plant availability, therefore, appears to be realistic. Stated procedures for assuring the design, procurement, and construction of a reliable power plant appear to be consistent with industry norms, and staff believes they are likely to ultimately produce an adequately reliable plant.

NOTEWORTHY PROJECT BENEFITS

This project would help serve the need for renewable energy in California, as 95 percent of the generated electricity would be produced by a reliable source of energy that is available during the hot summer afternoons, when power is needed most. Small natural gas-fired boilers would be used to bring the system up to operating temperature in the morning and periodically to keep system temperatures up when clouds briefly block the sunlight. These boilers are expected to be in use only 5 percent of the time.

CONCLUSION

The applicant predicts an equivalent availability factor of 92 to 98 percent, which staff believes is achievable. Based on a review of the proposal, staff concludes that the plant would be built and operated in a manner consistent with industry norms for reliable operation. This should provide an adequate level of reliability. No conditions of certification are proposed.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed.

REFERENCES

BSE 2007a—Bright Source Energy/ Solar Partners I, LLC/ J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Submitted to CEC/Docket Unit on 8/31/2007.

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TRANSMISSION SYSTEM ENGINEERING

Sudath Arachchige and Mark Hesters

SUMMARY OF CONCLUSIONS

Staff has not received the System Impact Study (SIS) for the entire proposed Ivanpah Solar Electric Generating System (ISEGS or "Project") and is unable to provide conclusions or recommendations for the proposed project without the study. The proposed conditions of certification are preliminary and may be updated when staff incorporates the results of the SIS into the analysis of the ISEGS project.

STAFF ANALYSIS

This transmission system engineering (TSE) analysis examines whether this project's proposed interconnection conforms to all LORS required for safe and reliable electric power transmission. Additionally, under CEQA, the Energy Commission must conduct an environmental review of the "whole of the action," which may include facilities not licensed by the Energy Commission (Title 14, California Code of Regulations §15378). The Energy Commission must therefore identify the system impacts and necessary new or modified transmission facilities downstream of the proposed interconnection that are required for interconnection and that represent the whole of the action.

Commission staff relies upon the responsible interconnecting authority for analysis of impacts on the transmission grid, as well as for the identification and approval of new or modified facilities required downstream from the proposed interconnection for mitigation purposes. The proposed project would connect to SCE's 115-kV transmission network and requires both analysis by SCE and the approval of the California Independent System Operator (California ISO).

Energy Commission staff has prepared a **Downstream Impacts Analsyis** as an Appendix to this Staff Assessment to examine the potential indirect impacts of future transmission line, fiber optic, and substation construction, line removal, and other upgrades that may be required.

SCE'S ROLE

SCE is responsible for ensuring electric system reliability in its service territory for proposed transmission modifications. For the ISEGS 2 project, SCE performed the System Impact Study (SIS) used to determine whether or not the proposed transmission modifications conform to reliability standards. Because the project would be connected to the California ISO controlled transmission grid, the California ISO's role is to review and approve the SIS and its conclusions.

CALIFORNIA ISO'S ROLE

The California ISO is responsible for ensuring electric system reliability for all participating transmission owners and is also responsible for developing the standards necessary to achieve system reliability. The project power will be dispatched to the

California ISO grid via SCE's newly built Ivanpah 115/230-kV substation. Therefore, California ISO will review the studies of the SCE system to ensure adequacy of the proposed transmission interconnection. The California ISO determines the reliability impacts of the proposed transmission modifications on the SCE transmission system in accordance with all applicable reliability criteria. According to the California ISO tariffs, the California ISO will determine the "need" for transmission additions or upgrades downstream from the interconnection point to insure reliability of the transmission grid. The California ISO reviewed the SIS performed by SCE and issued a preliminary approval to SCE. On completion of the SCE Facility Study, the California ISO will review the study results and provide its conclusions and recommendations. The California ISO may provide written and verbal testimony on its findings at the Energy Commission hearings.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

- California Public Utilities Commission (CPUC) General Order 95 (GO-95), *Rules for Overhead Electric Line Construction*, sets forth uniform requirements for the construction of overhead lines. Compliance with this order ensures both adequate service and the safety of both the public and the people who build, maintain, and operate overhead electric lines.
- CPUC General Order 128 (GO-128), *Rules for Construction of Underground Electric Supply and Communications Systems*, sets forth uniform requirements and *minimum* standards for underground supply systems to ensure adequate service and the safety of both the public and the people who build, maintain, and operate underground electric lines.
- The *National* Electric Safety Code, 1999, provides electrical, mechanical, civil, and structural requirements for overhead electric line construction and operation.
- The combined NERC/WECC (North American Electric Reliability *Corporation*/Western Electricity Coordinating Council) planning standards provide system performance standards for assessing the reliability of the interconnected transmission system. These standards require continuity of service as their first priority and the preservation of interconnected operation as their second. Some aspects of NERC/WECC standards are either more stringent or more specific than the either agency's standards alone. These standards are designed to ensure that transmission systems can withstand both forced and maintenance outage system contingencies while operating reliably within equipment and electric system thermal, voltage, and stability limits. These standards include reliability criteria for system adequacy and security, system modeling data requirements, system protection and control, and system restoration. Analysis of the WECC system is based to a large degree on Section I.A of WECC standards, *NERC and WECC Planning Standards with Table I and WECC Disturbance-Performance Table,* and on Section I.D, *NERC and WECC Standards for Voltage Support and Reactive Power.* These standards require that power flows and stability simulations verify defined performance levels. Performance levels are defined by specifying allowable variations in thermal loading, voltage and frequency, and loss of load that may occur during various disturbances. Performance levels range from no significant adverse effects inside and outside a system area during a minor disturbance (such as the loss of load from a single

transmission element) to a catastrophic loss level designed to prevent system cascading and the subsequent blackout of islanded areas and millions of consumers during a major transmission disturbance (such as the loss of multiple 500-kV lines along a common right-of- way, and/or of multiple large generators). While the controlled loss of generation or system separation is permitted under certain specific circumstances, this sort of major uncontrolled loss is not permitted (WECC, 2002).

- NERC's reliability standards for North America's electric transmission system spell out the national policies, standards, principles, and guidelines that ensure the adequacy and security of the nation's transmission system. These reliability standards provide for system performance levels under both normal and contingency conditions. While these standards are similar to the combined NERC/WECC standards, certain aspects of the combined standards are either more stringent or more specific than the NERC performance standards alone. *NERC's* reliability standards apply to both interconnected system operations and to individual service areas (NERC, 2006).
- California ISO planning standards also provide the standards and guidelines that ensure the adequacy, security, and reliability of the state's member grid facilities. These standards also incorporate the combined NERC/WECC and NERC standards. These standards are also similar to the NERC/WECC or NERC standards for transmission system contingency performance. However, the *California* ISO standards also provide additional requirements that are not found in either the WECC/NERC or NERC standards. The California ISO standards apply to all participating transmission owners interconnecting to the California ISO- controlled grid. They also apply to non-member facilities that impact the California ISO grid through their interconnections with adjacent control grids (California ISO, 2002a).
- California ISO/FERC (Federal Energy Regulatory Commission) electricity tariffs *contain* guidelines for building all transmission additions/upgrades within the California ISO-controlled grid. (California ISO, 2003a).

PROJECT DESCRIPTION

The applicant proposes to interconnect the 400 megawatt (MW) ISEGS to SCE's proposed built 230 kV Ivanpah substation near Nevada border, San Bernardino County, California. The proposed project would develop in three phases, two 100 MW phases known as ISEGS 1 and 2, and one 200 MW phase known as ISEGS 3, with planned operational dates of summer of 2009, 2010, and 2011 respectively.

ISEGS is a solar concentrating thermal power plant, based on distributed power tower and heliostat mirror technology. The heliostat fields focus solar energy on the power tower receivers near the center of each of the heliostat arrays. The heliostat mirrors would be asymmetrically arranged around each solar receiver boiler towers. Each mirror will track the sun throughout the day and reflect the solar energy to the receiver boiler. In each plant, one Rankine-cycle reheat steam turbine receives live steam from the solar boilers and reheat steam from one solar reheater-located in the power block at the top of its own tower. The solar field and power generation equipment would be started each morning after sunrise and insolation build-up, and shut down in the evening when insolation drops below the level required to maintain the turbine connected. Electricity

would be produced by each plant's solar receiver boiler and the steam turbine generator. Each of the three ISEGS projects would connect to its own 115 kV switchyard and from there to a proposed SCE Ivanpah 115/230 kV substation which would connect to the SCE system by looping an existing transmission line into the new substation.

SWITCHYARD AND INTERCONNECTION FACILITIES

Each of the Project's three generating units (#1, #2, and #3) would be connected to the low side of its dedicated 13.8/115 kV generator step-up (GSU) transformer through 25 kV, 7,000-ampere gas-insulated (SF6) breaker. The high side of generator step-up transformer would be connected to the project's switchyard via 115 kV, 1200-ampere disconnect switch. The step-up transformer for the steam turbine generating unit would be rated at 13.8/115 kV and 72/96/120 megavolt ampere (MVA). The project switchyard bay will consist with a 115 kV, 1200A single circuit breaker and two 1200A disconnect switches. The switchyard circuit breaker would interconnect to an overhead 115kV single circuit transmission line via 1200A disconnect switch. Each of the three phases will connect to a new Ivanpah substation via its own dedicated 115 kV generator tie line.

The ISEGS #1 115 kV generator tie line would be approximately 5,800 feet long, built with 477 kcmil ACSR conductors and supported by single-pole structures. The ISEGS #2 and #3 generator tie lines would share the same poles for the last 1,400 feet of their routes before they interconnect to SCE's Ivanpah Substation. The ISEGS #2 generator would connect to the Ivanpah Substation through 115kV, 3,900 feet-long single circuit generator tie line built with the last 1,400 feet merged with the ISEGS #3 generator tie line to create a 1,400 feet long, overhead double circuit line prior to entering the Ivanpah Substation. The ISEGS #3 generator tie line would be an approximately 14,100 feet long, single circuit, 115 kV line built with 1510 kcmil ACSR and would merge into a 115kV double circuit with the ISEGS #2 generator tie line.

SCE's Ivanpah Substation would use a double-bus breaker-and-a half configuration with 3 bays and 5 positions for outgoing transmission lines. The Ivanpah Substation would consists of 115kV, 1200A circuit breakers, 115kV disconnect switches and other switching gear that will allow delivery of the project's output to the SCE grid. The existing Eldorado-Baker-Cool Water-Dunn Siding-Mountain Pass 115kV line would loop in and out through the newly built Ivanpah Substation to interconnect the project to SCE transmission grid. (ISEGS 2, 2007b section 3.2.2 pages 3-4 to 3-6 and Figure 01-PB-E-D-201).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

For the interconnection of this proposed project to the grid, the interconnecting utility (SCE) and the control area operator (California ISO) are responsible for ensuring grid reliability. These two entities determine the transmission system impacts of the proposed project and any mitigation measures needed to ensure system conformance with utility reliability criteria, NERC planning standards, WECC reliability criteria, and California ISO reliability criteria. System impact and facilities studies are used to determine the impacts of the proposed project on the transmission grid. Staff relies on these studies and any review conducted by the California ISO to determine the effect of

the project on the transmission grid and to identify any necessary downstream facilities or indirect project impacts required to bring the transmission network into compliance with applicable reliability standards. System impact and facilities studies analyze the grid both with and without the proposed project, under conditions specified in the planning standards and reliability criteria. The standards and criteria define the assumptions used in the study and establish the thresholds through which grid reliability is determined. The studies analyze the impact of the project for the proposed first year of operation, and are based on a forecast of loads, generation, and transmission. Load forecasts are developed by the interconnected utility. Generation and transmission forecasts are established by an interconnection queue. The studies focus on thermal overloads, voltage deviations, system stability (excessive oscillations in generators and transmission system, voltage collapse, loss of loads, or cascading outages), and short circuit duties. If the studies show that the interconnection of the project causes the grid to be out of compliance with reliability standards, then the study will identify mitigation alternatives or ways in which the grid could be brought into compliance with reliability standards.

When a project connects to the California ISO-controlled grid, both the studies and mitigation alternatives must be reviewed and approved by the California ISO. If either the California ISO or interconnecting utility determines that the only feasible mitigation includes transmission modifications or additions requiring CEQA review, the Energy Commission must analyze those modifications or additions according to CEQA requirements.

SCOPE OF SYSTEM IMPACT STUDY

The system impact study was performed by SCE at the request of Bright Source Energy, Inc, to identify the transmission system impacts of ISEGS #2 on SCE's 115/230/500-kV system. The study included power flow, sensitivity, and short circuit studies, and transient and post-transient analyses (ISEGS 2, 2008a, system impact study). The study modeled the proposed project for a net output of 100 MW. The base cases included all California ISO approved major SCE transmission projects, the transmission system for the Los Angeles Department of Water and Power, and major path flow limits of Southern California Import Transmission, East-Of-River, and West-of-River. The study considered light load conditions with generation patterns and Path 46 imports maximized to identify the extent of potential congestion and fully stress the SCE system in the area where the ISEGS #2 project is interconnecting. The detailed study assumptions are described in the study. The power flow studies were conducted with and without ISEGS #2 connected to SCE's grid at the newly built Ivanpah Substation, using 2013 heavy summer and 2013 light spring base cases. The power flow study assessed the project's impact on thermal loading of the transmission lines and equipment. Transient and post-transient studies were conducted for ISEGS #2 using the 2013 heavy summer base case to determine whether the project would create instability in the system following certain selected outages. Short circuit studies were conducted to determine if ISEGS #2 would overstress existing substation facilities.

COMPLIANCE WITH LORS

Staff will analyze ISEGS compliance with LORS when the results of the System Impact Study for the 400 MW project are incorporated into this analysis

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency or public comments related to the TSE discipline have been received.

CONCLUSIONS AND RECOMMENDATIONS

Staff has not received the System Impact Study for the entire 400 MW of the proposed ISEGS and is unable to provide conclusions or recommendations for the proposed project without the study.

RECOMMENDATIONS

Staff makes no recommendation at this time.

CONDITIONS OF CERTIFICATION FOR TSE

TSE-1 The project owner shall furnish to the Compliance Project Manager (CPM) and to the Chief Building Official (CBO) a schedule of transmission facility design submittals, a Master Drawing List, a Master Specifications List, and a Major Equipment and Structure List. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide designated packages to the CPM when requested.

Verification: At least 60 days prior to the start of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit the schedule, a Master Drawing List, and a Master Specifications List to the CBO and to the CPM. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment (see a list of major equipment in **Table 1: Major Equipment List** below). Additions and deletions shall be made to the table only with CPM and CBO approval. The project owner shall provide schedule updates in the Monthly Compliance Report.

TRANSMISSION SYSTEM ENGINEERING Table 1
Major Equipment List

Breakers
Step-Up Transformer
Switchyard
Busses
Surge Arrestors
Disconnects
Take Off Facilities

Electrical Control Building
Switchyard Control Building
Transmission Pole/Tower
Grounding System

TSE-2 Prior to the start of construction, the project owner shall assign an electrical engineer and at least one of each of the following to the project: A) a civil engineer; B) a geotechnical engineer or a civil engineer experienced and knowledgeable in the practice of soils engineering; C) a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; or D) a mechanical engineer. (Business and Professions Code Sections 6704 et seq., require state registration to practice as a civil engineer or structural engineer in California.

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (e.g., proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California-registered electrical engineer. The civil, geotechnical or civil, and design engineer assigned in conformance with Facility Design condition **GEN-5**, may be responsible for design and review of the TSE facilities.

The project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all engineers assigned to the project. If any one of the designated engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer. This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform with predicted conditions used as a basis for design of earthwork or foundations.

The electrical engineer shall:

1. Be responsible for the electrical design of the power plant switchyard, outlet and termination facilities; and
2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days prior to the start of rough grading (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all the responsible engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the engineers within five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

TSE-3 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend corrective action (California Building Code, 1998, Chapter 1, Section 108.4, Approval Required; Chapter 17, Section 1701.3, Duties and Responsibilities of the Special Inspector; Appendix Chapter 33, Section 3317.7, Notification of Noncompliance). The discrepancy documentation shall become a controlled document and shall be submitted to the CBO for review and approval and shall reference this condition of certification.

Verification: The project owner shall submit a copy of the CBO's approval or disapproval of any corrective action taken to resolve a discrepancy to the CPM within 15 days of receipt. If disapproved, the project owner shall advise the CPM, within five days, the reason for disapproval, and the revised corrective action required obtaining the CBO's approval.

TSE-4 For the power plant switchyard, outlet line, and termination, the project owner shall not begin any increment of construction until plans for that increment have been approved by the CBO. These plans, together with design changes and design change notices, shall remain on the site for one year after completion of construction. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS. The following activities shall be reported in the Monthly Compliance Report:

- Receipt or delay of major electrical equipment;
- Testing or energization of major electrical equipment; and
- The number of electrical drawings approved, submitted for approval, and still to be submitted.

Verification: At least 30 days prior to the start of each increment of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval the final design plans, specifications, and calculations for equipment and systems of the power plant switchyard, outlet line, and termination, including a copy of the signed and stamped statement from the responsible electrical engineer attesting to compliance with the applicable LORS, and send the CPM a copy of the transmittal letter in the next Monthly Compliance Report.

TSE-5 The project owner shall ensure that the design, construction, and operation of the proposed transmission facilities will conform to all applicable LORS, including the requirements listed below. The project owner shall submit the

required number of copies of the design drawings and calculations as determined by the CBO.

1. The ISEGS #2 will be interconnected to the SCE grid via a segment of 115-kV, 477 kcmil-ACSR, 3900 feet long single circuit and a segment of 115kV,477- kcmil,1400 feet long double circuit generator tie-line. The proposed Ivanpah substation would use a double bus breaker- and- a half configuration with 3-bays and 5 positions.

2. The power plant outlet line shall meet or exceed the electrical, mechanical, civil, and structural requirements of CPUC General Order 95 and General Order 98 or National Electric Safety Code (NESC), Title 8 of the California Code and Regulations (Title 8), Articles 35, 36, and 37 of the "High Voltage Electric Safety Orders", California ISO standards, National Electric Code (NEC), and related industry standards.

3. Breakers and busses in the power plant switchyard and other switchyards, where applicable, shall be sized to comply with a short-circuit analysis.

4. Outlet line crossings and line parallels with transmission and distribution facilities shall be coordinated with the transmission line owner and comply with the owner's standards.

5. The project conductors shall be sized to accommodate the full output from the project.

6. Termination facilities shall comply with applicable SCE interconnection standards.

7. The project owner shall provide to the CPM:

   a. The final Detailed Facility Study (DFS) including a description of facility upgrades, operational mitigation measures, and/or Special Protection System (SPS) sequencing and timing if applicable,

   b. Executed project owner and California ISO Facility Interconnection Agreement.

Verification: At least 60 days prior to the start of construction of transmission facilities (or a lessor number of days mutually agree to by the project owner and CBO), the project owner shall submit to the CBO for approval:

1. Design drawings, specifications, and calculations conforming with CPUC General Order 95 and General Order 98 or NESC; Title 8, California Code of Regulations, Articles 35, 36, and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards for the poles/towers, foundations, anchor bolts, conductors, grounding systems, and major switchyard equipment.

2. For each element of the transmission facilities identified above, the submittal package to the CBO shall contain the design criteria, a discussion of the calculation

method(s), a sample calculation based on "worst-case conditions,"[1] and a statement signed and sealed by the registered engineer in responsible charge, or other acceptable alternative verification, that the transmission element(s) will conform with CPUC General Order 95 or NESC; Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards.

3. Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements **TSE-5** 1) through 5) above.

4. The final Detailed Facility Study, including a description of facility upgrades, operational mitigation measures, and/or SPS sequencing and timing if applicable, shall be provided concurrently to the CPM.

TSE-6 The project owner shall provide the following Notice to the California Independent System Operator (California ISO) prior to synchronizing the facility with the California transmission system:

1. At least one week prior to synchronizing the facility with the grid for testing, provide the California ISO a letter stating the proposed date of synchronization; and

2. At least one business day prior to synchronizing the facility with the grid for testing, provide telephone notification to the California ISO Outage Coordination Department.

Verification: The project owner shall provide copies of the California ISO letter to the CPM when it is sent to the California ISO one week prior to initial synchronization with the grid. A report of the conversation with the California ISO shall be provided electronically to the CPM one day before synchronizing the facility with the California transmission system for the first time.

TSE-7 The project owner shall be responsible for the inspection of the transmission facilities during and after project construction, and any subsequent CPM and CBO approved changes thereto, to ensure conformance with CPUC GO-95 or NESC; Title 8, CCR, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; applicable interconnection standards; NEC; and related industry standards. In case of non-conformance, the project owner shall inform the CPM and CBO in writing, within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after first synchronization of the project, the project owner shall transmit to the CPM and CBO:

1. "As built" engineering description(s) and one-line drawings of the electrical portion of the facilities signed and sealed by the registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95 or NESC; Title 8,

[1] Worst-case conditions for the foundations would include for instance, a dead-end or angle pole.

California Code of Regulations, Articles 35, 36 and 37 of the “High Voltage Electric Safety Orders”; applicable interconnection standards; NEC; and related industry standards, and these conditions shall be provided concurrently.

2. An “as built” engineering description of the mechanical, structural, and civil portion of the transmission facilities signed and sealed by the registered engineer in responsible charge or acceptable alternative verification. “As built” drawings of the electrical, mechanical, structural, and civil portion of the transmission facilities shall be maintained at the power plant and made available, if requested, for CPM audit as set forth in the “Compliance Monitoring Plan.”

3. A summary of inspections of the completed transmission facilities, and identification of any nonconforming work and corrective actions taken, signed and sealed by the registered engineer in charge

REFERENCES

California ISO (California Independent System Operator). 1998a. Cal-ISO Tariff Scheduling Protocol. Posted April 1998, Amendments 1,4,5,6, and 7 incorporated.

California ISO (California Independent System Operator). 1998b. Cal-ISO Dispatch Protocol. Posted April 1998.

California ISO (California Independent System Operator). 2002a. Cal-ISO Grid Planning Standards. February 2002.

ISEGS 2 (Ivanpah Solar Energy Generating Station #2). 2008a. Bright Source Energy, Inc. DPT1 project (System Impact Study) submitted to the California Energy Commission.

ISEGS 2 (Ivanpah Solar Energy Generating Station #2). 2007b, Ivanpah Solar Power, Application for Certification. Submitted to the California Energy Commission.

NERC/WECC (North American Reliability Council/Western Electricity Coordinating Council). 2002. NERC/WECC Planning Standards. August 2002.

DEFINITION OF TERMS

AAC - All aluminum conductor

ACSR - Aluminum conductor steel-reinforced

ACSS - Aluminum conductor steel-supported

Ampacity - Current-carrying capacity, expressed in amperes, of a conductor at specified ambient conditions, at which damage to the conductor is nonexistent or deemed acceptable based on economic, safety, and reliability considerations.

Ampere - The unit of current flowing in a conductor.

Bundled - Two wires, 18 inches apart.

Bus - Conductors that serve as a common connection for two or more circuits.

Conductor - The part of the transmission line (the wire) that carries the current.

Congestion management – A scheduling protocol, which provides that dispatched generation and transmission loading (imports) will not violate criteria.

Emergency overload – See “Single Contingency.” This is also called an L-1.

Kcmil or KCM – Thousand circular mil. A unit of the conductor’s cross sectional area When divided by 1,273, the area in square inches is obtained.

Kilovolt (kV) - A unit of potential difference, or voltage, between two conductors of a circuit, or between a conductor and the ground.

Loop - An electrical cul de sac. A transmission configuration that interrupts an existing circuit, diverts it to another connection, and returns it back to the interrupted circuit, thus forming a loop or cul de sac.

Megavar - One megavolt ampere reactive.

Megavars - Mega-volt-Ampere-Reactive. One million Volt-Ampere-Reactive. Reactive power is generally associated with the reactive nature of motor loads that must be fed by generation units in the system.

Megavolt ampere (MVA) – A unit of apparent power. It equals the product of the line voltage in kilovolts, current in amperes, and the square root of 3, divided by 1,000.

Megawatt (MW) – A unit of power equivalent to 1,341 horsepower.

Normal operation/normal overload – The condition arrived at when all customers receive the power they are entitled to, without interruption and at steady voltage, and with no element of the transmission system loaded beyond its continuous rating.

N-1 condition – See “single contingency.”

Outlet - Transmission facilities (circuit, transformer, circuit breaker, etc.) linking generation facilities to the main grid.

Power flow analysis – A forward-looking computer simulation of essentially all generation and transmission system facilities that identifies overloaded circuits, transformers, and other equipment and system voltage levels.

Reactive power – Generally associated with the reactive nature of motor loads that must be fed by generation units in the system. An adequate supply of reactive power is required to maintain voltage levels in the system.

Remedial action scheme (RAS) – An automatic control provision, which, for instance, will trip a selected generating unit upon a circuit overload.

SF6 (sulfur hexafluoride) – An insulating medium.

Single contingency – Also known as “emergency” or “N-1 condition,” the occurrence when one major transmission element (circuit, transformer, circuit breaker, etc.) or one generator is out of service.

Solid dielectric cable – Copper or aluminum conductors that are insulated by solid polyethylene type insulation and covered by a metallic shield and outer polyethylene jacket.

Switchyard - An integral part of a power plant and used as an outlet for one or more electric generators.

Thermal rating – See “ampacity.”

TSE - Transmission system engineering.

Tap - A transmission configuration creating an interconnection through a sort single circuit to a small or medium sized load or a generator. The new single circuit line is inserted into an existing circuit by utilizing breakers at existing terminals of the circuit, rather than installing breakers at the interconnection in a new switchyard.

Undercrossing – A transmission configuration where a transmission line crosses below the conductors of another transmission line, generally at 90 degrees.

Underbuild - A transmission or distribution configuration where a transmission or distribution circuit is attached to a transmission tower or pole below (under) the principle transmission line conductors.

ALTERNATIVES

Susan V. Lee

SUMMARY OF FINDINGS

In the analysis of individual resource areas, the Preliminary Staff Assessment (PSA) finds potential adverse impacts of the proposed Ivanpah Solar Electric Generating System (ISEGS) project to biological resources, land use, water and soils, visual resources, and transmission system engineering. Based on these and other concerns, 21 alternatives to the ISEGS project have been considered. Four alternatives are evaluated in this Preliminary Staff Assessment and the remaining alternatives are described along with the reasons they were eliminated from detailed analysis. One of the alternatives analyzed is the “no project” alternative mandated by the California Code of Regulations (Title 14 § 15126.6 and similar to the “no action” alternative mandated by the National Environmental Policy Act) that requires the Energy Commission to define the scenario that would exist if the proposed project were not constructed and determine whether that scenario (the “no project” alternative) is superior, equivalent, or inferior to the proposed ISEGS project.

This analysis, still in preliminary form at the time of the PSA, concludes that the Reconfiguration alternative (now the same as the proposed ISEGS project) is superior to the project as originally proposed. No other alternatives have shown that they would effectively reduce or eliminate the significant impacts of the proposed project without creating new impacts of their own. Therefore, at this time, no other alternatives are found to be superior to the proposed project.

The alternatives considered but eliminated from detailed analysis include four alternative sites, four different solar technologies, five different renewable technologies, three other generation technologies using different fuels, and conservation/demand-side management.

The alternative sites considered include a Private Land alternative that would be located on disturbed land that is primarily agricultural. At this site, achieving site control in an economically feasible manner would be challenging because land would have to be acquired from multiple landowners.

Among the solar technology alternatives, the linear Fresnel alternative has the potential for least impacts due to its more compact configuration (reducing ground disturbance); however, the technology is proprietary and is not available to other developers. The non-solar renewable technologies alternatives (wind, geothermal, biomass, tidal, wave) would either be infeasible at the scale of the ISEGS project, or would not eliminate significant impacts caused by the ISEGS project without creating significant impacts in other locations. Specifically, wind energy that would be viable at some locations in the Mojave Desert could create significant impacts to biological, visual, cultural, and water and soils resources.

Of the nonrenewable generation alternatives (natural gas, coal, and nuclear), only the natural gas-fired power plants would be viable alternatives within California. However,

gas-fired plants would fail to meet a major project objective: to construct and operate a renewable power generating facility in California capable of selling competitively priced renewable energy consistent with the needs of California utilities. Because these alternatives would not support renewable power generation within California, and could have significant environmental impacts of their own, they were eliminated from further consideration.

Staff also believes that, overall, the “no project” alternative is not superior to the proposed ISEGS project. If the “no project” alternative were selected, the construction and operational impacts of the ISEGS project would not occur. However, in the absence of the ISEGS project, other renewable or gas-fired power plants would likely be constructed to serve the electricity demand that could be met with the ISEGS project. The overall benefit to the state of meeting renewable standards would be a reduction of greenhouse gas emissions from gas- or coal-fired power plants.

Alternatives Table 1 presents a summary of the comparative impacts of the two alternative sites with the proposed project. It includes only the environmental disciplines identified as being of potential concern in the Issues Identification Report or that have the potential for severe impacts. Overall, the two alternative sites require similar area to the proposed site (approximately 4,000 acres), and they are both located on nearly flat Bureau of Land Management (BLM) desert land that is primarily Mojave creosote bush scrub. Therefore, it is not possible to determine that these sites would reduce or eliminate the significant impacts of the proposed site.

Alternatives Table 1
Comparison of Impacts of Alternative Sites to the Proposed ISEGS

Environmental and Engineering Assessment	Proposed ISEGS Project	Siberia East Alternative	Broadwell Lake Alternative
Air Quality	Project would comply with all applicable laws, ordinances, regulations, and standards (LORS) and would not result in any significant air quality-related impacts with the adoption of conditions of certification.	Longer commute during construction of project but similar operational impacts.	Longer commute during construction of project but similar operational impacts.
Biological Resources	Direct, indirect, and cumulative impacts to desert tortoise; loss of habitat for special-status plant and animal species and waters of the state.	Assumed to be similar to ISEGS based on habitat and slope.	Assumed to be similar to ISEGS based on habitat and slope.

Environmental and Engineering Assessment	Proposed ISEGS Project	Siberia East Alternative	Broadwell Lake Alternative
Cultural Resources	Final results of the cultural resources inventory for the project area required for conclusion regarding significance of impacts to cultural resources, but conditions of certification would likely reduce impacts to less than significant.	Assumed to be similar to ISEGS based on habitat and slope.	Assumed to be similar to ISEGS based on habitat and slope.
Land Use	Land use staff cannot yet conclude whether or not the proposed project is in conformance with the CDCA plan, nor can staff conclude that the project is in conformance with Title 43, Code of Federal Regulations §1610.5-3.	Site is Multiple-Use Class M (Moderate Use), which is less restrictive than MUC L; impacts are assumed to be similar because of potential significant biological and cultural impacts.	Site is Multiple-Use Class L and Multiple-Use Class M; impacts are assumed to be similar because of potential significant biological and cultural impacts.
Soils and Water	Detailed erosion and storm water plans required for conclusion regarding erosion, storm water, pollution, and flood-related impacts.	Assumed similar to ISEGS; uncertain water availability.	Assumed similar to ISEGS; uncertain water availability.
Visual Resources	Would not meet objectives of Visual Resource Management classes from several Key Observation Points; inconsistent with San Bernardino General Plan Conservation and Open Space Elements.	Less preferred due to more remote and pristine location. Visible to fewer people but would create a more dramatic change to undeveloped environment; longer transmission interconnection would visible from I-40.	Less preferred due to more remote and pristine location. Visible to fewer people but would create a more dramatic change to undeveloped environment.

INTRODUCTION

This section considers potential alternatives to the construction and operation of the proposed Ivanpah Solar Electric Generating System (ISEGS) by Solar Partners I, LLC; Solar Partners II, LLC; Solar Partners IV, LLC; and Solar Partners VIII, LLC (applicant), subsidiaries of BrightSource Energy, Inc. The purpose of this alternatives analysis is to comply with state and federal environmental laws by providing an analysis of a reasonable range of feasible alternative which could substantially reduce or avoid any potentially significant adverse impacts of the proposed project (Cal. Code Regs., tit. 14,

§ 15126.6; Cal. Code Regs., tit. 20, § 1765). This section identifies potentially significant impacts of the proposed project and analyzes different technologies and alternative sites that may reduce or avoid these significant impacts. Staff has also analyzed the impacts that may be created by locating the project at alternative sites and the impacts created by using different renewable and non-renewable technologies.

The California Energy Commission (Energy Commission) does not have the authority to approve an alternative or require BrightSource Energy, Inc. to move the proposed project to another location, even if it identifies an alternative site that meets the project objectives and avoids or substantially lessens one or more of the significant effects of the project. Implementation of an alternative site would require that the applicant submit a new Application for Certification (AFC), including revised engineering and environmental analysis. This more rigorous AFC-level analysis of any of the alternative sites could reveal environmental impacts; nonconformity with laws, ordinances, regulations, and standards; or potential mitigation requirements that were not identified during the more general alternatives analysis presented herein. Preparation and review of a new AFC would require substantial additional time.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

BrightSource Energy, Inc. proposes to build the ISEGS solar facility on Bureau of Land Management (BLM) land, which is under the jurisdiction of the federal government. Since the BLM is a federal agency, the ISEGS power plant is subject to review under the National Environmental Policy Act (NEPA) in addition to the California Environmental Quality Act (CEQA). The ISEGS plant would ultimately be reviewed under a joint state and federal process by the Energy Commission and BLM; the Final Staff Assessment would also be a Draft Environmental Impact Statement (EIS) in compliance with NEPA.

CALIFORNIA ENVIRONMENTAL QUALITY ACT CRITERIA

The *Guidelines for Implementation of the California Environmental Quality Act*, Title 14, California Code of Regulation, section 15126.6(a), provides direction by requiring an evaluation of the comparative merits of “a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project.” In addition, the analysis must address the “no project” alternative (Cal. Code Regs., tit. 14, § 15126.6(e)).

The range of alternatives is governed by the “rule of reason” which requires consideration only of those alternatives necessary to permit informed decision making and public participation. CEQA states that an environmental document does not have to consider an alternative of which the effect cannot be reasonably ascertained and of which the implementation is remote and speculative (Cal. Code Regs., tit. 14, § 15125(d)(5)).

SCOPE AND METHODOLOGY OF THE ALTERNATIVES ANALYSIS

The purpose of staff’s alternatives analysis is to provide a reasonable range of feasible alternatives that could substantially reduce or avoid any potentially significant adverse impacts of the proposed project. To accomplish this, staff must determine the

appropriate scope of analysis. It is necessary to identify and determine the potentially significant impacts of the proposed project and then focus on alternatives that are capable of reducing or avoiding those significant impacts.

To prepare the alternatives analysis, staff used the following methodology:

- Provide an overview of the project, identify the basic objectives of the project, and describe its potentially significant adverse impacts.
- Identify and evaluate technology alternatives to the project such as increased energy efficiency (or demand-side management) and the use of alternative technologies (e.g. solar or other renewable or nonrenewable technologies).
- Identify and evaluate alternative locations.
- Evaluate the impacts of not constructing the project, known as the ”no project” alternative required under CEQA.
- Based on this methodology, each potential alternative was evaluated according the following criteria for its ability to:
- avoid or substantially lessen one or more of the potential significant effects of the project as described above;
- meet most project objectives;
- not create unmitigable significant impacts of its own;
- be sufficiently far from moderate or high-density residential areas or from sensitive receptors (such as schools and hospitals) or from recreation areas so as to reduce or avoid temporary and permanent impacts of the project.

Staff used a two-stage process to select alternatives for analysis: first, staff identified a range of potential alternatives, and then staff screened these potential alternatives to select those that qualified for detailed evaluation. Staff considered alternatives to the project that were identified by several sources, including BrightSource, the National Park Service and National Parks Conservation Association, Energy Commission staff, and the public.

SUMMARY DESCRIPTION OF PROPOSED PROJECT

According to AFC (Section 2.0, Project Description) ISEGS is a nominal 400-MW solar power plant that would use distributed power tower technology. The ISEGS project is being put forth by Solar Partners, LLC and would be made up of three separate solar power plants: two 100-MW plants (Ivanpah 1 and Ivanpah 2) and one 200-MW plant (Ivanpah 3). Each 100-MW plant requires approximately 920 acres of land and the 200-MW plant requires approximately 1,840 acres of land for a total of approximately 4,065 acres of land including approximately 385 additional acres for administration buildings and maintenance facilities. ISEGS includes seven solar power towers, which would be 459 feet tall (plus an additional 10-foot-tall lightening rod that would extend above the top of the tower). The plants would share a groundwater well, access roads, and the administration building and maintenance facilities.

In each solar plant, one reheat steam turbine would receive live steam from the solar receiver boilers and reheated steam from a solar reheater located in the power block at the top of its own tower. Each plant also would include a natural gas-fired steam boiler and a pipeline to a source of natural gas. Each plant would use an air-cooled condenser or “dry cooling,” to minimize water usage at the site’s desert environment. Water consumption at the facility would predominantly be used for washing heliostats (the mirrors that reflect the sun’s rays onto the solar power towers). The heliostat mirrors would be arranged around each solar receiver boiler and track the sun throughout the day, reflecting the solar energy to the receiver boiler. The heliostats would be 7.2 feet high by 10.5 feet wide, yielding a reflecting surface of 75.6 square feet.

The ISEGS plant would be located in the Ivanpah Basin in San Bernardino County, California, 4.5 miles southwest of Primm, Nevada. It would be located adjacent to the Primm Valley Golf Course. The solar plant would be within the BLM’s California Desert Conservation Area and the Northern and Eastern Mojave (NEMO) Management Plan area. It would also border the Eastern Mojave Desert Wildlife Management Area, within which desert tortoise are protected. The NEMO Management Plan identifies measures to manage desert tortoise, a federal- and state-listed threatened species.

The project site lies on an alluvial fan that extends eastward from the Clark Mountains to Ivanpah Dry Lake. The topography slopes gradually, with a 3 to 5 percent grade from a high elevation of approximately 3,150 feet to a low elevation of approximately 2,850 feet in the southeast corner. There are many ephemeral wash drainages on the property including some with bank-to-bank widths of more than 50 feet. Drainage from the property flows toward the Ivanpah Dry Lake. The predominant vegetation is the Mojave creosote bush scrub, typical of the Mojave Desert region.

PROJECT OBJECTIVES

The following project objectives were defined by the Applicant in the ISEGS AFC. The critical project objectives, as determined by staff, are then listed. According to the AFC, the applicant chose the proposed site to satisfy the following requirements (BSE 2007a):

- to safely and economically construct and operate a nominal 400-MW, solar generating facility in California capable of selling competitively priced renewable energy consistent with the needs of California utilities;
- to demonstrate the technical and economic viability of BrightSource’s technology in a commercial-scale project;
- to minimize infrastructure needs and reduce environmental impacts by locating the plant near existing and planned infrastructure including: California Independent System Operator (California ISO) transmission lines, a source of natural gas, and an adequate water supply;
- to avoid highly pristine or biologically sensitive areas;
- to locate the project consistent with existing land use plans;
- to assist California in repositioning its generation asset portfolio to use more renewable energy in conformance with state policy;

- to develop a project that can interconnect to a California ISO transmission line with the potential of achieving a commercial on-line date in 2010, but no later than 2011.

Having taken into consideration the eight objectives set forth by BrightSource in its AFC, the Energy Commission and BLM identified the following three basic project objectives. These objectives are used to evaluate the viability of alternatives in accordance with CEQA and NEPA requirements:

- to safely and economically construct and operate a nominal 400-MW, renewable power generating facility in California capable of selling competitively priced renewable energy consistent with the needs of California utilities;
- to locate the facility in areas of high solarity with ground slope of less than 5 percent;
- To complete the impact analysis of the project by the first quarter of 2010 so that if approved, construction could be authorized in 2010 and beyond.

ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND AREAS OF IDENTIFIED PUBLIC CONCERN

The Issues Identification Report (IIR) prepared by the Energy Commission in December 2007 identified the following issues of concern for the ISEGS project.

Air Quality. The applicant believes ISEGS represents a net emissions reduction for all air contaminants. Staff has identified concerns due to incomplete data on project emissions; should emissions require mitigation, the project schedule would likely be impacted and any issues necessitating use of offset mitigation would need to be resolved.

Land Use. The ISEGS project requests the BLM issue a right-of-way grant on 4,065 acres of public land. This would potentially preclude or impact other existing and planned land uses within the area, including livestock grazing and dispersed recreation.

Soils and Water. The project proposes disturbing approximately 4,065 acres of land, which would lead to a high potential for water and wind erosion. The removal of vegetation and the grading of 4,065 acres would potentially change drainage and runoff patterns that could adversely impact the Ivanpah lakebed.

Visual Resources. The visual analysis must conform to BLM regulations including development of Interim Visual Resource Management classifications. A wider range of sensitive receptors and associated Key Observation Points will be required.

In addition to the issues defined in the IIR, the following disciplines have the potential for severe impacts:

Biological Resources. The permanent loss of 4,065 acres of Mojave creosote scrub and other native plant communities would result in a significant loss of habitat for special-status plant and animal species and waters of the state. Additionally, construction of the project would result in direct, indirect, and cumulative impacts to desert tortoise (a state- and federal-threatened species).

Cultural Resources. The extent of disturbance could affect an identified site as well as currently unknown sites.

The alternatives analysis focuses on the consideration of these impacts and the extent to which they could be reduced or eliminated with use of alternatives.

IDENTIFICATION AND SCREENING OF ALTERNATIVES

This Preliminary Staff Assessment (PSA) identifies 21 alternatives:

- A total of six site alternatives—four presented by BrightSource as part of its alternatives analyzed in the AFC (Siberia alternative, Broadwell Lake alternative, alternative Site A, alternative Site C; BSE 2007a) and two analyzed by staff: the West of Clark Mountain Site (suggested by the National Parks Conservation Association) and a Private Land Site (suggested by numerous scoping comments);
- Twelve other renewable and nonrenewable generation technologies;
- Conservation and demand-side management;
- One configuration option within the proposed ISEGS site area;
- The ”no project/no action” alternative.

SITE SELECTION CRITERIA

The following site selection criteria identified in the ISEGS AFC were used to choose the proposed site. According to the AFC, the applicant chose the proposed site to satisfy the following requirements (BSE 2007a):

- to locate the facility in an area of high solarity (low cloudiness), with at least 5 square miles of contiguous land and with a ground slope of less than 5 percent;
- to locate the facility on land that is available for sale or use. If on private land, the land owner(s) must be willing to negotiate a long-term option agreement so that site control does not require a large capital investment until the license is obtained;
- to minimize infrastructure needs and reduce environmental impacts by locating the plant near existing and planned infrastructure including transmission lines, a source of natural gas, and an adequate water supply;
- to avoid highly pristine or biologically sensitive areas;
- to locate the project consistent with existing jurisdictional policies;
- to locate the project in an area that will allow it to be economically viable and competitive with other renewable technologies including wind, geothermal, and solar.

The BLM has received a large number of utility-scale solar energy project proposals for BLM-administered lands in California. The BLM processes solar energy right-of-way applications under its Solar Energy Development Policy (Instruction Memorandum No. 2007-097) and currently addresses environmental concerns for the utility-scale energy projects on a case-by-case basis. As such, existing applications for renewable projects give applicants prior rights to BLM-administered lands. Therefore, an alternative site on

BLM land with a pending application for a renewable project is not considered as a viable alternative unless the other application is rejected or withdrawn, or if the application is from BrightSource, the Ivanpah applicant.

The BLM and Department of Energy (DOE) are preparing a Programmatic Environmental Impact Statement (PEIS) on solar energy development in six states in the western U.S. (Arizona, California, Colorado, New Mexico, Nevada, and Utah) (USDOE 2008). The Draft PEIS is expected to be published in the spring of 2009, with a Final PEIS in the spring of 2010. The appropriateness of siting solar energy plants on various land use designations may be revisited in the PEIS.

ALTERNATIVES EVALUATED IN DETAIL

This section describes and analyzes four alternatives to the proposed project: the Siberia East and Broadwell Lake alternatives, the Reconfiguration alternative, and the "no project" alternative. Seventeen other alternatives are described in four "Alternatives Considered but Eliminated from Detailed Analysis" subsections later in this section: "Site Alternatives," "Alternative Solar Generation Technologies," "Alternative Renewable Technologies," and "Alternative Methods of Generating or Conserving Electricity."

SIBERIA EAST ALTERNATIVE

The Siberia site was considered in the AFC as an alternative to the ISEGS site and the site is also the subject of a separate application to BLM for another potential future solar power facility. BrightSource Energy submitted an Application for Transportation and Utility Systems and Facilities on Federal Lands to the BLM on April 30, 2007, to develop up to 1,600 MW of solar power at this site.

The Siberia site as defined by BrightSource includes approximately 15,000 acres and covers BLM land, state land, and private land. It is located immediately north of the Marine Corps Air Ground Combat Center Twentynine Palms (MCAGCC) (BSE 2007b). For the purposes of this alternatives analysis, an area of approximately 4,000 acres has been identified as a subset of the Siberia site identified by the applicant. It is called herein the *Siberia East alternative*.

The Siberia East alternative site was chosen because the western half of the Siberia site identified in the BLM application is covered by a pending wind application to the BLM for use of the land that was received prior to the BrightSource application. Therefore, the western portion of the Siberia site identified in the BLM application may not be a feasible site alternative. The Siberia East alternative is located on the eastern half of the BrightSource Siberia site, in unincorporated San Bernardino County. See **Alternatives Figure 1** for the Siberia East alternative regional location and **Alternatives Figure 2** for a more detailed image of the Siberia East alternative. The alternative site is located approximately 8.5 miles southeast of the town of Ludlow and would be immediately west of National Trails Highway (Route 66). Interstate 40 is located approximately 5 miles north of the Siberia East alternative. National Trail Highway and a Burlington Northern Santa Fe (BNSF) railroad form the northeast border of the site.

Adequate land is available at the Siberia East alternative site. Approximately 15,000 acres located just north of MCAGCC have appropriate solarity and less than 5 percent slope, as evidenced by the BrightSource application. The Siberia East alternative would be a 400-MW plant, requiring an operational area of approximately 4,000 acres on BLM land. An additional 640 acres of state land immediately west of the Siberia East alternative would also be available for use. The Siberia East alternative has elevation ranging between 1,150 and 1,470 feet. It would be accessed via Interstate 40 and the National Trails Highway.

The Siberia East alternative, as defined in this PSA, is located on BLM public lands, managed under the principle of multiple use and sustainable yield, and designated Multiple Use Class M (Moderate) for a controlled balance between more intense land use and protection of public lands. It is located on the eastern edge of the BLM Western Mojave Plan, just west of the Northern and Eastern Mojave (NEMO) Plan.

The land use in the immediate area of the alternative site area is open space, public land. The nearest residences are in Ludlow, California (population 10 in 2000) and approximately 8.5 miles northwest of the Siberia East alternative (U.S. Census 2008). The nearest schools are in Newberry Springs, approximately 32 miles away. The Bagdad Chase Mine is located approximately six miles west of the site and is owned and controlled by Bagdad Chase, Inc. The mine shares an access road to the western half of the Siberia site as proposed in the BLM application.

Infrastructure Availability

The Siberia East alternative is assumed to consist of two interconnected solar plants, each capable of generating 200 MW of power (BSE 2007a).[1] Each plant would have two main elements, a solar field with power towers and a power block with power generation equipment. Each solar field would have four identical circular heliostat arrays that would focus on receiver-boilers at the top of power towers. A gas pipeline approximately 3.2 miles long would be required to connect to one of the four existing natural gas pipelines located in the vicinity of the alternative site. A natural gas pipeline approximately 6 inches in diameter would be required for each of the 200-MW solar power plants.[2]

Water would be provided from wells within the boundary of the project or would be piped in from local wells. Storage tanks for plant make-up water would be located on the power block. The plant would require approximately 100 to 123 acre feet of water per year (AFY).[3]

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[1] The plant design is based on information from the ISEGS AFC Section 6.0 Alternatives that states that the Siberia site would be too small for one contiguous 400-MW power plant but would be adequate for two 200-MW plants (BSE 2007a).

[2] Although the Siberia application does not determine the pipeline diameter at this time as it would be based on the size of each power plant, the ISEGS project would require a 6-inch pipeline for the Ivanpah 3 200-MW power plant; thus it can be assumed that a similar diameter would be required for each 200-MW Siberia power plant. (BSE 2007a).

[3] The Siberia application to the BLM states that it would require approximately 400 to 500 AFY for the entire 1600-MW power plant. For a nominal 400-MW plant, this would translate to approximately 100 to 125 AFY, which corresponds roughly with the 78 AFY of water required by the ISEGS project (BSE 2007b).

It is assumed that the project would require construction of an electrical substation that would connect via a new overhead 230-kV transmission line to an existing transmission line approximately 22 miles northwest of the project site near the Pisgah Substation. The existing Southern California Edison (SCE) transmission lines are 230 kV and 500 kV. The transmission line would be located between existing gas lines in an existing utility corridor (BSE 2007b).

Each field perimeter would include a chain link fence and a weatherized dirt road. Corridors 150 meters wide would surround the fields to allow space for drainage and flood control, should these be required.

It is assumed that the same number of construction and operation workers would be required for the Siberia East alternative as for the proposed ISEGS site. However, due to the limited available housing and temporary lodging in Ludlow, it is likely that the construction workers would use lodging in Barstow, California, approximately 50 miles west of the project site.

Environmental and Engineering Assessment of the Siberia East Alternative

Air Quality

Environmental Setting

Each local air quality district in California establishes its own significance criteria for environmental review of projects based on the specific conditions within each air basin. Like the proposed ISEGS project, the Siberia East alternative would be located within the Mojave Desert Air Basin, regulated by the Mojave Desert Air Quality Management District (MDAQMD). The Siberia East alternative would be located in the Western Mojave Desert where ozone and particulate matter violate ambient standards, despite the very low population density outside Barstow (USEPA 2008). More specific information regarding the Mojave Desert Air Basin and MDAQMD can be found in the **Air Quality** section of this PSA.

Environmental Impacts

The impacts would principally consist of exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment (*e.g.,* ozone precursors, NOx and VOC; other criteria pollutants, such as CO and PM10; and toxic diesel particulate matter emissions) and fugitive particulate matter (dust) from travel on unpaved surfaces. Beyond the boundaries of the project site, exhaust emissions would also be caused by workers commuting to and from the work sites, from trucks hauling equipment and supplies to the sites, and crew trucks (*e.g.,* derrick trucks, bucket trucks, pickups). Because of the remoteness of the site, workers and trucks hauling equipment and supplies would have to commute 50 miles or more to reach the Siberia East alternative.

Emissions from the Siberia East alternative would need to be controlled to satisfy the air permitting requirements of the MDAQMD. As such, construction and operation of the ISEGS project at the Siberia East alternative would be subject to permit requirements, and it would require Energy Commission mitigation, similar to that of the proposed

project, to avoid significant air quality impacts. Appropriate mitigation at the Siberia East alternative site would likely involve similar, locally oriented recommendations such as the conditions of certification presented in the **Air Quality** section of this PSA to reduce PM10 impacts.

Comparison to Proposed Project

The construction emissions resulting from building a 400-MW solar power plant at the Siberia East alternative site would be similar to the construction emissions for the ISEGS project at Ivanpah Basin. Both the Siberia East alternative and the ISEGS site are located in remote areas, so workers would travel from distant urban centers; however, the proposed ISEGS site is located five miles from Primm, Nevada, which could provide housing for the construction workers, whereas the Siberia East alternative is approximately 50 miles from Barstow, which would likely be the closest available housing for the construction workers. As such, during the construction period, commuting emissions would likely be greater for the Siberia East alternative site than for the proposed ISEGS site. Operational emissions from the Siberia East alternative would be similar to those of the proposed ISEGS site.

Biological Resources

The Siberia East alternative is located in the desert region of unincorporated San Bernardino County within the BLM West Mojave Planning Area, bordering the southeastern portion of the Northern and Eastern Mojave (NEMO) Planning Area. The western Mojave Desert comprises a distinct area of the Mojave Desert biome, and flora and fauna have adapted to local conditions and formed distinct natural communities. Freezing temperatures occur on a limited basis in the winter, and summer temperatures regularly exceed 100 degrees. The desert habitat of San Bernardino County includes soils that are predominantly sandy gravel, as well as major dune formations, desert pavement, and dry alkaline lake beds (San Bernardino County 2007). The Mojave Desert region is characterized by arid conditions with low precipitation, and the eastern portion of the West Mojave Planning Area is crossed by expansive alluvial washes.

The West Mojave Planning Area supports a diverse array of plant and wildlife species because of the varied topography and landforms within the planning area (BLM 2005a). The predominant aspect of the West Mojave is a flat, sparsely vegetated region interspersed with mountain ranges and dry lakes. The characteristic creosote bush and saltbush plant communities bloom during years of above-normal winter rainfall, and up to 90 percent of the flora is comprised of annual plants (BLM 2005a).

Most of the vegetation of the West Mojave Planning Area can be classified within creosote bush scrub and saltbush scrub, which occupy up to 75 percent of the natural lands. Most of the vegetation of the NEMO Planning Area (bordering the Siberia East alternative to the west) can be classified within creosote bush/white bursage, creosote bush scrub, mixed saltbush, Joshua tree, blackbush, and Mojave yucca vegetation series (BLM 2002).

The Siberia East alternative would be located primarily in Mojave Desert scrub, specifically creosote bush scrub, mixed scrub, and blackbush scrub (San Bernardino County 2006). Mojave creosote bush scrub is characterized by widely spaced shrubs

separated by bare ground, which is filled with annual grasses and wildflowers during the spring months (BLM 2003). Creosote bush (*Larrea divaricata* ssp. *tridentata*) is found on slopes and well-drained flats below approximately 4,500 feet in elevation and is commonly found with burrobush, boxthorn, and several cacti (San Bernardino County 2006).

Wildlife of the Mojave Desert scrub occurs at low densities and is highly specialized for the arid environment. It includes several rare, unusual, or protected species, including the desert tortoise (*Gopherus agassizii*), which is listed as "threatened" by the state and federal Endangered Species Acts. A California Natural Diversity Database search was conducted for sensitive plant and wildlife species occurring within 10 miles of the Siberia East alternative site. The results of this search are provided in **Alternatives Table 2** and discussed below.

Alternatives Table 2
California Natural Diversity Database Records for Sensitive Species Within 10 Miles of the Siberia East Alternative

Common Name / *Scientific Name*	Status State/Fed/CNPS/BLM	Occurrence Within 10 Miles of Siberia East Alternative
Foxtail cactus *Coryphantha alversonii*	--/--/4.3/--	Occurs approximately six miles west of the site.
White-margined beardtongue *Penstemon albomarginatus*	--/--/1B.2/S	Appropriate habitat exists near the site.
Desert tortoise *Gopherus agassizii*	FT/ST/__	Three occurrences within a 10-mile radius of site.
Mojave fringe-toed lizard *Uma scoparia*	CSC/--/--/S	Occurs northwest of the site.
Prairie falcon *Falco mexicanus*	WL/BSS/--/--	Occurs within 10 miles of site.
Le Conte's thrasher *Toxostoma lecontei*	CSC/BSS/S	Occurs northwest of the site.
Nelson's bighorn sheep *Ovis canadensis nelsoni*	__/__/S	Potential seasonal range six miles north of the site.

Source: CNDDB 2008.

Status Codes:

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

State SE - State listed, endangered
ST = State listed as threatened
WL = State watch list

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

BLM: Sensitive: Bureau of Land Management
BLM Manual § 6840 defines sensitive species as "…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." <www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf>

Sensitive Species

Following are descriptions of the sensitive species in the vicinity of the alternative site. **Foxtail cactus** occurs in Mojave and Sonoran desert scrub in Imperial, Riverside, and San Bernardino counties. It occurs in sandy or rocky soils, usually granitic, at elevations of 75 to 1,525 meters.

White-margined beardtongue occurs in stabilized desert dunes and Mojave sandy desert scrub in San Bernardino County in California, and in Arizona and Nevada. Appropriate habitat exists near the Siberia East alternative; populations near MCAGCC have been disturbed by military activities.

Prairie falcons are found throughout the western Mojave Desert. Nests are located on cliffs in rugged mountain ranges, often within one-half mile of a water source. Mountain ranges near agricultural areas also are favored because of increased prey density near nest sites. In winter, birds disperse widely and are joined by migratory birds from northern latitudes.

Le Conte's thrasher is a desert resident that inhabits areas with sparse desert scrub, alkali desert scrub, and desert succulent scrub habitats with open desert washes. It can be found year-round throughout much of the Mojave and Colorado deserts of California. The Le Conte's thrasher feeds on seeds, insects, small lizards, and other small vertebrates and prefers foraging habitat with accumulated leaf litter under plants.

Nelson's bighorn sheep is widely distributed from the White Mountains in Mono County to the Chocolate Mountains in Imperial County. Bighorn sheep are typically found on open, rocky, steep areas used for escape cover with available water and herbaceous vegetation for forage. Old Dad Mountains and Bristol Range, approximately six miles north of the Siberia East alternative site, are considered a seasonal range for the bighorn sheep with a population estimate of five individuals.

Desert tortoise range throughout the Mojave Desert region of Nevada, southern California, and the southwest corner of Utah and the Sonoran Desert region of Arizona and northern Mexico. The desert tortoise is divided into Mojave and Sonoran populations. The Siberia East alternative falls on the western border of the Northern Colorado desert tortoise recovery unit.

Mojave fringe-toed lizard is endemic to Southern California and a small area of western Arizona. This species is an obligate sand-dweller, found in dunes, sand fields, sand hummocks, and other sand deposits throughout the Mojave Desert in California. Its elevation ranges from 300 to 3,000 feet. Its survival requires conservation of sand ecosystem processes, including the sand source, fluvial sand transport areas, aeolian sand transport areas, and wind corridors.

Environmental Impacts

Construction of the ISEGS Sites and Associated Buildings and Roads. Approximately 4,000 acres of Mojave creosote scrub and other native plant communities would be permanently lost by vegetation clearing, grading, and construction of the solar facilities, potentially affecting special status animal species.

Impacts to listed or sensitive plant species would result from direct or indirect loss of known locations of individuals or direct loss of habitat. Indirect loss of individuals may occur in instances such as sediments transported (e.g., from cleared areas during rain events) that cover adjacent plants or changes in a plant's environment that cause its loss (e.g., adjacent shrubs that provided necessary shade are removed). Additional impacts would occur due to the construction and operation of linear facilities associated with a solar facility at the Siberia East alternative site, including a transmission line approximately 22 miles long and a 3.2-mile gas pipeline.

Impacts/Mitigation to Wildlife—Overview

Building a solar facility at the Siberia East alternative site would potentially have an adverse effect on listed and sensitive wildlife species and their habitats either directly or through habitat modifications. Any wildlife residing within the proposed project area would potentially be displaced, injured, or killed during project activities. Animal species in the project area could fall into construction trenches, be crushed by construction vehicles or equipment, or be harmed by project personnel. In addition, construction activities may attract predators or crush animal burrows or nests.

Migratory/Special Status Bird Species. Mojave creosote bush scrub at the power plant site provides foraging, cover, and/or breeding habitat for migratory birds, including special-status bird species that may be present at the site (LeConte's thrasher). Project construction and operation could impact nesting birds in violation of the Migratory Bird Treaty Act. Preconstruction surveys and avoidance of nesting birds could reduce such impacts.

Desert Tortoise (*Gopherus agassizii*). Construction and operation activities may result in direct or indirect impacts to the desert tortoise (*Gopherus agassizii)* or its occupied habitat. The desert tortoise is a federal- and state-listed threatened species and BLM sensitive species. Mitigation measures for impacts to desert tortoise may include implementing measures to decrease the likelihood of incidental take of desert tortoise and desert tortoise habitat compensation. Desert tortoise could be injured or killed, their activities altered, and their habitat degraded during construction and maintenance activities associated with this solar facility. Use of vehicles and equipment during construction activities could result in injury or death to tortoises. Hatchlings and immature desert tortoises may be particularly vulnerable because their small size and coloration that make them difficult to see. Desert tortoises could fall into uncovered holes or trenches that are dug during construction. In addition, desert tortoises could be entombed by equipment use and other construction activities in proximity to occupied burrows.

Human activities in the Siberia East alternative project area potentially provide food or other attractants in the form of trash, litter, or water, which draw unnaturally high numbers of tortoise predators such as the common raven, kit fox, and coyote. Predation could be reduced through the preparation of a Raven Management Plan and other avoidance and minimization measures such as the conditions of certification presented in the **Biological Resources** section of the PSA.

Spread of Noxious Weeds. Construction of a solar facility at the Siberia East alternative site could result in the introduction and dispersal of invasive or exotic weeds. The permanent and temporary earth disturbance adjacent to native habitats increases the potential for exotic, invasive plant species to establish and disperse into native plant communities, which leads to community and habitat degradation. A weed reduction program could potentially reduce and mitigate impacts.

Noise. Noise from construction activities could temporarily discourage wildlife from foraging and nesting immediately adjacent to the project area. Many bird species rely on vocalization during the breeding season to attract a mate within their territory. Noise levels from certain construction, operations, and demolition activities could reduce the reproductive success of nesting birds.

Lighting and Collisions. The heliostat array at the Siberia East alternative site would be arranged around centralized solar power towers 459 feet high, which would potentially include FAA-required lighting and a lightening pole that would extend above the top of the towers approximately 5 to 10 feet. Lighting may increase the collision risk because lights can attract nocturnal migrant songbirds. Bright night lighting close to the ground at the ISEGS project site could also disturb wildlife that occurs adjacent to the project site (e.g., nesting birds, foraging mammals, and flying insects).

Operation of a 22-mile transmission line could result in increased avian mortality due to collision with new transmission lines. Mitigation could include installing the transmission line in accordance with the Avian Powerline Interaction Committee (APLIC) Guidelines designed to minimize avian-power line interactions.

Staff cannot make definite conclusions about the potential for significant impacts because of the absence of site-specific survey and project design information.

Comparison to Proposed Project

Overall, development of a solar project at the Siberia East alternative site would likely have biological resource impacts similar to those of the proposed ISEGS project. Both projects would have potential for direct take of desert tortoise, and both would permanently eliminate approximately 3,800 acres of habitat for desert tortoise. Like the proposed ISEGS site, a number of special-status plant and animal species are present at the Siberia East alternative site and would be impacted by the proposed project, and both projects would contribute to cumulatively significant loss of Mojave Desert plant and wildlife communities. However, without more site-specific information about biological resources at the Siberia East alternative, detailed comparisons are not possible.

Cultural Resources

Environmental Setting

The Siberia East alternative site is located in San Bernardino County, California, on undeveloped BLM land. The alternative site is located in the Mojave Desert and is bounded by mountains to the south. The California desert has been inhabited for at least 8,000 to 12,000 years and perhaps longer (BLM 2005a). Settlement was centered

on lakes, now the dry playas characteristic of the Mojave Desert and Great Basin. The lakes and marsh environments along the edges had abundant plant and animal species providing food, fibers, medicines, tools, clothing, and ritual objects required for daily life (BLM 2005a).

From 8,000 to 6,000 years before present, climatic change caused the lakes to dry, and food gathering and land use patterns began that continued into the historic period, including a use of a greater variety of habitats, plants, and animals (BLM 2005a). The bow and arrow may have appeared around 2,000 years ago as evidenced by a shift in projectile point types, and the expansion of bow-and-arrow technology is evidenced by the late prehistoric introduction of the Desert Side-Notched and Cottonwood Triangular points found through the California desert (BLM 2005a). A pattern of exploitation of seasonally available resources resulted in the use of large areas by relatively small populations and left archaeological sites widely scattered (BLM 2005a).

The first documented exploration of the Mojave Desert by nonindigenous people occurred in the mid-1700s by Francisco Garces, a Spanish Franciscan priest looking for a route from Arizona to Northern California (BLM 2005a). Much of the history of this region is because of its use as a corridor, one used by fur trappers and caravans. California was annexed in 1848, the same year that gold was discovered, leading to an influx of prospectors (BLM 2005a). Roads were established to transport goods, people, livestock, food, and ore between the Mojave Desert and Los Angeles, and the western Mojave Desert began to have a large mining industry.

Railroad surveys began in 1853; the San Pedro, Los Angeles, and Salt Lake Line, predecessor to the Union Pacific through the Mojave Desert, was completed in 1905, and the Tonopah and Tidewater finished its line from Ludlow to Beatty, Nevada, in 1907 (BLM 2005a). In 1914, a road was completed to parallel the tracks of the Atlantic & Pacific Railroad, which was the precursor to U.S. 66 (National Trails Highway).

Military bases were established in the desert prior to World War II, and large tracks were set aside for military use, including the MCAGCC (BLM 2005a). Further information regarding this region can be found in the **Cultural Resources** section of the PSA.

A cultural record search (CHRIS) was conducted for known resources within the Siberia East alternative site. Because of the sensitive nature of historic resources, the specific locations of the resources are not disclosed.

The San Bernardino Archaeological Information Center (AIC), in its record search report on both the Siberia East and Broadwell Lake alternative sites, stated that the sites were deemed to have a high sensitivity for prehistoric and historic archaeological resources, a low sensitivity for historic resources, and unknown sensitivities for cultural landscapes and ethnic resources (AIC 2008). One recorded NRHP-eligible resource was identified for the Siberia East alternative: the National Trails Highway (Route 66) (SBR-2910H, Nat. Old Trails; AIC, 2008).

Environmental Impacts

One known site, National Trails Highway, would potentially be affected by construction and operation a solar facility at the Siberia East alternative site. The presence of a solar facility at the Siberia East site would likely result in indirect visual impact to the historic architectural resources such as the National Trails Highway (SBR-2910H). This resource has been recommended eligible for the National Register of Historic Places (NRHP). Conditions of certification such as those required for the ISEGS project in the **Cultural Resources** section may reduce this impact; however, specific site surveys would be required to be certain.

Unknown, unrecorded cultural resources may be found at the Siberia East alternative site. As they are discovered, resources are recorded and information retrieved. If the nature of the resource requires it, the resource is protected. When discovered, cultural resources are treated in accordance with applicable federal and state laws and regulations as well as the mitigation measures and permit requirements applicable to a project. It is not known what cultural resources, if any, would be affected by development of a solar facility at the Siberia East alternative site; however, it is reasonable to assume that resources exist and would be uncovered at some places of this site (AIC 2008). As would be done during ISEGS construction at the Ivanpah Basin, should resources be discovered during construction of current and future projects, they would be subject to legal requirements designed to protect them, thereby reducing the effect of impacts.

Comparison to Proposed Project

Overall, development of a solar project at the Siberia East alternative site may have cultural resource impacts similar to those of the ISEGS project at the Ivanpah Basin. However, without more site-specific information about cultural resources at the Siberia East alternative, no more detailed comparison is possible.

Hazardous Materials Management

Environmental Setting

The topography of the Siberia East alternative site is essentially flat, as are the immediately surrounding areas. No sensitive receptors are present in a five-mile radius of the alternative site. The nearest sensitive receptors would be located at Ludlow, approximately 8.5 miles northwest of the Siberia East alternative site.

Access to the Siberia East alternative would likely be via Interstate 40 west from Barstow to the Ludlow exit. At Ludlow, transport would likely turn southeast onto the National Trails Highway past the town of Ludlow and would continue southeast for approximately 10 miles through open space.

Environmental Impacts

Hazardous materials use at the Siberia East alternative, including the quantities handled during transportation and disposal, would be the same as those of the proposed project. As stated in the **Hazard Materials Management** section for the proposed project, hazardous materials used during the construction phase of the project would include

gasoline, diesel fuel, motor oil, lubricants, and small amounts of solvents and paint. No acutely toxic hazardous materials would be used on site during construction, and none of these materials pose a significant potential for off-site impacts as a result of the quantities on site, their relative toxicity, their physical states, and/or their environmental mobility.

Natural gas would be transmitted to the site via a new pipeline from an existing gas line approximately 3.2 miles north of the Siberia East alternative and would likely require another 0.5 to 1.5 miles of pipeline to reach the power block depending on the site layout.

Transportation of hazardous materials to the Siberia East alternative site would require passing through residences located in the town of Ludlow, approximately 8.5 miles from the Siberia East alternative. The transportation route from Interstate 40 on National Trails Highway would be primarily through open space areas.

Comparison to Proposed Project

Because the hazardous materials that would be used at the Siberia East alternative site would be the same as those used at the proposed ISEGS site, and neither site has sensitive subgroups within a five-mile radius, the impacts would be the same at either site. Compared to the proposed project, selecting the Siberia East site would result in similar impacts from transportation of hazardous materials, and with adoption of the proposed conditions of certification, the Siberia East alternative would comply with all applicable laws, ordinances, regulations, and standards (LORS) and result in no significant impacts to the public.

Land Use

Environmental Setting

The Siberia East alternative would be located entirely on BLM land, approximately six miles east of the Bagdad Chase Mine. The land is classified as BLM Multiple Use Class M and would border MCAGCC to the south (BLM 2008b). Multiple Use Class M allows for controlled balance between higher intensity use and protection of public lands. It allows for the use of renewable energy resources after NEPA requirements are met and as such, a solar thermal power plant would be an acceptable use of the Siberia East alternative. The Siberia East alternative would be located on open space far from sensitive land uses, such as residences, educational institutions, and certain public facilities (e.g., religious facilities, health care facilities). The nearest residences, as stated previously, would be located approximately 8.5 miles northwest of the Siberia East alternative.

The Siberia East alternative would also be located within the BLM Western Mojave Planning Area, the purpose of which is to develop management strategies for the desert tortoise, Mohave ground squirrel and over 100 other sensitive plants and animals throughout the western Mojave Desert.

Environmental Impacts

Like the ISEGS proposed site, a key land use plan affecting this project is the U.S. Bureau of Land Management's California Desert Conservation Area (CDCA) Plan of 1980, as amended. The Siberia East alternative, as stated above, is located within areas of the CDCA that are designated Multiple-Use M. The CDCA Plan identifies solar facilities as permitted use on Multiple-Use M lands after NEPA requirements are met. Multiple-Use M is based upon a controlled balance between higher intensity use and protection of public lands. At this time, staff cannot conclude whether the project is in conformance with the CDCA Plan.

Additionally, the Siberia East alternative would be located within the BLM West Mojave Planning Area. The Siberia East alternative would border the NEMO Management Plan which amends the CDCA for those areas identified as the northern and eastern Mojave Desert. Because of potential significant unmitigated biological impacts caused by the project, the Siberia East alternative site may not be compatible with the West Mojave Plan and may therefore create significant impacts. BLM would have to issue a right-of-way agreement for the use of this land following NEPA requirements.

Based on the applicant's review of aerial photographs and field surveys and staff's independent review, there are no agricultural uses or properties within one mile of the proposed project site. Neither the construction nor operation of the proposed project would result in any impacts to existing agricultural operations or foreseeable future agricultural use. The alternative site would have no impact with respect to farmland conversion nor would the Siberia East alternative be located within any grazing allotment.

The Siberia East alternative would fall within the San Bernardino County's Desert Region of the General Plan. Like the proposed ISEGS site, the Development Code identifies the alternative site as Resource Conservation (RC). Resource Conservation comprises the majority of the designated land uses in the county and covers over one million acres, or about 1,500 square miles of land. Most of the land within this designation is publicly owned (federal and state) and includes national parks, military bases, conservation areas, and lands owned by other federal and state agencies. The **Land Use** section of this PSA discusses the San Bernardino County's General Plan and development code RC in further detail.

As with the proposed ISEGS site, the Siberia East alternative would not physically divide an established community because the solar facility site and linear features would be located on undeveloped federal property in unincorporated San Bernardino County and would not be located within or near an established community.

Comparison to Proposed Project

Selecting the Siberia East alternative site would result in similar impacts to land use as would the ISEGS Ivanpah Basin site selection and may result in a significant impact. Similar conditions of certification as those proposed for the Ivanpah Basin site would be required. However, the proposed ISEGS site is located in areas that are designated Multiple-Use Class L (Limited Use). While Multiple-Use Class L is more restrictive than

Multiple-Use Class M, both allow for solar energy plants after complying with NEPA requirements.

Recreation and Wilderness

Environmental Setting

The Siberia East alternative site is approximately six miles south of the BLM Bristol Mountains Wilderness, a 68,515-acre wilderness area comprised of the Bristol Mountains and tilted volcanic plain form (BLM 1998a). It is bordered by National Trails Highway (Historic Route 66) which was the major cross-county highway for the central United States. The highway was popularized by songs and television and stretches for over 2,000 miles from Chicago, Illinois, to Los Angeles, California. Numerous travelers follow Historic Route 66, and numerous roadside museums have been set up adjacent to the recreational route.

BLM has recognized a growth in the number of off-highway vehicles being used in the California Desert District. Numerous trails exist on BLM-managed lands in California; however, the nearest official off-highway vehicle area to the Siberia East alternative site is the Johnson Valley Off-Highway Vehicle Area, over 30 miles west of the site.

Environmental Impacts

Rolling hills block the view of Siberia East alternative from the Bristol Mountain Wilderness, so recreationists using the wilderness would not see the solar facility. The Siberia East alternative would be adjacent to MCAGCC on the south and to the Bagdad Chase Mine on the west. As such, little recreational activity would be affected in the immediate vicinity of the Siberia East alternative. The closest recreational activities would be motorists along National Trails Highway which would border the Siberia East side to the east including visitors to Amboy, approximately 20 miles east of the site. The noise and presence of heavy equipment associated with project construction may be temporarily visible and audible to motorists travelling along the National Trails Highway. The project location at the Siberia East alternative site would be visible to motorists traveling westbound along National Trails Highway especially because there would be little to block the view of the Siberia East alternative.

Comparison to Proposed Project

There is a high level of recreational use at the proposed ISEGS site; the Ivanpah Dry Lakebed alone is visited by an estimated 5,000 visitors annually. Recreation and wilderness impacts would be less severe at the Siberia East alternative site because the site is less intensely used. The solar facility would be blocked from view of recreationists using the Bristol Mountain Wilderness and motorists along Route 66 going east. Motorists using Route 66 going west would have a clear view of the project for an extended time period; however, compared with recreationists on the Ivanpah dry lakebed these impacts are considered less severe.

Noise

Environmental Setting

Generally low levels of ambient noise exist at the Siberia East alternative area, as the region is completely undeveloped BLM land. Noise levels in such natural areas are expected to be as low as 35 to 50 dBA. Intermittent noise is expected to occur at the Siberia East alternative because of operations at the nearby MCAGCC and the Bagdad Chase Mine and because the site borders the BNSF railroad and National Trails Highway. There are no nearby sensitive receptors. The nearest residential area is approximately 8.5 miles northwest of the site in Ludlow.

Environmental Impacts

As stated in the **Noise** section of this PSA, the construction of the ISEGS plant would create noise, or unwanted sound. The character and loudness of this noise, the times of day or night at which it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts. If built in accordance to conditions of certification similar to those proposed for the ISEGS site, no significant adverse noise impacts from construction and operation would be expected to affect people within the receptor area.

Comparison to Proposed Project

While the Siberia East alternative would be in a more isolated location with fewer nearby sensitive receptors than the proposed site, overall noise impacts of the two locations would be similar.

Public Health

Environmental Setting

Staff has reviewed the Siberia East alternative site from the perspective of public health impacts from emissions of toxic air contaminants from all the sources identified in the **Public Health** analysis. The Siberia East alternative site is located in an isolated desert area with no population centers or residences within miles of the alternative site. The nearest small town is located approximately 8.5 miles northwest of the Siberia East alternative site.

Environmental Impacts

While the meteorological conditions and topography at the site are not exactly the same as at the applicant's proposed site, they are similar enough that staff believes the results of air dispersion modeling and a human health risk assessment for the Siberia East alternative site would be similar to that found for the proposed site. The cancer risk and hazard indices are much below the level of significance at the point of maximum impact, so the project would not pose a significant risk to public health.

Comparison to Proposed Project

There is no significant different between this location and the proposed site for public health.

Socioeconomics

Environmental Setting

Like the proposed ISEGS site, the Siberia East alternative is located in San Bernardino County. The demographic characteristics of San Bernardino County are described in the **Socioeconomics** section of the PSA.

Environmental Impacts

Because of the limited population in Ludlow and the surrounding areas, construction workers would most likely be from larger nearby cities such as Barstow. The construction workers would most likely have to commute 50 miles or more daily to reach the construction site due to the limited housing availability in the Ludlow region. There is one motel in Ludlow. An additional option would be to erect temporary housing in the immediate area of the Siberia East alternative site; however, this would increase the construction impacts and require provision of additional services such as electricity, water, and food. Because it is unlikely that the construction workers would relocate to the Ludlow region, the Siberia East alternative would not cause a significant adverse socioeconomic impact on the area's housing, schools, police, emergency services, hospitals, and utilities.

There would be no adverse socioeconomic impacts since most of the construction and operation workforce is within the regional labor market area, and construction activities are short-term. Benefits from the ISEGS project, should it be built at the Siberia East alternative, are likely to be similar to the benefits from ISEGS in the Ivanpah Valley. Benefits include increases in sales taxes, employment, and income for San Bernardino County.

Comparison to Proposed Project

Most of the socioeconomic impacts of the ISEGS project at the Siberia East alternative site would be similar to building and operating the project at the proposed site. However, because of the limited housing options compared with the proposed site, accommodations for the construction workers at the Siberia East alternative would create greater construction impacts than at the proposed ISEGS site.

Soils & Water Resources

Environmental Setting

Soils in the San Bernardino County Desert Region are primarily sandy gravel with high runoff coefficients and fast percolation (San Bernardino County 2006). The desert habitat of San Bernardino County includes soils that are predominantly sandy gravel and include major dune formations, desert pavement, and dry alkaline lake beds (San Bernardino County 2007). The soil families within the Siberia East alternative are primarily *chuckawalla* and *bitter* soils (San Bernardino County 2006).

The entire region is crossed by alluvial wash deposits. Desert soils are susceptible to erosion where disturbed due to the limited vegetation and low moisture content, as well as common high winds and infrequent high-intensity rainfall events that may occur (San Bernardino County 2006).

The Siberia East alternative lies within the Broadwell Valley Groundwater Basin (DWR 2004). The Broadwell Valley Groundwater Basin underlies a north trending valley in south-central San Bernardino County. Elevation of the valley floor ranges from about 2,600 feet on the west to 1,296 feet above mean sea level at Broadwell (dry) Lake. The basin is bounded by non-water-bearing consolidated rocks of the Cady Mountains on the north and west, the Bristol Mountains on the north and east, the Bullion Mountains on the south, and a surface drainage divide on the southwest. The Cady Mountains attain elevations exceeding 4,600 feet (DWR 2004).

The total storage capacity of the Broadwell Valley basin is estimated at approximately 1,200,000 acre feet (DWR 2004). The recharge of the basin is primarily through percolation of runoff through alluvial fan deposits at the base of the Cady and Bullion Mountains and from infiltration of precipitation that falls to the valley floor. Because much of the land in the Broadwell Valley Groundwater Basin is public land with very low population density, there has been little groundwater development, and little is known about the basin. Of the few wells known to exist in the basin, most are dry. Groundwater has been encountered at depths of 785 and 1,084 feet at a well located at Ludlow in 1883, and at a depth of 102 feet at a well on the west side of the Broadwell Lake in 1979 (DWR 2004).

Environmental Impacts

Soil Erosion Potential by Wind and Water. As stated in the **Soils and Water** section of this PSA, construction activities can lead to adverse impacts to soil resources including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water-dependent habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters. Access to the Siberia East alternative site would require creating approximately 2 miles of access roads, similar to the 1.9-mile improvement required for the proposed ISEGS site. Additionally, while the volume of earth movement is unknown at this time, the topography and slopes are similar. Therefore, it is expected that the large footprint and extensive grading required for the facilities would be similar at both the Ivanpah and Siberia East alternative sites, and similar erosion and sedimentation control methods would be used at both sites. Because of the high erosion potential of the desert soil, impacts to the soils at the Siberia East alternative site would likely be significant and require mitigation similar to the mitigation required at the Ivanpah Basin site. Low Impact Development principles would likely be used at this site, as at the ISEGS site, and grading plans, a Storm Water Pollution Prevention Plan (SWPPP), and a Drainage Erosion and Sediment Control Plan (DESCP) would be required. While grading plans, an SWPPP, and a DESCP would potentially reduce impacts to a less than significant level, near final grading plans,

the SWPPP, and the DESCP would need to be prepared and reviewed to be certain this would be feasible.

Storm Water. As stated in the **Soils and Water** section, potentially significant water quality impacts could occur during construction, excavation, and grading activities if contaminated or hazardous soil or other materials used during construction were to drain off site. The Siberia East alternative site is in an undeveloped area. Brush would be cleared prior to grading. The storm water runoff percolates either into the soil or into flows overland off site. Impacts from storm water runoff would likely be similar to those at the Ivanpah Basin site because of the high volume of earth displacement and the long duration for construction. Similar conditions of certification would be required.

Project Water Supply. It is unlikely that groundwater would be encountered during grading activities as the recorded depth to groundwater in the Broadwell Lake Valley Groundwater Basin is between 100 and 1,000 feet as stated above. The volume of groundwater required for construction would be similar to that required for constructing the projects at the Ivanpah Basin location; however, it is unknown at this time if there is sufficient groundwater available in the Broadwell Lake Valley Groundwater Basin to meet the construction requirements.

Wastewater. Groundwater would be needed during construction of the ISEGS project at the Siberia East alternative. Once used, this water would be reused to the extent possible and then discharged as wastewater. Improper handling or containment of construction wastewater could cause a broader dispersion of contaminants to soil or groundwater. The discharge of any nonhazardous wastewater during construction would be required to be in compliance with regulations for discharge. Water that could not be reused would be transported to an appropriate treatment facility. With implementation of required regulations, impacts would likely be less than significant.

Comparison to Proposed Project

Due to the large footprint and extensive grading required for the solar facility at both the Ivanpah and Siberia East alternative sites, similar erosion and sedimentation control methods would be used at both sites. Impacts to soil and water erosion would be similar at the two sites; however, whether sufficient water is available at the Siberia East alternative site is unknown.

Traffic & Transportation

Environmental Setting

The Siberia East alternative would be located approximately five miles south of Interstate 40 and adjacent to the National Trails Highway (Historic Route 66). As shown in **Alternatives Figure 1** and **Alternatives Figure 2**, access to this site would be via Interstate 40 to the Crucero Road exit in Ludlow, then approximately 11.5 miles southeast on National Trails Highway.

The Siberia East alternative site entrance would most likely be from the National Trails Highway, adjacent to the BNSF right-of-way. The railroad crossing is located approximately one mile north of the site, adjacent to the National Trails Highway. The

Siberia East alternative would border the MCAGCC to the south which is used for ground, air, and logistics combat elements. Military review may be required for structures above 80 feet.

Environmental Impacts

Similar to the ISEGS project at Ivanpah Basin, before construction could occur for the Siberia East alternative, a construction traffic control and transportation demand implementation program would need to be developed in coordination with Caltrans. This analysis may result in the need to limit construction-period truck and commute traffic to off-peak periods to avoid or reduce traffic and transportation impacts. These impacts would likely be less severe than those of the proposed project because construction at the Siberia East alternative would not require travel on Interstate 15 east of Barstow, so the Interstate15 areas with most severe congestion would be avoided. The impacts caused by construction at the Siberia East alternative would likely be less than significant through proper coordination with local agencies.

The project would potentially impact the BNSF right-of-way because it would be located less than one mile south of an active railroad crossing. The National Trails Highway separates the Siberia East alternative site from the BNSF so impacts would be limited to the nearest railroad crossing, which would be approximately 2.5 miles from the Crucero Road entrance to National Trails Highway. Impacts to rail operations would be less than significant through proper coordination with local agencies.

Additionally, the Siberia East alternative borders the MCAGCC and, as would be the case at the ISEGS proposed site, may require additional marking and lighting along the power towers in order to ensure safety of aircraft.

Comparison to Proposed Project

Impacts to traffic and transportation at the Siberia East alternative site would be similar to those at the proposed ISEGS site; however, the Siberia East alternative site would not require the use of Interstate 15 east of Barstow during the highly congested Friday afternoon time period. As such, the Siberia East alternative site would likely have fewer impacts on traffic and transportation than the Ivanpah Basin site.

Transmission Line Safety and Nuisance

Environmental Setting

The transmission connection of the Siberia East alternative to the SCE system would be via overhead transmission lines to an existing transmission line approximately 22 miles northwest of the project site near the Pisgah Substation. The existing SCE transmission lines at this location are 230 kV and 500 kV. The Siberia East alternative site is in an uninhabited open space crossed by a BLM utility corridor. BLM utility corridors are typically between two and five miles wide to provide flexibility in selecting alternative routes for rights-of-way (BLM 1999). Four pipelines are located within the utility corridor, including the El Paso and Mojave pipelines and two Pacific Gas and Electric Company (PG&E) pipelines (BSE 2007b). Both the El Paso and the Mojave pipelines are two of the largest interstate pipelines in the United States and are regulated by the Federal Energy Regulatory Commission (FERC). The nearest transmission line is located

approximately 11 miles north of the Siberia East alternative site. The new transmission interconnection would not cross any residences; it would be located approximately three miles south of the town of Ludlow.

Environmental Impacts

Power generated at the Siberia East alternative would travel from a new on-site switchyard to the SCE transmission line via a new overhead transmission line following an existing utility corridor which parallels the National Trails Highway from the Siberia East alternative site until crossing the National Trails Highway and Interstate 40 around the Pisgah Substation. Similar to the proposed project, this alternative would not be likely to cause transmission line safety hazards or nuisances.

The transmission line is not expected to pose an aviation hazard, and the applicant has consulted with the Department of Defense for any potential height restrictions due to the proximity of the solar plant site and transmission line with the MCAGCC (BSE 2007b). As stated in the **Transmission Line Safety and Nuisance** section, the potential for nuisance shocks would be minimized through grounding and other field-reducing measures that would be implemented in keeping with current standard industry practices, and the potential for hazardous shocks would be minimized through compliance with the height and clearance requirements of CPUC's General Order 95. Compliance with Title 14, California Code of Regulations, section 1250, would minimize fire hazards, while the use of low-corona line design, together with appropriate corona-minimizing construction practices, would minimize the potential for corona noise and its related interference with radio-frequency communication in the area around the route. As with the proposed ISEGS transmission lines, the public health significance of any related field exposures cannot be characterized with certainty. The only conclusion to be reached with certainty is that the proposed lines' design and operational plan would be adequate to ensure that the generated electric and magnetic fields are managed to an extent the CPUC considers appropriate in light of the available health effects information.

However, the length of the proposed project's new transmission line would be approximately 5,800 feet (for Ivanpah 1; Ivanpah 2 and 3 would require shorter interconnections) compared to the 22 miles of transmission line that would be required for the Siberia East alternative.

Comparison to Proposed Project

The Siberia East alternative site would require a longer transmission line interconnection with the SCE transmission system; however, because it would not pass or be adjacent to any residences, there would be no difference between the Siberia East alternative and the proposed Ivanpah Basin ISEGS site for transmission line safety and nuisance.

Visual Resources

Environmental Setting

There are no structures other than the Bagdad Chase Mine near the alternative site and no structures of notable height. The Mojave Pipeline Operating Company right-of-way is

less than one mile north of the project; however, the pipeline markers are short and minimally visible. Views from the Siberia East alternative site to the north and east are of undisturbed desert landscape crossed by a few unpaved roads, with the Bristol Mountain Range visible to the northeast of the site. The Bristol Mountain Wilderness is located approximately five miles north of the Siberia East alternative. National Trails Highway (Historic Route 66) borders the site to the east and introduces a more developed character to the otherwise undeveloped site. The MCAGCC is adjacent to the site to the south; however, views to the south are relatively pristine and low ridges block the site from the more developed areas of MCAGCC.

Environmental Impacts

As stated in the **Visual Resource** section, the Energy Commission staff, in coordination with BLM, applied the BLM Visual Resource Management (VRM) system of visual assessment to the proposed ISEGS site at Ivanpah Basin. The existing visual setting baseline under the VRM methodology is characterized in terms of Visual Resource (VR) Classes. Under the VRM system, areas of the project viewshed are delineated and mapped based on broadly uniform characteristics of visual quality, viewers' sensitivity, and distance from project to viewers. These delineated areas are then assigned a VR Class (from I through IV). VR Classes are analogous to Overall Sensitivity ratings under the Energy Commission method and are used to determine an area's visual objective, that is, the level of project-caused contrast that is acceptable, above which contrast could constitute a potentially significant adverse impact. The areas considered for the Siberia East alternative were not assigned a VR Class so a formal impact determination under BLM's system cannot be made.

At the Siberia East alternative, views of the desert would change from a relatively undisturbed desert landscape to an industrial, highly altered one, dominated by roughly four square miles of mirror-arrays and 459-foot-tall solar collector towers, graded areas, and retention ponds, as well as light rays reflected off ambient atmospheric dust and the bright glow of the receiving portions of the solar collectors. Intervening ridges would block the view of the site from Interstate 40 and the Bristol Mountains Wilderness.

The site would be prominently visible from the National Trails Highway (Route 66), particularly for westbound traffic. Travelers would see the site from a distance and there is little elevation or natural contouring to block the solar power towers. The ridges on the northern border of the MCAGCC would border the site to the south and as such would block the Siberia East alternative from sensitive viewers to the south.

The linear facilities associated with the Siberia East alternative site include a gas pipeline approximately three miles long and a 230-kV transmission line approximately 22 miles long. Construction of the gas pipeline would create a visible scar across the desert landscape that would remain for many years, even with restoration efforts. The transmission line would be prominently visible from Route 66 and Interstate 40. The transmission line would follow the existing utility corridor and would meet up with and roughly parallel Interstate 40 for approximately 7.5 miles until reaching the existing SCE transmission lines adjacent to the Pisgah Substation. The Siberia East alternative interconnection would introduce additional industrial character to the Interstate 40 and Route 66 corridors.

Comparison to Proposed Project

The proposed Ivanpah site is preferred over the Siberia East alternative site because while Siberia East would be visible to fewer people than the proposed ISEGS site, it would be located in a much more remote and pristine area. The ISEGS project is located in an area with substantially more development and use because of its location along Interstate 15, adjacent to Primm, Nevada, and adjacent to heavily used recreation areas. As a result, a large solar project in the Siberia East area would create a more dramatic change to the visual environment than would occur at the ISEGS site.

The Siberia East alternative transmission line would create more visual impacts than the Ivanpah Basin transmission interconnection. The interconnection transmission line at the Siberia East alternative would be significantly longer than the Ivanpah Basin transmission interconnection and would be adjacent to the frequently travelled Interstate 40 for approximately 7.5 miles.

Waste Management

Environmental Setting

As stated in the **Waste Management** section, hazardous and nonhazardous solid and liquid waste, including wastewater, would be generated at the ISEGS project during construction and operation of the solar power plant. Waste would be recycled where practical and nonrecyclable waste would be deposited in a Class III landfill. The nearest waste disposal facility that could potentially accept the nonhazardous construction and operation wastes generated by the project is the Barstow Sanitary Landfill in Barstow, California. The remaining capacity for the disposal facility is 924,401 cubic yards, and the Barstow Sanitary Landfill Expansion plan is currently undergoing environmental review (CIWMB 2008).

The hazardous waste generated during this phase of the project would consist of electrical equipment, used oils, universal wastes, solvents, and empty hazardous waste materials (BSE 2007a, section 5.14.1.2). Universal wastes are hazardous wastes that contain mercury, lead, cadmium, copper, and other substances hazardous to human and environmental health. Examples of universal wastes are batteries, fluorescent tubes, and some electronic devices. Section 5.14.4.2.2 of the ISEGS AFC discusses the two Class I landfills that accept hazardous wastes and are open in California: the Clean Harbor Landfill (Buttonwillow) in Kern County and the Chemical Waste Management Landfill (Kettleman Hills) in Kings County. The Kettleman Hills facility also accepts Class II and Class III wastes. In total, there is in excess of 11 million cubic yards of remaining hazardous waste disposal capacity at these landfills, with approximately 30 years of remaining operating lifetimes.

Environmental Impacts

Construction at the Siberia East alternative site would require excavation of fill material that underlies the site similar to that of the proposed project. Both nonhazardous and hazardous wastes would be created by the construction of the ISEGS project at the Siberia East alternative in similar quantities as at the proposed ISEGS site and would be disposed of at appropriate facilities. As with the proposed ISEGS site, the applicant would be required to obtain a unique hazardous waste generator identification number

for the site prior to starting construction and would be required to comply with similar conditions of certification. The project would produce minimal maintenance and plant wastes.
All nonhazardous wastes would be recycled to the extent possible, and nonrecyclable wastes would be regularly transported off site to a local solid waste disposal facility. Generation plant wastes include: oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other miscellaneous solid wastes, including the typical refuse generated by workers. As with the proposed project, all construction and operation activities would need to be conducted in compliance with regulations pertaining to the appropriate management of wastes. The total amount of nonhazardous waste generated from the project is estimated to be less than 300 cubic yards of solid waste from construction, and approximately 250 cubic yards per year from operation. This would contribute less than 4 percent of the available landfill capacity. Staff finds that disposal of the solid wastes generated by the ISEGS can occur without significantly impacting the capacity or remaining life of any of these disposal facilities.

Like nonhazardous wastes, hazardous wastes would be recycled to the extent possible. The four tons of hazardous waste from the ISEGS requiring off-site disposal would be far less than staff's threshold of significance and would therefore not significantly impact the capacity or remaining life of the Class I waste facilities. Similar to the proposed project, the project would need to implement a comprehensive program to manage hazardous wastes and obtain a hazardous waste generator identification number (required by law for any generator of hazardous wastes).

Comparison to Proposed Project

The environmental impacts of waste disposal at the Siberia East alternative site would be similar to those at the proposed ISEGS site at Ivanpah. While the Siberia East alternative is closer to the Barstow Sanitary Landfill, the Ivanpah site has the option of using two additional landfills in Nevada (see the **Waste Management** section).

Worker Safety and Fire Protection

Environmental Setting

The Siberia East alternative site would be located within an area that is open space. The area is currently served by the San Bernardino County Fire Department. See the **Worker Safety and Fire Protection** section for more information regarding the San Bernardino County Fire Department. The fire risks of this alternative would be similar to those of the proposed Ivanpah Basin site as there are a similar habitat and desert conditions. There is potentially less likelihood of a fire starting at the Siberia East alternative site because, unlike the proposed Ivanpah Basin site, it is not adjacent to a heavily used transportation corridor.

Environmental Impacts

Similar to the proposed Ivanpah Basin project, it would be appropriate for a solar plant at Siberia East to provide a Project Demolition and Construction Injury and Illness Prevention Program and a Project Operations Safety and Health Program in order to ensure adequate levels of industrial safety. The applicant would also be required to provide safety and health programs for project construction, operation, and

maintenance, similar to the requirements for the proposed Ivanpah Basin project site. Also similar to the proposed project, the San Bernardino County fire department would be contacted to assure that the level of staffing, equipment, and response time for fire services and emergency medical services are adequate.

Comparison to Proposed Project

Staff concludes that the environmental impact of worker safety and fire protection at the Siberia East alternative site would be similar to that at the proposed Ivanpah Basin site.

Engineering Assessment for Siberia East Alternative

Facility Design

The project's design at the Siberia East alternative would be similar to that of ISEGS at the proposed project Ivanpah Basin site. As with the proposed site, staff-recommended measures may be appropriate to ensure compliance with engineering laws, ordinances, regulations, and standards applicable to the design and construction of the project.

Geology & Paleontology

Environmental Setting

The Siberia East alternative site is located in an area mapped as Pleistocene to Holocene Age alluvium. No known geologic resources exist at the Siberia East alternative site. Active mineral resources occur in the hills surrounding the Siberia East alternative.

The Ludlow fault, which has had Pleistocene-age movement, crosses the site (USGS 2008). The active Pisgah-Bullion faults, located 13.9 miles southwest of the Siberia East alternative, produced the M7.3 Landers earthquake in 1992 and the M7.1 Hector Mine earthquake in 1999. Pleistocene age cinder cones are within 20 miles of the sites.

Alternatives Table 3 gives a comparison of the seismic parameters at the Siberia East, Broadwell Lake, and proposed Ivanpah Basin site. This includes faults within 100 miles of the solar plant site and estimates of potential seismic ground motion. The peak bedrock ground acceleration is shown to be higher for both the Siberia East alternative and the Broadwell Lake alternative than for the proposed ISEGS site at Ivanpah Basin.

Alternatives Table 3. Comparison of Seismic Parameters

Seismic Parameter	Broadwell Lake	Siberia East	Ivanpah Basin
Bedrock PGE (2% in 50 years)	0.42 g	0.44 g	0.15 g
Bedrock PGE (10% in 50 years)	0.21g	0.23 g	0.08g
Number of active faults within 100 miles	34	37	14
Closest active fault	14.7 miles	13.9 miles	51.3 miles
Max. PGE at site if max. earthquake on active fault (Site Class D)	0.21g	0.22 g	0.10g
Number of M5.0 earthquakes within 100 miles	83	94	23
Closest M5.0 earthquake	10.8 miles	6.5 miles	46.1 miles
Max. PGE site has experienced during historic	0.19g	0.25 g	0.07g

Seismic Parameter	Broadwell Lake	Siberia East	Ivanpah Basin
earthquakes			

PGE: Peak ground acceleration

Environmental Impacts

Seismic ground shaking is probable at the alternative site because the Ludlow fault crosses the site. The number of active faults within 100 miles of the alternatives is listed in **Alternatives Table 3, Comparison of Seismic Parameters**, along with the distance from the project site and maximum earthquake magnitude. **Alternatives Table 3** shows the peak acceleration and estimated intensity the site would experience during a maximum magnitude earthquake on each fault. The severity and frequency of ground shaking associated with earthquake activity at the Siberia East alternative is higher than at the proposed Ivanpah Basin site as can be seen in the table: the maximum Peak Ground Acceleration (PGE) experienced at the Siberia East alternative during historic earthquakes is 0.19 g, compared with only 0.07g for the proposed Ivanpah Basin site. As such, more stringent design criteria may be required for the Siberia East alternative in accordance with a design-level geotechnical report and California Building Code (2007) standards. Adequate design parameters for the facility would need to be determined through a site-specific evaluation by a Certified Engineering Geologist or Geotechnical Engineer. Impacts due to seismic hazards and soil conditions would be addressed by compliance with the requirements and design standards of the California Building Code.

The paleontological sensitivity and potential to encounter significant paleontological resources in Quaternary alluvium at the alternative site and the Ivanpah Basin site is similar. As stated in the **Geology and Paleontology** section, construction of the proposed project will include grading, foundation excavation, utility trenching, and possibly drilled shafts. There exists the probability of encountering paleontological resources. As with the Ivanpah Basin site, the proposed conditions of certification are designed to mitigate any paleontological resource impacts to a less-than-significant level.

Comparison to Proposed Project

With the exception of stronger ground shaking, the Siberia East alternative site is subject to geologic hazards of similar magnitude as the Ivanpah Basin site. Strong ground shaking could be effectively mitigated through facility design. The potential to encounter geologic resources and significant paleontological resources at both alternative sites is similar to the Ivanpah Basin site. The conditions of certification provided in the **Geology and Paleontology** section would be applicable to the Siberia East alternative.

Power Plant Efficiency

The plant configuration and solar power tower technology that would be employed at the Siberia East alternative would be similar to the proposed project, which means it would result in similar consumption of fuel, and it would result in a similar level of efficiency.

Power Plant Reliability

The plant configuration at the Siberia East alternative would be similar to the proposed project, which means it would result in similar levels of equipment availability. Plant maintainability, fuel and water availability, and reliability of the plant in relation to natural hazards would each be similar to the proposed project.

Transmission System Engineering

Locating a solar facility at the Siberia East alternative would require re-evaluating the capacity of the SCE transmission lines that would be used for interconnection. This alternative may cause adverse effects to the SCE transmission system and require system upgrades. Moreover, it may not accomplish the project goal to be on line in 2011 because of grid improvement constraints.

Summary of Impacts

The Siberia East alternative would have impacts similar to the proposed ISEGS site at Ivanpah Basin for air quality (operational impacts and most construction impacts), hazardous materials management, noise, visual resources, public health, transmission line safety and nuisance, waste management, worker safety and fire protection, facility design, power plant efficiency and power plant reliability.

The Siberia East alternative would be less preferred than the proposed ISEGS site at Ivanpah Basin for air quality (commuting impacts during construction impacts only), socioeconomics, geology and paleontology, and transmission system engineering. The Siberia East alternative would be preferred to the proposed ISEGS site at Ivanpah Basin for land use, recreation, and traffic and transportation.

It is believed that impacts to biological resources and cultural resources would be similar at the Siberia East alternative and at the proposed Ivanpah Basin site; however, without more site-specific information about biological and cultural resources at the Siberia East alternative, a detailed comparison is not possible. Similarly, it is believed that impacts to soils and water at the Siberia East alternative would be similar to those at the proposed Ivanpah Basin site; however, it is uncertain if there is groundwater available at the Siberia East alternative site.

BROADWELL LAKE ALTERNATIVE

The Broadwell Lake site was considered as an alternative to the Ivanpah Basin site and as a site for a potential future solar facility (BSE 2007a). Independently, BrightSource submitted an Application for Transportation and Utility Systems and Facilities on Federal Lands to the BLM on January 25, 2007 to develop up to 500 MW of solar power at this site (BSE 2007c).

The Broadwell Lake alternative would be located on BLM land, approximately 8.5 miles north northwest of Interstate 40 at Ludlow. The Broadwell Lake alternative is located in unincorporated San Bernardino County, approximately 1.5 miles east of the Kelso Dunes Wilderness, approximately 7 miles north-northwest of the Bristol Mountains Wilderness, and approximately 1 mile west of the Broadwell Dry Lake. National Trails Highway (Route 66) and Interstate 40 are located approximately 8.5 miles south of the

alternative site, and the historic Tonopah and Tidewater Railroad is located approximately 7 miles south of the site.

Adequate land is available at the Broadwell Lake alternative site. Approximately 5,000 acres located just west of the Broadwell Dry Lake have appropriate solarity and less than 5 percent slope and are located entirely on BLM public land. The elevation of the site is approximately 1,300 feet above mean sea level. The site would be accessed via Crucero Road, a one-lane dirt road with an exit off Interstate 40 (DWR 2004).

The Broadwell Lake alternative as defined in this PSA is located on BLM public lands, which are managed under the principle of multiple use and sustainable yield and are designated Multiple Use Class L (Limited) and M (Moderate) for a controlled balance between higher intensity use and protection of public lands (BLM 2008c). The site is located within the NEMO Planning Area.

Broadwell Dry Lake is located approximately one mile east of the site. The land use character of the immediate alternative site area is open space and public land. The eastern portion of the dry lake and the mountains to the east are designated as wilderness—BLM's Kelso Dunes Wilderness Area.

The nearest residences are in Ludlow, CA (population 10 in 2000), approximately 7.5 miles south of the Broadwell Lake alternative (U.S. Census 2008). The nearest schools are in Newberry Springs, approximately 32 miles away.

Infrastructure Availability

The Broadwell Lake alternative would have four interconnected plants, each capable of generating 100 MW of power (BSE 2007c). Each plant would have two main elements, a solar field with power towers, and a power block with power generation equipment. Each solar field would have four identical circular heliostat arrays that would focus on receiver-boilers at the top of distributed power towers. Each plant would require approximately 830 acres. A gas pipeline approximately six miles long would be required to connect to the existing natural gas pipeline located approximately two miles north of Interstate 40 (BSE 2007c).

Water would be provided from wells within the boundary of the project or would be piped in from local wells. Storage tanks for plant make-up water would be located on the power block. The plant would require approximately 400 acre feet of water per year (BSE 2007c).[4]

The project would require construction of an electrical substation that would connect via overhead transmission lines to an existing transmission line approximately one mile northwest of the project site. The existing SCE transmission lines are 230 kV and 500 kV. It is assumed that the alternative would require construction of a new one-mile 230-kV transmission line and would require a new right-of-way (BSE 2007c).

[4] According to the BrightSource application to the BLM for a 500-MW solar facility at the Broadwell Lake site, the project would use 500 AFY (BSE 2007c). This is substantially more per MW than the water requirements at either the Siberia East alternative or at the proposed Ivanpah Basin ISEGS site.

Each field perimeter would include a chain link fence and a weatherized dirt road. Corridors 150 meters wide would surround the fields to allow space for drainage and flood control, should these be required.

It is assumed that the same number of construction and operation workers would be required for the Broadwell Lake alternative as for the proposed ISEGS site at Ivanpah Basin. However, due to the limited available housing and hotels or motels in Ludlow, it is likely that the construction workers would use lodging in Barstow, California, approximately 50 miles west of the project site.

Environmental and Engineering Assessment of the Broadwell Lake Alternative

Air Quality

Environmental Setting

Each local air quality district in California establishes its own significance criteria for environmental review of projects based on the specific conditions within each air basin. Similar to the proposed ISEGS project at Ivanpah Basin, the Broadwell Lake alternative site would be located within the Mojave Desert Air Basin, regulated by the Mojave Desert Air Quality Management District (MDAQMD). The Broadwell Lake alternative would be located in the Western Mojave Desert where ozone and particulate matter violate ambient standards, despite the very low population density outside Barstow (USEPA 2008). More specific information regarding the Mojave Desert Air Basin and MDAQMD can be found in the **Air Quality** section of this PSA.

Environmental Impacts

The impacts would principally consist of exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment (*e.g.,* ozone precursors, NOx and VOC; other criteria pollutants, such as CO and PM10; and toxic diesel particulate matter emissions) and fugitive particulate matter (dust) from travel on unpaved surfaces. Beyond the boundaries of the project site, exhaust emissions would also be caused by workers commuting to and from the work sites, from trucks hauling equipment and supplies to the sites, and crew trucks (*e.g.,* derrick trucks, bucket trucks, pickups). Because of the remoteness of the site, workers and trucks hauling equipment and supplies would have to commute 50 miles or more to reach the Broadwell Lake alternative.

Emissions from the Broadwell Lake alternative would need to be controlled to satisfy the air permitting requirements of the Mojave Desert Air Quality Management District (MDAQMD). As such, construction and operation of the ISEGS project at the Broadwell Lake alternative would be subject to permit requirements, and it would require Energy Commission mitigation, similar to that of the proposed project at Ivanpah Basin, to avoid significant air quality impacts. Appropriate mitigation at the Broadwell Lake alternative site would likely involve locally oriented recommendations such as the conditions of certification presented in the **Air Quality** section of this PSA to reduce PM10 impacts.

Comparison to Proposed Project

The construction emissions resulting from building a 400-MW solar power plant at the Broadwell Lake alternative site would be similar to the construction required for the construction of the ISEGS project at Ivanpah Basin. Both the Broadwell Lake alternative and the Ivanpah Basin site are located in remote areas so workers would travel from distant urban centers; however, the proposed Ivanpah Basin site is located 5 miles from Primm, Nevada, which could provide housing for the construction workers; whereas, the Broadwell Lake Alternative is approximately 50 miles from Barstow, which would likely be the closest available housing for the construction workers. As such, emissions from the commute of the construction workers would likely be greater at the Broadwell Lake alternative than at the proposed Ivanpah Basin site. Operational emissions from the Broadwell Lake alternative would be similar to those for the proposed Ivanpah Basin site.

Biological Resources

Environmental Setting

The Broadwell Lake alternative would be located in between the southeastern portion of the Northern and Eastern Mojave Planning Area (NEMO) and the Western Mojave Planning Area in the desert region of San Bernardino County. The desert regional habitat of San Bernardino County includes soils that are predominantly sandy gravel and include major dune formations, desert pavement, and dry alkaline lake beds (San Bernardino County 2007). The Mojave Desert region is characterized by arid conditions with low precipitation. The entire planning region is crossed by expansive alluvial washes. The Broadwell Lake alternative would be located approximately one mile west of the Broadwell Dry Lake. Dry lake beds support a vegetation community of primarily fleshy salt-tolerant plants such as iodine bush and seepweed (San Bernardino County 2006). The density and variety of plants found in such regions are naturally low.

Please refer to “Biological Resources,” “Environmental Setting” under the Siberia East alternative for information regarding the biological resources of the Western Mojave Planning Area. Most of the vegetation of the NEMO planning area can be classified within the creosote bush/white bursage, creosote bush scrub, mixed saltbush, Joshua tree, blackbush, and Mojave yucca vegetation series (BLM 2002). The Broadwell Lake alternative would be located primarily in Mojave Desert scrub, specifically, creosote bush scrub, mixed scrub, and blackbush scrub (San Bernardino County 2006). Mojave creosote bush scrub is characterized by widely spaced shrubs separated by bare ground that is filled with annual grasses and wildflowers during the spring months (BLM 2003). Creosote bush (*Larrea divaricata* ssp. *tridentata*) is found on slopes and well-drained flats below approximately 4,500 feet in elevation and is commonly found with burrobush, boxthorn, and several cacti (San Bernardino County 2006).

Wildlife of the Mojave Desert scrub occurs at low densities and is highly specialized for the arid environment. It includes several rare, unusual, or protected species, including the desert tortoise (*Gopherus agassizii*). The desert tortoise, which occurs throughout most of San Bernardino County’s deserts, is fully protected by both the California and the federal Endangered Species Acts.

The Broadwell Lake alternative falls within the Broadwell Valley Water Basin and within the Southern Mojave watershed. The basin underlies a north trending valley in south-central San Bernardino County. Elevation of the valley floor ranges from approximately 2,600 feet on the west to 1,296 feet above sea level at Broadwell Dry Lake (DWR 2004). Average annual precipitation ranges from 3 to 5 inches with runoff draining toward the Broadwell Dry Lake (DWR 2004). The Mojave River is the predominant water body in the Mojave Desert, spanning the eastern San Bernardino Mountains near Hesperia, eastward through Afton Canyon, and terminating in Soda Lake within the Mojave National Preserve. Most of the water flow is subterranean; however, the water is forced to the surface in Afton Canyon (BLM 2003). The Mojave River is located approximately 20 miles northeast of the Broadwell Lake alternative site.

Wildlife of the Mojave Desert scrub occurs at low densities and is highly specialized for the arid environment. It includes several rare, unusual, and protected species, including the desert tortoise (*Gopherus agassizii*) which is listed as “threatened” by the state and federal Endangered Species Acts.

A California Natural Diversity Database (CNDDB) search was conducted for sensitive plant and wildlife species occurring within 10 miles of the Broadwell Lake alternative. The results of this search are provided in **Alternatives Table 4** and discussed below.
Alternatives Table 4. California Natural Diversity Database Records for Sensitive Species Within 10 Miles of the Broadwell Lake Alternative

Alternatives Table 4

Common Name/ *Scientific Name*	Status State/Fed/CNPS/BLM	Occurrence Within 10 miles of Broadwell
Foxtail cactus *Coryphantha alversonii*	--/--/4.3/--	Occurs approximately three miles northeast of the site.
Emory's crucifixion-thorn *Castela emoryi*		Occurs in numerous locations southwest of the site.
White-margined beardtongue *Penstemon albomarginatus*	--/--/1B.2/S	Appropriate habitat available near site north and south of the I-40.
Desert tortoise *Gopherus agassizii*	ST/FT/__	No records within 10 miles of site, but potential habitat available.
Mojave fringe-toed lizard *Uma scoparia*	CSC/--/--/S	Occurs southeast and southwest of the site.
Le Conte's thrasher *Toxostoma lecontei*	CSC/BSS/S	Occurs southeast of the site.
Nelson's bighorn sheep *Ovis canadensis nelsoni*	--/--/--/--/S	Potential seasonal range six miles north of the site, and a population of 25 individuals known to occur within two miles west of the site in the Cady Mountains.

Source: CNDDB 2008.

Status Codes:

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

State SE - State listed, endangered
ST = State listed as threatened
WL = State watch list

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

BLM: Sensitive: Bureau of Land Management
BLM Manual § 6840 defines sensitive species as "…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." <www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf>

Sensitive Species

Foxtail cactus occurs in Mojave and Sonoran desert scrub in Imperial, Riverside, and San Bernardino counties. It occurs in sandy or rocky soils, usually granitic, at elevations of 75 to 1,525 meters.

White-margined beardtongue occurs in stabilized desert dunes and Mojave sandy desert scrub in San Bernardino County in California, and in Arizona and Nevada. Appropriate habitat exists near the Siberia East alternative site; populations near MCAGCC have been disturbed by military activities.

Emory's crucifixion-thorn is a deciduous shrub that occurs in Mojave and Sonoran desert scrub and playas. It is known to occur in Imperial, Riverside, and San Bernardino

counties in California, and in Arizona and Sonora, Mexico. Two known populations occur in the western Mojave Desert.

Prairie falcons are found throughout the western Mojave Desert. Nests are located on cliffs in rugged mountain ranges, often within one-half mile of a water source. Mountain ranges near agricultural areas also are favored because of increased prey density near nest sites. In winter, birds disperse widely and are joined by migratory birds from northern latitudes.

Le Conte's thrasher is a desert resident that inhabits areas with sparse desert scrub, alkali desert scrub, and desert succulent scrub habitats with open desert washes. It can be found year-round throughout much of the Mojave and Colorado deserts of California. The Le Conte's thrasher feeds on seeds, insects, small lizards, and other small vertebrates and prefers foraging habitat with accumulated leaf litter under plants.

Nelson's bighorn sheep is widely distributed from the White Mountains in Mono County to the Chocolate Mountains in Imperial County. Bighorn sheep are typically found on open, rocky, steep areas used for escape cover with available water and herbaceous vegetation for forage. CNDDB records indicate that the Old Dad Mountains and Bristol Range, approximately three to six miles east of the Broadwell Lake alternative, is considered a seasonal range for the bighorn sheep with a population estimate of five individuals. Additionally a population of 25 individual is known to occur within the Cady Mountains two miles west of the Broadwell Lake alternative. The BLM regulatory status of the bighorn sheep is BLM-sensitive (BLM 2005).

Desert tortoise range throughout the Mojave Desert region of Nevada, southern California, the southwest corner of Utah, and the Sonoran Desert region of Arizona and northern Mexico. The desert tortoise is divided into Mojave and Sonoran populations. The Broadwell Lake alternative is located on the western borders of the Northern Colorado and Eastern Mojave desert tortoise recovery units.

Mojave fringe-toed lizard is endemic to southern California and a small area of western Arizona. This species is an obligate sand-dweller, found in dunes, sand fields, sand hummocks, and other sand deposits throughout the Mojave Desert in California. Its elevation ranges from 300 to 3,000 feet. Its survival requires conservation of sand ecosystem processes, including the sand source, fluvial sand transport areas, aeolian sand transport areas, and wind corridors.

Environmental Impacts

Construction of the ISEGS Sites and Associated Buildings and Roads. Approximately 4,000 acres of Mojave creosote scrub and other native plant communities would be permanently lost to the siting of a solar facility at Broadwell Lake by vegetation clearing, grading, and construction of the solar facilities. Such a siting also would potentially result in losses of habitat for special-status plant and animal species. Impacts to listed or sensitive plant species would result from direct or indirect loss of known locations of individuals or direct loss of habitat. Indirect loss of individuals may occur in instances such as sediments transported (e.g., from cleared areas during rain events) that cover adjacent plants or changes in a plant's environment that cause its

loss (e.g., the removal of shrubs that provided necessary shade). Additional impacts would occur due to the construction and operation of linear facilities associated with a solar facility at the Broadwell Lake alternative site, including a one-mile transmission line and a two-mile gas pipeline.

Impacts/Mitigation to Wildlife - Overview

Building a solar facility at the Broadwell Lake alternative site would potentially have an adverse effect on listed and sensitive wildlife species and their habitats either directly or through habitat modifications. Any wildlife residing within the proposed project area would potentially be displaced, injured, or killed during project activities. Animal species in the project area could fall into construction trenches, be crushed by construction vehicles or equipment, or be harmed by project personnel. In addition, construction activities may attract predators or crush animal burrows or nests.

Migratory/Special-Status Bird Species. Mojave creosote bush scrub at the power plant site provides foraging, cover, and/or breeding habitat for migratory birds, including special-status bird species that may be present at the site (LeConte's thrasher). Project construction and operation could impact nesting birds in violation of the Migratory Bird Treaty Act. Preconstruction surveys and avoidance of nesting birds could reduce such impacts.

Desert Tortoise (*Gopherus agassizii*). Construction and operation activities may result in direct or indirect impacts to the desert tortoise or its occupied habitat. The desert tortoise is a federal- and state-listed threatened species and the BLM regulatory status is BLM-sensitive species. Mitigation measures for impacts to desert tortoise may include implementing measures to decrease the likelihood of incidental take of desert tortoise and desert tortoise habitat compensation. Desert tortoise could be injured or killed, their activities altered, and their habitat degraded during construction and maintenance activities associated with this solar facility. Use of vehicles and equipment during construction activities could result in injury or death to tortoises. Hatchlings and immature desert tortoises may be particularly vulnerable because their small size and coloration make them difficult to see. Desert tortoises could fall into uncovered holes or trenches that are dug during construction. In addition, desert tortoises could be entombed by equipment use and other construction activities in proximity to occupied burrows.

Human activities in the Broadwell Lake alternative project area potentially provide food or other attractants in the form of trash, litter, or water, which draw unnaturally high numbers of tortoise predators such as the common raven, kit fox, and coyote. Predation could be reduced through the preparation of a Raven Management Plan and other avoidance and minimization measures such as the conditions of certification presented in the **Biological Resources** section of the PSA.

Spread of Noxious Weeds. Construction of a solar facility at the Broadwell Lake alternative site could result in the introduction and dispersal of invasive or exotic weeds. The permanent and temporary earth disturbance adjacent to native habitats increases the potential for exotic, invasive plant species to establish and disperse into native plant

communities, which leads to community and habitat degradation. A weed reduction program could potentially reduce and mitigate impacts.

Noise. Noise from construction activities could temporarily discourage wildlife from foraging and nesting immediately adjacent to the project area. Many bird species rely on vocalization during the breeding season to attract a mate within their territory. Noise levels from certain construction, operations, and demolition activities could reduce the reproductive success of nesting birds.

Lighting and Collisions. The heliostat array at the Broadwell Lake alternative site would be arranged around centralized solar power towers 459 feet high, which would potentially include FAA-required lighting and a lightening pole that would extend above the top of the towers approximately 5 to 10 feet. Lighting may increase the collision risk because lights can attract nocturnal migrant songbirds. Bright night lighting close to the ground at the ISEGS project site could also disturb wildlife that occurs adjacent to the project site (e.g., nesting birds, foraging mammals, and flying insects).

Operation of a 22-mile transmission line could result in increased avian mortality due to collision with new transmission lines. Mitigation could include installing the transmission line in accordance with the Avian Powerline Interaction Committee (APLIC) Guidelines designed to minimize avian-power line interactions.

Staff cannot make definite conclusions about the potential for significant impacts, or make recommendations for conditions of certification, because of the absence of site-specific survey and project design information.

Comparison to Proposed Project

Overall, development of a solar project at the Broadwell Lake alternative would likely have biological resource impacts similar to those of the Ivanpah Basin site. Both projects would have potential for direct take of desert tortoise, and both would permanently eliminate approximately 4,000 acres of habitat for desert tortoise. Like the Ivanpah Basin site, a number of special-status plant and animal species are present at the Broadwell Lake alternative and would be impacted by the proposed project, and both projects would contribute to cumulatively significant loss of Mojave Desert plant and wildlife communities. However, without more site-specific information about biological resources at the Broadwell Lake alternative, no more detailed comparisons are possible.

Cultural Resources

Environmental Setting

The regional cultural setting for the Mojave Desert is described in the “Cultural Resources,” “Environmental Setting” for the Siberia East alternative earlier in this section. Further information regarding this region can be found in the **Cultural Resources** section of the PSA.

A cultural record search was conducted for historic resources within the Broadwell Lake alternative. Because of the sensitive nature of historic resources, the specific locations

of the resources are not disclosed. Based on the record search, the site was deemed to have a high sensitivity for Prehistoric and Historic Archaeological resources, a low sensitivity for historic resources, and unknown sensitivities for cultural landscapes and ethnic resources (AIC 2008). Based on a database search of the Broadwell Lake alternative site; a total of 20 recorded resources were identified (AIC 2008), as shown in **Alternatives Table 5**, including:

- 2 prehistoric archaeological sites
- 10 prehistoric isolate
- 5 historic archaeological
- 3 historic isolates

Alternatives Table 5
Cultural Record Search Results for Cultural Resources Broadwell Lake Alternative

Resource	Description	Resource	Description
SBR-2340H	Railroad	36-061393	Isolate
SBR-6404H	Road	36-061392	Isolate
SBR-170	Village Site	36-061391	Isolate
SBR-3507H	Cairn	36-061387	Isolate
SBR-6405H	Mining Site	36-061386	Isolate
SBR-3508H	Mining Site	36-061385	Isolate
SBR-3509	Lithic Reduction Site	36-061383	Isolate
36-061396	Isolate	36-061380	Isolate
36-061395	Isolate	36-061379	Isolate
36-061394	Isolate	36-061378	Isolate

Source: AIC 2008.

Environmental Impacts

Twenty known archaeological, architectural, or historical sites would potentially be affected by construction and operation a solar facility at the Broadwell Lake alternative site. Conditions of certification such as those required for the ISEGS project at Ivanpah Basin in the **Cultural Resources** section of this PSA may reduce this impact; however, specific site surveys would be required to be certain.

Unknown, unrecorded cultural resources may be found at the Broadwell Lake alternative site. As they are discovered, resources are recorded and information retrieved. If the nature of the resource requires it, the resource is protected. When discovered, cultural resources are treated in accordance with applicable federal and state laws and regulations as well as the mitigation measures and permit requirements applicable to a project. It is not known what cultural resources, if any, would be affected by development of a solar facility at the Broadwell Lake alternative site; however, it is reasonable to assume that resources exist and would be uncovered at some places in this site (AIC 2008). As would be done during construction at the Ivanpah Basin location, should resources be discovered during construction of current and future projects, they would be subject to legal requirements designed to protect them, thereby reducing the effect of impacts.

Comparison to Proposed Project

Overall, development of a solar project at the Broadwell Lake alternative site may have cultural resource impacts similar to those of the ISEGS project at Ivanpah Basin. However, without more site-specific information about cultural resources at the Siberia East alternative, no more detailed comparisons are possible.

Hazardous Materials Management

Environmental Setting

The topography of the Broadwell Lake alternative site is essentially flat, as are the immediately surrounding areas. Additionally, no sensitive receptors are present in a five-mile radius. The nearest sensitive receptors would be located at Ludlow, approximately seven miles south of the site.

Access to the Broadwell Lake alternative would likely be via Interstate 40 west from Barstow to the Ludlow exit. At Ludlow, transport would likely turn north onto Crucero Road and would continue north for approximately eight miles through open space.

Environmental Impacts

Hazardous materials use at the Broadwell Lake alternative, including the quantities handled during transportation and disposal, would be the same as those of the proposed project at Ivanpah Basin. As stated in the **Hazard Materials Management** section for the proposed project, hazardous materials used during the construction phase of the project would include gasoline, diesel fuel, motor oil, lubricants, and small amounts of solvents and paint. No acutely toxic hazardous materials would be used on site during construction, and none of these materials pose a significant potential for off-site impacts as a result of the quantities on site, their relative toxicity, their physical states, and/or their environmental mobility.

Natural gas would be transmitted to the site from an existing gas line approximately seven miles south of the Broadwell Lake alternative site and would likely require another 0.5 to 1.5 miles of pipeline to reach the power block depending on the site layout.

The transportation route for trucks carrying hazardous materials from Interstate 40 to the Broadwell Lake alternative would be on Crucero Road through open space. The site would likely require adoption of the conditions of certification presented in the **Hazardous Materials Management** section of this PSA.

Comparison to Proposed Project

Because the hazardous materials that would be used at the Broadwell Lake alternative site would be the same as those used at the Ivanpah Basin site, and neither site has sensitive subgroups within a five-mile radius, the impacts would be the same at either site. Compared to the proposed site, selecting the Broadwell Lake alternative site would result in similar impacts from transportation of hazardous materials, and with adoption of the proposed conditions of certification, the Broadwell Lake alternative would comply

with all applicable laws, ordinances, regulations, and standards (LORS) and result in no significant impacts on the public.

Land Use

Environmental Setting

The Broadwell Lake alternative would be located entirely on BLM land, approximately one mile west of the Broadwell Dry Lake. The land is classified as Multiple Use Class L (Limited) and M (Multiple) (BLM 2008c). Multiple Use Class L is designed for the protection of sensitive, natural, scenic, ecological, and cultural resource values (BLM 1999). Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. Multiple Use Class M allows for controlled balance between higher intensity use and protection of public lands. Multiple Use Class M allows for the use of renewable energy resources and as such, a solar facility would be an acceptable use of the land. The Broadwell Lake alternative would be located on open space far from sensitive land uses, such as residences, educational institutions, and certain public facilities (e.g., religious facilities, health care facilities). The nearest residences, as stated above, would be located approximately seven miles south of the Broadwell Lake alternative.

The Siberia East alternative would also be located within the BLM Western Mojave Planning Area and the NEMO Planning Area. The purpose of the Western Mojave Planning Area is to develop management strategies for the desert tortoise, Mohave ground squirrel, and over 100 other sensitive plants and animals throughout the western Mojave Desert. As stated in the **Land Use** section, the NEMO plan addresses threatened and endangered species conservation and recovery and adoption of public land health standards, evaluation of segments for eligibility in the National Wild and Scenic river system, and changes resulting from the California Desert Protection Act passed in 1994.

Environmental Impacts

Like the ISEGS proposed site at Ivanpah Basin, a key land use plan affecting this project are the U.S. Bureau of Land Management's (BLM) California Desert Conservation Area (CDCA) Plan of 1980, as amended. The Broadwell Lake alternative as stated above is located within areas of the CDCA that are designated Multiple-Use Class L and M. The CDCA plan identifies solar facilities as permitted use on Multiple-Use Class L and M lands after NEPA requirements are met. Multiple-Use Class L is designated as limited use, protecting sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. Multiple-Use Class M is based upon a controlled balance between higher intensity use and protection of public lands. Because of potential significant unmitigated biological and cultural impacts caused by the project, the Broadwell Lake alternative site may not be compatible with the CDCA Plan.

Additionally, the Broadwell Lake alternative would be located within the BLM NEMO Desert Management Plan and the BLM Western Mojave Planning Area, which amend the BLM CDCA plan. The NEMO plan also designates routes of travel in Desert Wildlife Management Areas consistent with federal regulations. Because of potential significant unmitigated biological impacts caused by the project, the Broadwell Lake alternative site may not be compatible with the NEMO Plan or the Western Mojave Plan and may therefore create significant impacts. BLM would have to issue a right-of-way agreement for the use of this land following NEPA requirements.

Based on the applicant's review of aerial photographs and field surveys and staff's independent review, there are no agricultural uses or properties within one mile of the proposed project site. Neither the construction nor operation of the proposed project would result in any impacts to existing agricultural operations or foreseeable future agricultural use. The alternative site would have no impact with respect to farmland conversion; however, the Broadwell Lake alternative site would be located within the Cady Mountain Grazing Allotment (Cady Mountain, allotment #08006). The Broadwell Lake alternative 4,000-acre property boundary area is part of a larger 97,560-acre (150 square mile) grazing lease. The ISEGS site boundary of approximately 4,200 acres constitutes 5.3 square miles of the 150-square-mile grazing lease, equivalent to approximately 3.5 percent of the area of the grazing lease. This 10-year lease expires in 2010 (BLM, 2008a). Effective January, 2001 a "Settlement Agreement" for the management of livestock on the Cady Mountain Grazing Allotment stipulated that the allotment be excluded from cattle grazing in the spring and fall. In October 2004 the U.S. Army purchased the base property of the Cady Mountain Grazing Allotment, which became eligible for voluntary relinquishment (BLM 2006). The Cady Mountain Grazing Allotment was then renewed as a grazing lease, and this process was undergoing environmental review in 2006 (BLM 2006).

As stated in the **Land Use** section, pursuant to Title 43 Code of Federal Regulations, section 4110.4-2(2)(b) Grazing Administration, the process to withdraw a BLM grazing lease to allow development requires a two-year notification be given to the lease holder prior to the start of development. This notification would inform the lease holder that a portion of the grazing lease has been withdrawn. It is also possible for the grazing lessee to waive notice. Removing land from the grazing allocation should the solar facility be built at the Broadwell Lake alternative site would potentially require BLM to issue a record of decision.

The Broadwell Lake alternative would fall within the San Bernardino County's Desert Region of the General Plan. Like the proposed Ivanpah Basin site, the Development Code identifies the alternative site as Resource Conservation (RC). Resource Conservation comprises the majority of the designated land uses in the county and covers over one million acres, or about 1,500 square miles of land. Most of the land within this designation is publicly owned (federal and state) and includes national parks, military bases, conservation areas, and lands owned by other federal and state agencies. The **Land Use** section of this PSA discusses San Bernardino County's General Plan and development code RC in further detail.

As with the proposed Ivanpah Basin site, the Broadwell Lake alternative would not physically divide an established community because the solar facility site and linear

features would be located on undeveloped federal property in unincorporated San Bernardino County and would not be located within or near an established community.

Comparison to Proposed Project

Selecting the Broadwell Lake alternative site would result in similar impacts to land use as the Ivanpah Basin site and may result in a significant impact. Similar conditions of certification as those proposed for the Ivanpah Basin site would be required.

Recreation and Wilderness

Environmental Setting

The Broadwell Lake alternative would be located approximately one mile from the western border of the BLM Kelso Dunes Wilderness, approximately seven miles north-northwest from the BLM Bristol Mountain Wilderness, approximately nine miles south of the Afton Canyon Natural Area, and three miles east of the Cady Mountains. The Kelso Dunes themselves are designated as a National Natural Landmark (San Bernardino County 2007); however, the Bristol Mountain Range located in the Kelso Dunes Wilderness would block the project from the view of visitors to the Kelso Dunes. According to the San Bernardino County Open Space Plan, the Kelso Dunes Buffer Area extends several miles outward from the boundaries of the federally designated scenic area identified for its scenic values and significant habitat. The plan recommends scenic resource policies to preserve the appearance of the area and reduce visual impact to the Kelso Dunes area, as well as restricting land uses that would destroy scenic or habitat values.

BLM has recognized a growth in the number of off-highway vehicles being used in the California Desert District. The Sleeping Beauty Subregion is an area used for off-highway vehicles that is located approximately three miles west of Ludlow. The northern half of the subregion includes Sleeping Beauty Mountain, a part of the southern Cady Mountains. The southern half is a large, sweeping bajada sloping southward to Interstate 40. The larger washes draining the southern Cady Mountains support disjunct occurrences of white-margined beardtongue, a rare plant. Elevations within the subregion range from 1,300 near the Broadwell Lake alternative site to 3,980 feet (BLM 2005a).

Environmental Impacts

The Broadwell Lake alternative would be highly visible from the Kelso Dunes Wilderness and from the Bristol Mountain Wilderness because of the open space between the site and the Bristol Mountains. Hiking, horseback riding, hunting, camping, rock hounding, photography, and backpacking recreational opportunities exist in the Kelso Dunes Wilderness. No natural landmark would offer a buffer to block the solar power towers and associated facilities from this natural area. As such, impacts to the Kelso Dunes Wilderness and Bristol Mountain Wilderness would be extensive.

The Broadwell Lake alternative would also be visible from the Cady Mountains, including the Sleeping Beauty Subregion, and potentially visible from the Afton Canyon Natural Area. The Afton Canyon Natural Area is a one of the few places the Mojave River flows on the surface most of the year, providing a unique desert habitat for desert

plants and animals (BLM 1998a). The Afton Canyon Natural Area is designated as an Area of Critical Environmental Concern to protect plant and wildlife habitat and to preserve scenic values of the riparian area within the canyon.

Impacts to wilderness and recreation at the Broadwell Lake alternative site would be similar to impacts at the proposed Ivanpah Basin site. Recreationists at the Bristol Mountains Wilderness and at the Kelso Dunes Wilderness would have an unobstructed view of the ISEGS project were it built at the Broadwell Lake alternative site. Additionally, recreationists at the Cady Mountains and Afton Canyon Natural Area would have a distant view of the power towers. Because of the relatively pristine nature of these recreation areas, the ISEGS project would introduce an industrial nature to the region dissimilar to any existing facilities.

Comparison to Proposed Project

There is a high level of recreational use at the Broadwell Lake alternative site. However, while both the Broadwell Lake alternative and the proposed Ivanpah Basin site are used for numerous recreational activities, the Ivanpah Dry Lakebed is potentially visited by an estimated 5,000 visitors and hosts more organized recreational events than the Broadwell Lake alternative. While potentially fewer recreationists visit the region surrounding the Broadwell Lake alternative than the proposed Ivanpah Basin site, the recreationists visiting the Broadwell Lake alternative are likely searching for undisturbed desert landscape and wilderness. As such, there may be potential impacts to recreational resources at the Broadwell Lake alternative similar to the proposed project.

Noise

Environmental Setting

Generally low levels of ambient noise exist at the Broadwell Lake alternative area as the region is completely undeveloped BLM land. Noise levels in such natural areas are expected to be as low as 35 to 50 dBA. The nearest intermittent noise source would be motorists along the Interstate 40 and National Trails Highway; however, these roadways are approximately seven miles south of the Broadwell Lake alternative. There are no nearby sensitive receptors. The site is within one mile of the Kelso Dunes Wilderness, approximately nine miles south of the Afton Canyon Natural Area, and approximately one mile west of the Cady Mountains Proposed Wilderness. The nearest residential area is approximately seven miles south in Ludlow.

Environmental Impacts

As stated in the **Noise** section of this PSA, the construction of the ISEGS plant would create noise, or unwanted sound. The character and loudness of this noise, the times of day or night at which it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts. If built in accordance with conditions of certification similar to those proposed for the Ivanpah Basin site, no significant adverse noise impacts from construction and operation of the facility at the Broadwell Lake alternative site would be expected to affect people within the receptor area.

Comparison to Proposed Project

While the Broadwell Lake alternative would be in a more isolated location with fewer nearby sensitive receptors than the proposed site, overall noise impacts of the two locations would be similar.

Public Health

Environmental Setting

Staff has reviewed the Broadwell Lake alternative from the perspective of public health impacts from emissions of toxic air contaminants from all the sources identified in the **Public Health** section of this PSA. The Broadwell Lake alternative is located in an isolated desert area with no population centers or residences within miles of the site. The nearest town is located approximately seven miles south of the Broadwell Lake alternative.

Environmental Impacts

While the meteorological conditions and topography at the site are not exactly the same as at the applicant's proposed site, they are similar enough that staff believes that the results of air dispersion modeling and a human health risk assessment for the Broadwell Lake alternative would be similar to those found for the proposed site. The cancer risk and hazard indices are much below the level of significance at the point of maximum impact, so the project would not pose a significant risk to public health.

Comparison to Proposed Project

There is no significant difference between this location and the proposed site for public health.

Socioeconomics

Environmental Setting

Like the proposed Ivanpah Basin site, the Broadwell Lake alternative would be located in San Bernardino County. The demographic characteristics of San Bernardino County can be found in the **Socioeconomics** analysis of the PSA.

Environmental Impacts

Because of the limited population in Ludlow and the surrounding areas, construction workers would most likely be from larger nearby cities such as Barstow. The construction workers would most likely have to commute 50 miles or more daily to reach the construction site due to the limited housing availability in the Ludlow region. There is one motel in Ludlow. An additional option would be to erect temporary housing in the immediate area of the Broadwell Lake alternative site; however, this would increase the construction impacts and require provision of additional services such as electricity, water, and food. Because it is unlikely that the construction workers would relocate to the Ludlow region, the Broadwell Lake alternative would not cause a significant adverse socioeconomic impact on the area's housing, schools, police, emergency services, hospitals, and utilities.

There would be no adverse socioeconomic impacts since most of the construction and operation workforce is within the regional labor market area, and construction activities are short-term; however, because of the limited housing options compared with the proposed site, accommodations for the construction workers would create greater impacts. Benefits from the ISEGS project, should it be built at the Broadwell Lake alternative, are likely to be similar to the benefits from ISEGS in the Ivanpah Valley. Benefits include increases in sales taxes, employment, and income for San Bernardino County.

Comparison to Proposed Project

Most of the socioeconomic impacts of the ISEGS project at the Broadwell Lake alternative site would be similar to building and operating the project at the proposed site. However, because of the limited housing options in the Ludlow area as compared with the proposed site, accommodations for the construction workers at the Broadwell Lake alternative would create greater impacts than at the proposed Ivanpah Basin site.

Soils & Water Resources

Environmental Setting

Soils in the San Bernardino County Desert Region are primarily sandy gravel with high runoff coefficients and fast percolation (San Bernardino County 2006). The desert habitat of San Bernardino County includes soils that are predominantly sandy gravel and include major dune formations, desert pavement, and dry alkaline lake beds (San Bernardino County 2007). The soil families within the Broadwell Lake alternative site are primarily *chuckawalla*, *calvista*, and *lavic* soils (San Bernardino County 2006).

The entire region is crossed by alluvial wash deposits. Desert soils are susceptible to erosion where disturbed due to the limited vegetation and low moisture content, as well as the common high winds and infrequent high intensity rainfall events that may occur (San Bernardino County 2006). Access to the Broadwell Lake alternative would likely require widening of approximately 7 miles of access road, compared with the 1.9 mile improvement required for the Ivanpah Basin site. The widening and improvements of a greater number of miles of access road would create more erosion. Because of the high erodibility of the desert soil, impacts to the soils at the Broadwell Lake alternative would likely be significant and require mitigation similar to the mitigation required at the Ivanpah Basin site. The large footprint and extensive grading required for the solar facility would be similar at both the Ivanpah and Broadwell Lake alternatives.

The Broadwell Lake alternative lies within the Broadwell Valley Groundwater Basin (DWR 2004). The total storage capacity of the Broadwell Valley Basin is estimated at approximately 1,200,000 acre feet (DWR 2004). The recharge of the basin is primarily through percolation of runoff through alluvial fan deposits at the base of the Cady and Bullion Mountains and from infiltration of precipitation that falls to the valley floor. Because much of the land in the Broadwell Valley Groundwater Basin is public land with very low population density, there has been little groundwater development, and little is known about the basin; however, a well located along the west side of Broadwell Lake measured at a depth of 101.6 feet in the spring of 1979 (DWR 2004).

Although there are dry desert washes in the vicinity of the Broadwell Lake alternative, there are no permanent water bodies or perennial streams in the area of this site. Any impacts on dry washes would be limited to temporary alteration of bed and banks (where they would intersect new access roads and heliostats) and increased sediment load during initial storm events following construction.

Environmental Impacts

Soil Erosion Potential by Wind and Water. As stated in the **Soils and Water** section of this PSA, construction activities can lead to adverse impacts to soil resources including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water-dependent habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters. Access to the Broadwell Lake alternative site would potentially require improvement of approximately seven miles of access roads. Additionally, while the volume of earth movement is unknown at this time, the topography and slopes are similar at the Broadwell Lake alternative and the Ivanpah Basin site. Therefore, it is expected that the large footprint and extensive grading required for a solar power plant would be similar at both sites and that similar erosion and sedimentation control methods would be used at both sites. Because of the high erosion potential of the desert soil, impacts to the soils at the Broadwell Lake alternative site would likely be significant and require mitigation similar to the mitigation required at the Ivanpah Basin site. Low Impact Development principles would likely be used at this site, as at the Ivanpah Basin site, and grading plans, a Storm Water Pollution Prevention Plan (SWPPP), and a Drainage Erosion and Sediment Control Plan (DESCP) would be required. While grading plans, a SWPPP, and DESCP would potentially reduce impacts to a less-than-significant level, near-final grading plans, SWPPP, and DESCP would need to be prepared and reviewed to be certain this would be feasible.

Storm Water. As stated in the **Soil and Water** section of this PSA, potentially significant water quality impacts could occur during construction, excavation, and grading activities if contaminated or hazardous soil or other materials used during construction were to drain off site. The Broadwell Lake alternative site is located in an undeveloped area. Brush would be cleared prior to grading. The storm water runoff percolates either into the soil or into flows overland off site. Because the water in the Broadwell Lake region drains to the Broadwell Lake (dry) and because of the proximity between the site and the Broadwell Lake, impacts to the dry lake could be significant without mitigation. Conditions of certification similar to those required for the proposed Ivanpah Basin site would be required.

Project Water Supply. It is unlikely that groundwater would be encountered during grading activities as the recorded depth to groundwater in the Broadwell Lake Basin is approximately 100 feet as stated previously. The volume of groundwater required for construction would be similar to that required for constructing the project at the Ivanpah location; however, it is unknown at this time if there is sufficient groundwater available in the Broadwell Lake Basin to meet the construction requirements.

Wastewater. Groundwater would be needed during construction of the ISEGS project at the Broadwell Lake alternative. Once used, this water would be reused to the extent possible and then discharged as wastewater. Improper handling or containment of construction wastewater could cause a broader dispersion of contaminants to soil or groundwater. The discharge of any nonhazardous wastewater during construction would be required to be in compliance with regulations for discharge. Water that could not be reused would be transported to an appropriate treatment facility. With implementation of required regulations, impacts would likely be less than significant.

Comparison to Proposed Project

Due to the large footprint and extensive grading required for the solar power plant at both the Ivanpah and Broadwell Lake alternative sites, similar erosion and sedimentation control methods would be used at both sites. Impacts to soil and water erosion would be similar at the two sites. However, it is unknown if there is sufficient water availability at the Broadwell Lake alternative site.

Traffic & Transportation

Environmental Setting

The Broadwell Lake alternative would be located approximately seven miles north of Interstate 40 and National Trails Highway (Historic Route 66). As shown in **Alternatives Figure 1** and **Alternatives Figure 3**, access to this site would be via Interstate 40 to the Crucero Road exit in Ludlow, then approximately seven miles north on Crucero Road. Access would potentially require widening of Crucero Road, a single lane north-south dirt road. A one-mile access road from Crucero Road to the Broadwell Lake alternative would also be required.

Environmental Impacts

Similar to the ISEGS project at Ivanpah Basin, before construction could occur for the Broadwell Lake alternative, a construction traffic control and transportation demand implementation program would need to be developed in coordination with Caltrans. This analysis may result in the need to limit construction-period truck and commute traffic to off-peak periods to avoid or reduce potential traffic and transportation impacts. These impacts would likely be less severe than those of the proposed Ivanpah Basin site because construction at the Broadwell Lake alternative would not require travel on Interstate 15 east of Barstow, so the Interstate15 areas with most severe congestion would be avoided. The impacts caused by construction at the Broadwell Lake alternative would likely be less than significant through proper coordination with local agencies.

Comparison to Proposed Project

Impacts to traffic and transportation at the Broadwell Lake alternative site would be similar to those at the proposed Ivanpah Basin site; however, the Broadwell Lake alternative site would not require the use of Interstate 15 east of Barstow during the highly congested Friday afternoon time period. As such, the Broadwell Lake alternative site would likely have fewer impacts than the Ivanpah Basin site on traffic and transportation.

Transmission Line Safety and Nuisance

Environmental Setting

The Broadwell Lake alternative solar facility would likely include an electrical substation that would connect via overhead transmission lines to an existing transmission line approximately one mile northwest of the alternative site. The existing SCE transmission lines are 230 kV and 500 kV. The Broadwell Lake alternative site is in an uninhabited open space with existing utility corridors to the west and south; however, the one-mile transmission line interconnection would require a new right-of-way on BLM land.

Environmental Impacts

Similar to the proposed Ivanpah Basin site, this alternative would not be likely to cause transmission line safety hazards or nuisances. The length of the proposed project line would be approximately 5,800 feet for Ivanpah 1 (Ivanpah 2 and 3 would require shorter interconnections) and would be similar to the one-mile transmission line that would be required for the Broadwell Lake alternative site in terms of the total length of the source of line fields to which individuals might be exposed.

The transmission line is not expected to pose an aviation hazard as it is not located near any airport. As stated in the **Transmission Line Safety and Nuisance** section of this PSA, the potential for nuisance shocks would be minimized through grounding and other field-reducing measures that would be implemented in keeping with current standard industry practices, and the potential for hazardous shocks would be minimized through compliance with the height and clearance requirements of CPUC's General Order 95. Compliance with Title 14, California Code of Regulations, section 1250, would minimize fire hazards, while the use of low-corona line design, together with appropriate corona-minimizing construction practices, would minimize the potential for corona noise and its related interference with radio-frequency communication in the area around the route. As with the proposed Ivanpah Basin transmission lines, the public health significance of any related field exposures cannot be characterized with certainty. The only conclusion to be reached with certainty is that the proposed lines' design and operational plan would be adequate to ensure that the generated electric and magnetic fields are managed to an extent the CPUC considers appropriate in light of the available health effects information.

Comparison to Proposed Project

Because the Broadwell Lake alternative site would require a transmission line of similar length as the proposed Ivanpah Valley site to interconnect with the SCE transmission system and because of the similar terrain and habitat of the desert environments, staff concludes the impacts of the two sites would be similar.

Visual Resources

Environmental Setting

The Broadwell Lake alternative would be located approximately seven miles north of Interstate 40. Views from the Broadwell Lake alternative site are relatively undisturbed desert landscape in all directions, with the Bristol Mountain Range and the Cady

Mountains rising to the east and west of the site respectively. An existing SCE transmission line crosses approximately one mile north of the alternative site, introducing a more developed character to the site. The power towers and the sheen from the heliostats would be visible to motorists heading west on Interstate 40 and the National Trails Highway. Because of the location of the Cady Mountains, the visibility of the Broadwell Lake alternative site would be brief, as the Sleeping Beauty Mountain would block much of the site from passing motorists.

Environmental Impacts

As stated in the **Visual Resources** section of this PSA, the Energy Commission staff, in coordination with BLM, applied the BLM Visual Resource Management (VRM) system of visual assessment to the proposed ISEGS site. The existing visual setting baseline under the VRM methodology is characterized in terms of Visual Resource Classes. Under the VRM system, areas of the project viewshed are delineated and mapped based on broadly uniform characteristics of visual quality, viewers' sensitivity, and distance from project to viewers. These delineated areas are then assigned a Visual Resource (VR) Class (from I through IV). VR Classes are analogous to Overall Sensitivity ratings under the Energy Commission method and are used to determine an area's visual objective, that is, the level of project-caused contrast that is acceptable and above which contrast could constitute a potentially significant adverse impact. The areas considered for the Broadwell Lake alternative have not been assigned a VR Class.

Like the proposed Ivanpah Basin site, views of the desert would change from a relatively undisturbed desert landscape and dry lake bed to an industrial, highly altered landscape dominated by roughly four square miles of mirror-arrays and 459-foot-tall solar collector towers, graded areas, and retention ponds, as well as light rays reflected off ambient atmospheric dust and the bright glow of the receiving portions of the solar collectors.

The Broadwell Lake alternative would be highly visible from numerous observation viewpoints to recreationists in the Kelso Dunes Wilderness, the Bristol Mountain Wilderness and the Cady Mountains. Visitors to these wilderness areas expect natural environments. There are few structures in the region other than the SCE transmission line that traverses the Cady Mountains and one distribution line that heads north from Interstate 40 along Crucero Road. Because of the undisturbed nature of the site, the solar facility would introduce a dominant feature that would heavily impact the scenic nature of the Kelso Dunes Wilderness and would likely cause significant and unmitigable visual impacts. Because there are few visual intrusions constructed near the Broadwell Lake alternative, viewer sensitivity at the Broadwell Lake alternative would be high. Construction of the gas pipeline and the new transmission line would also create a visible scar across the desert landscape that would remain for many years, even with restoration efforts.

Comparison to Proposed Project

The proposed Ivanpah site would be preferred to the Broadwell Lake alternative because the alternative site would be located in an area that is much more remote and undeveloped, adjacent to wilderness. The Ivanpah Basin site is located in an area with

substantially more development and use because of its location along Interstate 15 adjacent to Primm, Nevada, and to heavily used recreation areas. As a result, a large solar project in the Broadwell Lake area would create a more dramatic change to the visual environment than would occur at the Ivanpah Valley site.

Waste Management

Environmental Setting

As stated in the **Waste Management** section of this PSA, hazardous and nonhazardous solid and liquid waste, including wastewater, would be generated at the ISEGS project during construction and operation of the solar power plant. Waste would be recycled where practical and nonrecyclable waste would be deposited in a Class III landfill. The hazardous waste generated during this phase of the project would consist of electrical equipment, used oils, universal wastes, solvents, and empty hazardous waste materials (BSE 2007a, section 5.14.1.2). Universal wastes are hazardous wastes that contain mercury, lead, cadmium, copper, and other substances hazardous to human and environmental health. Examples of universal wastes are batteries, fluorescent tubes, and some electronic devices. The nearest waste disposal facility that could potentially accept the nonhazardous construction and operation wastes generated by the project is the Barstow Sanitary Landfill in Barstow, California. The remaining capacity for the disposal facility is 924,401 cubic yards, and the Barstow Sanitary Landfill Expansion plan is currently undergoing environmental review (CIWMB 2008). Section 5.14.4.2.2 of the project AFC discusses the two Class I landfills that accept hazardous wastes and are open in California: the Clean Harbor Landfill (Buttonwillow) in Kern County and the Chemical Waste Management Landfill (Kettleman Hills) in Kings County. The Kettleman Hills facility also accepts Class II and Class III wastes. In total, there is in excess of 11 million cubic yards of remaining hazardous waste disposal capacity at these landfills, with approximately 30 years of remaining operating lifetimes.

Environmental Impacts

Construction at the Broadwell Lake alternative site would require excavation of fill material that underlies the site similar to that at the Ivanpah Basin site. Both nonhazardous and hazardous wastes would be created by the construction of the ISEGS project at the Broadwell Lake alternative in similar quantities as at the proposed Ivanpah Basin site and would be disposed of at appropriate facilities. As with the proposed Ivanpah Basin site, the project owner would be required to obtain a unique hazardous waste generator identification number for the site prior to starting construction, and the alternative site would require similar conditions of certifications.

The project would produce minimal maintenance and plant wastes. All nonhazardous wastes would be recycled to the extent possible, and nonrecyclable wastes would be regularly transported off site to a local solid waste disposal facility. Generation plant wastes include: oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other miscellaneous solid wastes, including the typical refuse generated by workers. As with the proposed Ivanpah Basin site, all construction and operation activities would need to be conducted in compliance with regulations pertaining to the appropriate management of wastes. The total amount of nonhazardous waste generated from the project is estimated to be less than 300

cubic yards of solid waste from construction and approximately 250 cubic yards per year from operation. This would contribute less than 4 percent of fill to the available landfill capacity. Staff finds that disposal of the solid wastes generated by the ISEGS can occur without significantly impacting the capacity or remaining life of any of these facilities.

As with the Ivanpah Basin site, hazardous wastes generated during construction and operation would be recycled to the extent possible and practical. Those wastes that cannot be recycled would be transported off site to a permitted treatment, storage, or disposal facility. The four tons of hazardous waste from the ISEGS requiring off-site disposal would be far less than staff's threshold of significance and would therefore not significantly impact the capacity or remaining life of the Class I waste facilities. Similar to the proposed project at Ivanpah Basin, the project at Broadwell Lake would need to implement a comprehensive program to manage hazardous wastes and obtain a hazardous waste generator identification number (required by law for any generator of hazardous wastes).

Comparison to Proposed Project

The environmental impact of waste disposal at the Broadwell Lake alternative site would be the similar to that at the Ivanpah Basin site. While the Broadwell Lake alternative is closer to the Barstow Sanitary Landfill, the Ivanpah Basin site has the option of using two additional landfills in Nevada (see the **Waste Management** section of this PSA).

Worker Safety and Fire Protection

Environmental Setting

The Broadwell Lake alternative would be located within an area that is open space. The area is currently served by the San Bernardino County Fire Department. See the **Worker Safety and Fire Protection** section of this PSA for more information regarding the San Bernardino County Fire Department. The fire risks of this alternative would be similar to those of the proposed Ivanpah Basin site, as there are similar habitat and desert conditions. There is potentially less likelihood of a fire starting at the Broadwell Lake alternative site because, unlike the proposed Ivanpah Basin site, it is not adjacent to a heavily used transportation corridor.

Environmental Impacts

Similar to the proposed Ivanpah Basin site, it would be appropriate for a solar facility at this site to provide a Project Demolition and Construction Injury and Illness Prevention Program and a Project Operations Safety and Health Program in order to ensure adequate levels of industrial safety. The applicant would also be required to provide safety and health programs for project construction, operation, and maintenance, similar to the requirements for the proposed Ivanpah Basin site. Also similar to the proposed project, the local fire department would be contacted to assure that the level of staffing, equipment, and response time for fire services and emergency medical services are adequate.

Comparison to Proposed Project

Staff concludes that the environmental impact of worker safety and fire protection at the Broadwell Lake alternative site would be similar to that at the proposed Ivanpah Basin site.

Engineering Assessment for Broadwell Lake Alternative

Facility Design

The project's design at the Broadwell Lake alternative would be similar to that of ISEGS at the proposed project site. As with the proposed site, staff-recommended measures may be appropriate to ensure compliance with engineering laws, ordinances, regulations, and standards applicable to the design and construction of the project.

Geology and Paleontology

Environmental Setting

The Broadwell Lake alternative is located in areas mapped as Pleistocene to Holocene Age alluvium. No known geologic resources exist at the Broadwell Lake alternative site. Some mineral resources occur in the hills surrounding the Broadwell Lake alternative. The Broadwell Lake alternative, however, includes the Broadwell playa lakebed. The likelihood of encountering Quaternary lakebed sediments at the Broadwell Lake alternative site increases with decreasing distance from the playa lake. Geologic hazards associated with such fine-grained lakebed deposits include the potential for compressible soils and expansive clay soils. These materials may also require separation from overlying structural improvements.

The Ludlow fault, which has had Pleistocene-age movement, crosses the site (USGS 2008). The active Pisgah-Bullion faults, located 14.7 miles west of the Broadwell Lake alternative, produced the M7.3 Landers earthquake in 1992 and the M7.1 Hector Mine earthquake in 1999. Surface rupture is associated with both earthquakes. Pleistocene age cinder cones are within 20 miles of the sites.

Alternatives Table 3 gives a comparison of the seismic parameters at the Siberia East, Broadwell Lake, and proposed Ivanpah Basin sites.

Environmental Impacts

Seismic ground shaking is probable at the alternative site because the Ludlow fault crosses the site. The number of faults within 100 miles of the alternative site is listed in **Alternatives Table 3, Comparison of Seismic Parameters**, along with the distance from the project site and maximum earthquake magnitude. The table gives the peak acceleration and estimated intensity the site would experience during a maximum magnitude earthquake on each fault. The severity and frequency of ground shaking associated with earthquake activity has the potential to be significantly higher at the Broadwell Lake alternative than at the Ivanpah Basin site. **Alternatives Table 3** compares the seismic parameters of all sites. More stringent design criteria may be required for the Broadwell Lake alternative in accordance with a design-level geotechnical report and California Building Code (2007) standards.

Adequate design parameters for the facility would need to be determined through a site-specific evaluation by a Certified Engineering Geologist or Geotechnical Engineer. Impacts due to seismic hazards and soil conditions would be addressed by compliance with the requirements and design standards of the California Building Code.

No known geological resources exist on the Broadwell Lake alternative. Mineral resources in the surrounding hills are similar to those found in the Ivanpah area.

The paleontological sensitivity of lakebed deposits associated with Broadwell Dry Lake may be high. The potential to impact these highly sensitive sediments increases with decreasing distance from the playa lake. The bedrock in the surrounding hills consists of Mesozoic granites, Miocene volcanics, and Tertiary intrusives, all of which have a negligible paleontological sensitivity. The potential to impact sensitive bedrock at depth at the Broadwell Lake alternative is negligible.

As stated in the **Geology and Paleontology** section of this PSA, construction of the proposed project would include grading, foundation excavation, utility trenching, and possibly drilled shafts. The probability of encountering paleontological resources is considered to be generally high on portions of the proposed plant site, especially as the distance to the Broadwell Dry Lake decreases. As would be the case with the alternative site, the conditions of certification proposed for the Ivanpah Basin site are designed to mitigate any paleontological resource impacts to a less-than-significant level.

Comparison to Proposed Project

With the exception of stronger ground shaking, the Broadwell Lake alternative is subject to geologic hazards of the same magnitude as the Ivanpah Basin site. Strong ground shaking could be effectively mitigated through facility design. The potential to encounter geologic resources and significant paleontological resources at both alternative sites is similar to the potential at the Ivanpah Basin site, although the potential to impact highly sensitive sediments at the Broadwell Lake alternative increases with decreasing distance from the playa lake. The conditions of certification provided in the **Geology and Paleontology** section of this PSA would be applicable to the Broadwell Lake alternative.

Power Plant Efficiency

The plant configuration and solar power tower technology that would be employed at the Broadwell Lake alternative would be similar to that of the proposed Ivanpah Basin site, which means it would result in similar consumption of fuel and a similar level of efficiency.

Power Plant Reliability

The plant configuration at the Broadwell Lake alternative would be similar to that of the proposed project at Ivanpah Basin, which means it would result in similar levels of equipment availability. Plant maintainability, fuel and water availability, and reliability of the plant in relation to natural hazards would all be similar to those for the proposed project.

Transmission System Engineering

Locating a solar facility at the Broadwell Lake alternative site would require re-evaluating the capacity of the SCE transmission lines that would be used for interconnection. This alternative may cause adverse effects to the transmission system and require system upgrades. Moreover, it may not accomplish the project goal to be on line in 2011 because of grid improvement constraints.

Summary of Impacts

The Broadwell Lake alternative would have similar impacts as the proposed Ivanpah Basin site for air quality (operation and most construction impacts), hazardous materials management, visual resources, land use, recreation, noise, public health, transmission line safety and nuisance, waste management, worker safety and fire protection, facility design, power plant efficiency and power plant reliability.

The Broadwell Lake alternative would be less preferred than the proposed Ivanpah Basin site for air quality (for construction commuting only), socioeconomics, geology and paleontology, and transmission system engineering. The Broadwell Lake alternative would be preferred to the proposed Ivanpah Basin site for traffic and transportation.

It is believed that impacts to biological resources and cultural resources would be similar at the Broadwell Lake alternative and at the proposed Ivanpah Basin site; however, without more site-specific information about biological and cultural resources at the Broadwell Lake alternative, a detailed comparison is not possible. Similarly, it is believed that impacts to soils and water at the Broadwell Lake alternative would be similar to those at the proposed Ivanpah Basin site; however, it is uncertain if there is groundwater available at the Broadwell Lake alternative site.

RECONFIGURATION ALTERNATIVE

The proposed project as originally considered by the applicant consisted of a 400-MW concentrating solar project built in three phases. Two 100-MW sites required approximately 850 acres, and a 200-MW site required approximately 1,660 acres. The total area for the three plants and the shared facilities, including an administration and maintenance complex, was expected to be 3,400 acres. The ISEGS AFC Figure 1.3-1 illustrates the original site configuration of the proposed project.

During the review of the original ISEGS site, staff identified a number of significant concerns about the site design. After a series of data requests and discussions, the applicant revised the proposed project within the proposed site to minimize environmental impacts of the project. The primary revisions of the proposed project were as follows (CH2ML 2008g):

- The land required for Ivanpah Phases 1 and 2 was increased to approximately 920 acres. The land required for Ivanpah Phase 3 was increased to approximately 1,894 acres. The total acreage required for the three plants and the shared facilities increased to approximately 4,065 acres.

- The applicant reduced the number of heliostat poles from 68,000 poles to 55,000 poles for Phases 1 and 2 and from 136,000 poles to 104,000 poles for Phase 3, thus reducing the amount of land disturbance.
- The applicant reduced the number of power towers in Phase 1 and Phase 2 from three power tower receivers and one solar reheater to one solar tower, thereby reducing the amount of land disturbance. The tower height will increase from 312 feet to 459 feet, consistent with the height of the Ivanpah 3 configuration.
- The applicant realigned the power block at Phase 2. The power block at Phase 2 would be relocated approximately 200 feet to avoid a sizable wash and reduce erosion impacts.
- The applicant included detention ponds sized for the site's 100 year, 24 hour storm event that would be placed upstream in each facility drainage area to detain and release a volume of concentrated offsite stormwater run-on.
- The applicant realigned the Phase 3 boundary to exclude an existing mining claim at the limestone outcrop west of the project, thereby reducing impacts to mine operations.
- The applicant relocated project wells and linear corridors. The project wells would be moved approximately 4,250 feet south of their original location, eliminating the need for a separate access road and minimizing land disturbance and moving the wells farther from the existing supply wells for the Primm Valley Golf Club.
- The applicant stated that it would reroute existing public trails that cross the Ivanpah Valley. The original AFC addressed rerouting only Colosseum Road. The applicant proposes to reroute Trail 699226, Trail 699198, and an unnumbered trail used to access the mining claim. Rerouting the trails would allow continued use of and access to the Ivanpah Valley and would minimize impacts.
- An additional 120-acre temporary construction use area was added.
- The overall size of the project would be increased from 3,400 acres to 4,065 acres.

Environmental Impacts

As stated above, the original ISEGS project was modified to reduce the following environmental impacts to the Ivanpah Basin site.

Land disturbance would be similar or greater to the original ISEGS project because although the number of heliostat poles, power towers and access roads would be reduced, the detention ponds included in the Reconfiguration alternative would require significant land disturbance that was not included in the project as originally described.

Land use, recreation, and mining impacts would be reduced because of the realignment of the Ivanpah 3 boundary to avoid an existing mining claim and the rerouting of exiting public trails.

Impacts to water and soil resources would be reduced by revising the location of the power block at Ivanpah 2, which would avoid a sizable wash and reduce impacts caused by erosion.

The applicant also moved the proposed project wells, moving the wells farther from the existing Primm Valley Golf Club wells, thus reducing potential effects on the existing wells.

The amount of desert habitat that would be fenced would increase from 3,400 to 4,065 acres, and the amount of land that would be graded would increase from approximately 640 acres to 690 acres for Phases 1 and 2 and from approximately 1,250 acres to 1,335 acres for Phase 3 (CH2ML 2008g). As such, impacts to biological resources, cultural resources, and visual resources would be slightly greater.

Comparison to Proposed Project

While the Reconfiguration alternative would increase the project footprint slightly, overall the alternative would be environmentally superior to the original project configuration. The Reconfiguration alternative would decrease land use, recreation, and mining impacts and would decrease impacts cause by erosion by avoiding sizable washes. Due to the changes made by BrightSource as a result of staff and agency input, the Reconfiguration alternative has become the proposed ISEGS project.

“NO PROJECT” ALTERNATIVE

The “no project” alternative under CEQA (called the “no action” alternative under NEPA) defines the scenario that would exist if the project were not constructed. In the CEQA analysis, the “no project” alternative is compared to the proposed project and determined to be either superior, equivalent, or inferior to it. The CEQA Guidelines state that “the purpose of describing and analyzing a ”no project” alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project” (Cal. Code Regs., tit. 14 § 15126.6(i)). Toward that end, the “no project” analysis considers “existing conditions” and “what would be reasonably expected to occur in the foreseeable future if the project were not approved…” (§ 15126.6(e)(2)). Under NEPA, the “no action” alternative is used as a benchmark of existing conditions by which the public and decision makers can compare the environmental effects of the proposed action and the alternatives. The “no action” alternative is compared to the effects of the proposed action. In short, the site-specific and direct impacts associated with the power plant would not occur at this site if the project does not go forward.

If the ”no project” alternative were selected, the construction and operational impacts of the ISEGS project would not occur. There would be no grading of the site, no loss or disturbance of desert habitat, and no installation of extensive power generation and transmission equipment. The “no project” alternative would also eliminate contributions to cumulative impacts in the Ivanpah Valley and in the Mojave Desert as a whole.

In the absence of the ISEGS project, however, other power plants, both renewable and nonrenewable, would have to be constructed to serve the demand for electricity. It is likely that existing gas-fired plants could operate longer. If the project were not built, California would not benefit from the reduction in greenhouse gases that this facility would provide. PG&E would not receive the 400-MW contribution to the 20 percent of energy from renewable resources that it must procure by 2010 to meet state requirements.

Conclusion

California's Renewable Portfolio Standard has been implemented to reduce greenhouse gas emissions from power plants. While the ISEGS project as proposed would have substantial impacts as a result of the extent of its disturbance, the facility is proposed to be located in an area of the desert that is not protected for specific wildlife species or for its wilderness values. In addition, substantial other development is proposed in the Ivanpah Valley. As a result, the importance of solar technology as a tool in reducing greenhouse gases is considered to outweigh the impacts of the project itself.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS – SITE ALTERNATIVES

Alternatives sites for the ISEGS project were suggested in the AFC and in scoping comments and were developed by BLM and Energy Commission staff. The origin of each alternative is explained below. The National Parks Conservation Association and National Park Service suggested consideration of a site west of Clark Mountain, thus offering a buffer between the project site and the preserve. Multiple scoping comments suggested consideration of a private, already disturbed site. The following alternative sites were evaluated in this analysis:

- Ivanpah Site A alternative
- Ivanpah Site C alternative
- West of Clark Mountain alternative
- Private Land alternative

IVANPAH SITE A ALTERNATIVE

Ivanpah Site A was identified by BrightSource in the AFC as a potential alternative site. It was not pursued as the proposed site because it is located partly on state land, further complicating the land leasing and permitting process; had a longer interconnection with the Kern River gas transmission line; would require more grading; and was found to be slightly less environmentally preferred by the applicant (BSE 2007a). It is located adjacent to and southwest of the proposed ISEGS site in the Ivanpah Valley, in the southern portion of the NEMO Planning Area; see **Alternatives Figure 4**. Ivanpah Site A overlaps the ISEGS site in a portion of BLM sections totaling approximately one square mile, and it also includes one section (Section 16) of state land under the jurisdiction of the California State Lands Commission.

The setting of Ivanpah Site A is very similar to that of the ISEGS site, as illustrated by the close proximity and overlapping of the two sites. They are both adjacent to the Ivanpah Dry Lake and the Primm Valley Golf Club, northeast of the Mojave National Preserve and approximately five miles from the California/Nevada border. The elevation of Ivanpah Site A is between 3,600 feet and 3,100 feet, as compared with between 3,150 to 2,850 feet for the proposed site. The sites share similar habitats and similar biological and cultural concerns (BSE 2007a). Both Ivanpah Site A and the proposed site would be visible from the Mojave National Preserve, Interstate 15, and the Clark Mountains.

Environmental Assessment

Ivanpah Site A would require a vast amount of land and would result in the permanent loss of approximately 3,800 acres of desert habitat in the same region as the proposed

ISEGS site. Given the proximity of Ivanpah Site A to the proposed ISEGS, it is reasonable to assume that the impacts to desert tortoise and barrel cacti would occur and be similar at both sites in the approximately one square mile of overlapping region between the two sites.

Impacts to land use and recreation at the Ivanpah Site A would be similar to impacts of the proposed ISEGS site because they are both equally distant from the Ivanpah Dry Lake and other recreational activities in the Ivanpah Valley. Like the proposed ISEGS site, Ivanpah Site A is located within the CDCA and NEMO Planning Areas and may conflict with these plans. Ivanpah Site A would also be located on some state lands, which may cause permitting difficulties (BSE 2007a).

Both the proposed ISEGS site and Ivanpah Site A would have a large footprint and require extensive grading, potentially resulting in erosion and runoff. However, the Ivanpah Site A has a somewhat greater slope, being located nearer to the Clark Mountains, and would therefore require somewhat greater grading and would potentially have a greater impact to soils and water. Ivanpah Site A is the same distance as the proposed ISEGS site from Ivanpah Dry Lake and would be visible from the dry lake, a resource frequently used for recreation (BSE 2007a). Additionally, because Ivanpah Site A is closer to the Mojave National Preserve than the proposed ISEGS site (less than one mile away) it would also result in visual impacts to the preserve and to recreationists within the preserve (including from the Clark Mountains) that are similar to those at the proposed site. Given the size of the power plants and the height of the receiver power towers, approximately 459 feet tall for the three power plants, visual impacts would be considerable and similar to those at the proposed ISEGS site. In addition, Ivanpah Site A is closer to I-15 than the ISEGS facility, so visual impacts would be greater for passing motorists.

Rationale for Elimination

Due to the proximity between the ISEGS site and the Ivanpah Site A, impacts of the Ivanpah Site A would be similar to the proposed project. However, Ivanpah Site A would be closer to Interstate 15 and to the Mojave National Preserve. This results in increased visibility from these sensitive areas. Also, a longer interconnection with the Kern River gas transmission line would be required, thereby increasing any impacts associated with the linear connection, including ground disturbance.

This alternative would not reduce impacts of the proposed project without creating more severe impacts of its own. Therefore, the Ivanpah Site A was eliminated from further consideration.

IVANPAH SITE C ALTERNATIVE

Ivanpah Site C was identified in the AFC as a site considered by BrightSource. It was not pursued as the proposed site because the interconnections to both the Kern River

gas transmission line and SCE transmission line would be longer, the site offered little flexibility for layout revisions, and the site was considered to have greater environmental concerns than the proposed ISEGS site (BSE 2007a).

Site C alternative is located southeast of the proposed ISEGS site, bordering Interstate 15 on the north and west and Nipton Road (Highway 164) to the south; see **Alternatives Figure 4**. It would be bordered by the Ivanpah Dry Lake to the east. It has similar characteristics to the ISEGS site, with an average elevation of between 2,950 and 2,600 feet and a similar slope. Given the proximity of the sites, it is reasonable to assume that they have similar habitat characteristics. The transmission interconnection would also be similar to that at the ISEGS site. Ivanpah Site C would border the Mojave Desert Preserve to the south.

The site would be located in a Desert Wildlife Management Area, established to protect denser populations of desert tortoise (BSE 2007a). Longer interconnections with the Kern River gas transmission line and the SCE transmission line would be required due to the site's greater distance from these utilities.

Environmental Assessment

Ivanpah Site C would result in the permanent loss of approximately 4,000 acres of desert habitat. Given the proximity of Ivanpah Site C and the proposed ISEGS site at Ivanpah Basin, the impacts on biological resources and sensitive species habitat would be about the same. Given that the Ivanpah Site C would be located in a Desert Wildlife Management Area, impacts to desert tortoise may be greater than at the proposed ISEGS site. Impacts to land use and recreation at the Ivanpah Site C would also be similar to impacts of the proposed ISEGS site due to its proximity to Ivanpah Dry Lake and recreational off-highway vehicle use. Ivanpah Site C would be located entirely on BLM land and would be within the CDCA and NEMO Planning Areas and may conflict with these agencies' plans.

Ivanpah Site C is immediately adjacent to the Ivanpah Dry Lake on the east side, which is used more frequently than the west side for large recreational events (Downing 2008). Ivanpah Site C borders the Mojave National Preserve, a National Park Service unit with high value for recreation and preservation of views. In addition, Ivanpah Site C borders both the I-15 and Nipton Road and would cause greater visual impacts to passing motorists than the proposed site.

Rationale for Elimination

Due to the proximity of the proposed ISEGS site and the Ivanpah Site C, many impacts of the Ivanpah Site C would be similar to those of the proposed site. However, Ivanpah Site C would be more visible from I-15 and Nipton Road. Also, because Ivanpah Site C is located in a Desert Wildlife Management Area, the potential for impacts to desert tortoise may be greater. Longer interconnections with the Kern River gas transmission line and the SCE transmission line would be required, with associated increased ground disturbance and visual impacts. The greater proximity to the Ivanpah Dry Lake could increase cultural resource impacts as more cultural artifacts may be present.

This alternative would not reduce impacts of the proposed project without creating new impacts of its own, and, therefore, the Ivanpah Site C was eliminated from further consideration.

WEST OF CLARK MOUNTAIN ALTERNATIVE

At the request of the National Parks Conservation Association and National Park Service, a site west of Clark Mountain was considered as a means of reducing visual impacts to the Mojave National Preserve. Two broad valleys west of Clark Mountain offer slopes consistent with solar requirements: the Silurian Valley (north of Baker, which is used by the Army for desert warfare training based in the National Training Center at Fort Irwin) and the Shadow Valley immediately west of the Clark Mountain Range. The Silurian Valley is bisected by State Highway 127, which is a major access road for Death Valley National Park.

Although there is land west of Clark Mountain that fits the site selection criteria for a solar energy project, much of the land immediately west of the Clark Mountain Range in Shadow Valley is located in the Eastern Mojave Desert Tortoise Recovery Unit and within a Desert Wildlife Management Area and therefore, while it may meet the site selection criteria, it would not be viable as an alternative to the ISEGS site. Further east of Shadow Valley, among the Shadow Mountains, the topography is such that a contiguous 400-MW solar thermal power plant would not have the suitable ground slope requirement and is therefore not viable for solar energy projects. Suitable land for a solar project exists in the Silurian Valley; however, existing solar and wind applications have already requested use of this land. The solar and wind project applications in the area west of Clark Mountain pending before BLM are the following (BLM 2008b and BLM 2008c):

- Solar Investments VI LLC, solar trough technology (6,400 acres);
- FPL Energy LLC, parabolic trough technology (7,680 acres);
- Solar Investments Inc., parabolic trough technology (9,600 acres);
- Solar Investments XI LLC, parabolic trough technology (10,000 acres);
- Pacific Wind Development LLC (Iberdrola), wind turbines (6,623 acres).

West of the Silurian Valley is the Fort Irwin National Training Center, which is not considered to be available for a large solar project.

Rationale for Elimination

The only land west of Clark Mountain that is not within a Desert Wildlife Management Area and not military land and that achieves the appropriate solarity and slope requirements already has applications pending before BLM. As described above, BLM considers only one application at a time for a particular site, and the existing applications have first rights. Therefore, the West of Clark Mountain alternative is not feasible and has been eliminated from further consideration.

PRIVATE LAND ALTERNATIVE

Multiple scoping comments requested that a site be considered on private, already disturbed land. Staff evaluated private lands in the desert region where the slope and solarity are adequate. The Harper Lake, Lucerne Valley, and Rabbit Lake alternatives (see **Alternatives Figure 4**) were considered by BrightSource. These sites were eliminated from further consideration by the applicant because they would have required completing several option agreements with different private owners. BrightSource felt that obtaining site control with numerous owners would have been timely and risky (BSE 2007a).

There are limited numbers of undeveloped contiguous private land parcels within the California desert. **Alternatives Figure 5** shows an area of private land (in white) with appropriate slope and solarity requirements. This area is east of Barstow and surrounds Daggett, California. It is also the area where the first two solar power tower facilities of the Solar Electric Generating System (SEGS), built in Daggett by LUZ Industries, were installed. The area is used for agriculture or covers lands that have previously been in agricultural use but are now fallow.

The figure also illustrates the size of the area that would be required for a 100-MW solar power plant. This shows that to acquire land for even a 100-MW power plant would require working with a minimum of two, and most likely many more, land owners. While this alternative is not infeasible, it would be challenging for an applicant to obtain site control due to the requirement to negotiate separately with multiple landowners. Additionally, because there may be existing structures and residences on some of this private land, tearing down houses or other structure may be required and would potentially cause additional impacts. These challenges would be compounded for a 400-MW power plant.

Rationale for Elimination

Achieving site control for a large solar facility in an area of private land in an economically feasible manner would be challenging. It would likely take substantial additional time to acquire the land. The land acquisition challenges are considered to be substantial, so a private land alternative was eliminated from further consideration.

OTHER ALTERNATIVES ELIMINATED

The following alternatives were considered by the applicant, but were not retained for full analysis in the AFC; they are also not analyzed in this PSA as explained in **Alternatives Table 6**.

Alternatives Table 6
Alternatives Not Carried Forward for Further Analysis

Site	Reasons Eliminated
Carrizo Plain	Carrizo Plain was eliminated from consideration due to poor solarity and poor gas and water infrastructure. In addition, potential site control difficulties meant the site was not considered economically viable.
Harper Lake	Harper Lake was eliminated from consideration because gaining site

Site	Reasons Eliminated
	control was considered to be time consuming and risky.
Lucerne Lake	Lucerne Lake was eliminated from consideration because the site was too small and did not provide adequate site control; therefore, the site was not economically viable.
Rabbit Lake	Rabbit Lake was eliminated from consideration because the site was too small and did not provide adequate site control; therefore, the site was not economically viable.
Jean Lake	Jean Lake was eliminated from consideration because the site was reserved by a different applicant and is located in Nevada, potentially creating jurisdictional complications.
Ivanpah Site B	Ivanpah Site B was eliminated from consideration because the site was reserved by a different applicant.

Source: BSE 2007a.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS – ALTERNATIVE SOLAR GENERATION TECHNOLOGIES

Alternative solar generation technologies were evaluated as potential alternatives to the proposed project. Although alternative solar generation technologies would achieve most of the project objectives, each would have different environmental or feasibility concerns. The following solar generation technologies are considered in this analysis:

- parabolic trough technology
- Stirling dish technology
- linear Fresnel technology
- photovoltaic technology

PARABOLIC TROUGH TECHNOLOGY

A parabolic trough system converts solar radiation to electricity by using sunlight to heat a fluid, such as oil, which is then used to generate steam. The plant consists of a large field of trough-shaped solar collectors arranged in parallel rows, normally aligned on a north-south horizontal axis. As illustrated in the photo below. Each parabolic trough collector has a linear parabolic-shaped reflector that focuses the sun's direct beam radiation on a linear receiver, also referred to as a heat collection element located at the focus of the parabola. Heat transfer fluid within the collector is heated to approximately 740°F as it circulates through the receiver and returns to a series of heat exchangers where the fluid is used to generate high-pressure steam. The superheated steam is then fed to a conventional reheat steam turbine/generator to produce electricity.

A solar trough power plant generally requires land with a grade of less than 1 percent. On average, 5 to 8 acres of land are required per MW of power generated. A parabolic trough power plant would include the following major elements.

Parabolic Trough Collectors. The parabolic trough collectors rotate around the horizontal north/south axis to track the sun as it moves through the sky during the day. Reflectors, or mirrors, focus the sun's radiation on a linear receiver/heat collection element, which is located along the length of the collector.

Solar Boiler. Solar boilers are designed differently than conventional gas-fired boilers in that they are fueled with hot oil instead of hot gases. This design is similar to any shell and tube heat exchanger in that the hot heat transfer fluid is circulated through tubes and the steam is produced on the shell side.

Heat Transfer Fluid Oil Heater. Due to the high freezing temperature of the solar field's heat transfer fluid (54°F), to eliminate the problem of oil freezing, an oil heater would be installed and used to protect the system during the night hours and colder months.

Parabolic trough power plants are the most established type of large solar generator. They exist in several places, including the following examples:

Nevada SolarOne (illustrated in **Alternatives Figure 6**) near Boulder City, Nevada, has been in operation since June 2007. It cost of more than $260 million dollars and generates 64 MW. It is the largest concentrating solar power plant to be built in the last 17 years and is the third largest plant of its kind in the world (Nevada SolarOne 2008).

Sunray Energy, Inc. Solar Energy Generating System is located in Daggett, adjacent to an abandoned power tower facility. It generates 44 MW and is shown in **Alternatives Figure 6**.

Kramer Junction Solar Energy Generating System is located about 30 miles west of Barstow. The solar energy generating system projects are a series of utility-scale solar thermal electric power plants, which were designed and developed in the mid-1980s by LUZ Industries. The facility can produce 165 MW at full capacity (Solel 2008).

Environmental Assessment

Approximately 2,000 to 3,200 acres of land would be required for a 400-MW solar trough power plant, resulting in a permanent loss of natural desert habitat similar to the habitat loss created by the proposed solar tower technology.

If the solar trough technology were used at Ivanpah, somewhat greater acreage may be required because the proposed site is crossed by several desert washes. Parabolic troughs require a more level ground surface, so the entire solar trough power plant would be graded, removing all vegetation from the area. This results in a somewhat more severe effect on biological and cultural resources than the ISEGS project, which would not require grading over the entire site.

The size and height of the solar trough mirrors (each approximately 20 feet high) would cause visual impacts from Interstate 15 and Ivanpah Dry Lake. The plant would also be visible from the Primm Golf Course, immediately east of the ISEGS site and slightly elevated. While the solar trough technology would not have the approximately 459-foot-

tall solar power towers, the number of solar troughs and the large acreage required would still introduce prominent and reflective structures.

Solar trough plants require water to generate the steam that powers the turbines. The technology uses a closed-loop circulation that requires some make-up water to replace water lost in the system. Water is also required to wash the mirrors for both types of technologies. If wet cooling were used, the cooling towers would require approximately 600 acre-feet/year (AFY) per 100 MW. Dry cooling would use significantly less water, approximately 18 AFY per 100 MW (NRDC 2008a).

Because of the extensive grading required for a solar trough plant, soil erosion could be more severe than that of the ISEGS project.

Rationale for Elimination

The large area needed for a solar trough power plant would be comparable to that required by the ISEGS power tower plant. Because of the more intensive use of the land and the grading required to achieve a 1 percent grade, there could be more severe impacts to biological and cultural resources than would occur with the ISEGS facility. In addition, due to the large size of the power plant and the use of angled mirrors, potentially severe impacts to visual resources would likely also occur.

While solar trough technology is a viable renewable technology, it would not significantly reduce the impacts of the ISEGS. Therefore, this alternative technology is eliminated from further consideration.

STIRLING DISH TECHNOLOGY

The Stirling dish technology converts thermal energy to electricity by using a mirror array to concentrate and focus sunlight on the receiver end of a Stirling engine. The curved dishes that focus the sun's energy are approximately 45 feet tall and occupy a maximum horizontal space of approximately 1,135 square feet (0.026 acres), with an anchored footprint of 12.5 square feet (assumed 4-foot diameter caisson). See **Alternatives Figure 6** for an illustration. The internal side of the receiver heats hydrogen gas, which expands. The pressure created by the expanding gas drives a piston, crankshaft, and drive shaft. The drive shaft turns a small electricity generator. The entire energy conversion process takes place within a canister the size of an oil barrel. The generation process requires no water, and the engine does not produce emissions as no combustion takes place. Each concentrator consists of one Stirling engine mounted above one mirror array. Once installed, each concentrator requires very little maintenance aside from periodic washing of the mirrored surfaces of the dish.

In general, the Stirling system requires 7 to 9 acres of land per MW of power generated. A 400-MW Stirling engine field would require from 2,800 acres to 3,600 acres of land.

Site preparation involves sinking a cement base with an embedded pedestal to support the dish (SES 2008). Each Stirling dish generates 25 kilowatts (KW) of power, so 16,000 dishes would be required to generate 400 MW. Each dish includes two major elements:

Solar Concentrator. Large parabolic concentrators include 89 mirror facets attached to a frame by three point adjusting mounts (SES 2008). They are designed in five subassembly units for ease of transport and installation on site. Two small motors are attached to the pedestal and programmed to swivel the dish on two axes, following the sun's progress across the sky during the day.

Power Conversion Unit. The Stirling engine's cylinder block incorporates four sealed cylinder assemblies along with coolers, regenerators, and heater heads (SES 2008). Concentrated solar energy heats up self-contained gas (hydrogen) in the power conversion unit, causing the gas to expand into the cylinders, moving the cylinders, and generating electricity. This cycle is repeated over and over as the engine runs at a steady rate of 1,800 rpm (SES 2008). Power is generated by heat transfer from the concentrated solar rays to the working gas in the engine's heater head, which converts the heat energy into mechanical motion.

The generator of each unit in a utility-scale project is connected by underground transmission line to a small substation where the power can be transformed into a higher voltage for more efficient transmission across the grid.

Environmental Assessment

The land area required for a 400-MW Stirling engine power plant is similar to that required for the proposed ISEGS project. However, it is not necessary to grade the entire parcel as only the 18-inch diameter pedestal of the Stirling engine requires level ground. It would still be necessary to grade permanent access roads between every two rows of Stirling engines due to the need for regular washing of the mirrors. This grading would cause removal of vegetation. Additionally, because the proposed Ivanpah site is crossed by several desert washes, the installation of 16,000 Stirling engines could require a larger total acreage of land, resulting in a greater loss of habitat.

Due to the size and height of the Stirling mirrors, impacts to visual resources would be similar to those of ISEGS. While the Stirling engine technology would not require the approximately 459-foot-tall solar power towers, the 16,000 Stirling engines and the 2,800 to 3,600 acres required to achieve 400 MW of power would introduce an industrial character. There would be less grading for the Stirling engine structures, but the numerous access roads required for cleaning the energy systems would create a high contrast between the disturbed area and its surroundings.

Rationale for Elimination

The large area needed for a Stirling engine power plant would be comparable to the land requirement for the ISEGS power plant. Although grading requirements for the Stirling engines themselves are relatively small, grading for access roads would be extensive because access roads are required for every other row of Stirling engines (SES 2008b). For these reasons, recreation and land use, biological resources, and cultural resource impacts would be similar to those of the ISEGS facility. In addition, due to the extent of the facility and the height of each concentrator, visual impacts would not be significantly reduced by this alternative.

Because no substantial reduction in impact has been identified, the Stirling dish technology has been eliminated from further consideration as an alternative technology.

LINEAR FRESNEL TECHNOLOGY

A solar linear Fresnel power plant converts solar radiation to electricity by using flat moving mirrors to follow the path of the sun and reflect its heat on the fixed pipe receivers located about the mirrors. During daylight hours, the solar concentrators focus heat on the receivers to produce steam, which is collecting in a piping system and delivered to steam drums located in a solar filed and then transferred to steam drums in a power block (Carrizo 2007). The steam drums transferred to the power block will be used to turn steam turbine generators and produce electricity. The steam is then cooled, condensed into water, and recirculated back into the process.

In general, the linear Fresnel technology requires 4 acres of land per MW of power generated, which is about half the land required by the other solar technologies. A 400-MW solar linear Fresnel field would require approximately 1,600 acres of land.

Each row-segment is supported by large hoops that rotate independently on metal castors. Rotation of the reflectors would be driven by a small electrical pulse motor. Reflectors are stowed with the mirror aimed down at the ground during the night. The major components are:

CLFR Solar Concentrator. A solar Fresnel power plant would use Ausra's CLFR technology which consists of slightly curved linear solar reflectors that concentrate solar energy on an elevated receiver structure. Reflectors measure 52.5 by 7.5 feet (Carrizo 2007). There are 24 reflectors in each row. A line is made up of 10 adjacent rows and operates as a unit, focusing on a single receiver (Carrizo 2007).

Receiver Structure. The receiver structure is approximately 56 feet tall (Carrizo 2007). It would carry a row of specially coated steel pipes in an insulated cavity. The receiver would produce saturated steam at approximately 518°F from cool water pumped through the receiver pipes and heated (Carrizo 2007). The steam would drive turbines and produce electricity.

Environmental Assessment

Though the Fresnel solar technology would require less acreage per MW of electricity produced than the ISEGS power tower plant, the Fresnel technology would still require the removal of approximately 1,600 acres of desert habitat. The mirrors are placed close together, so grading of the entire 1,600 acres would likely be required. Also, because the proposed Ivanpah site location is crossed by several desert washes, the engineering of the Fresnel siting may require a larger acreage than would otherwise be expected.

The Fresnel receiver structure is approximately 56 feet high and is required for every 10 rows of mirrors. Additionally, steam drums about 58 feet tall would be required to collect the steam from the receiver structure. The steam turbine generators would be roughly 60 feet tall and the air-cooled condensers, 115 feet tall. Due to the height of the many

project facilities, impacts to visual resources would be similar to those of the proposed ISEGS facility.

Linear Fresnel plants would require water to generate the steam that powers the turbines. The technology uses a closed-loop circulation that requires some make-up water to replace water lost in the system. Water would also be required to wash the mirrors. If wet cooling were used, the cooling towers would require approximately 600 acre feet per year per 100 MW. Dry cooling would use significantly less water, approximately 12.3 acre feet per year per 100 MW (NRDC 2008b).

Rationale for Elimination

Although the linear Fresnel technology would require grading of the entire project site, the plant would require only 1,600 acres, less than half the acreage required by the ISEGS project to generate the same amount of power. While visual and ground disturbance impacts would be reduced due to the smaller footprint, these impacts would be substantial.

The Fresnel solar technology is a proprietary technology owned by Ausra, Inc. and could not be developed by BrightSource at the Ivanpah site. Therefore, while this technology offers environmental advantages, it is not available to the ISEGS applicant, so is not considered to be feasible at the Ivanpah site.

SOLAR PHOTOVOLTAIC TECHNOLOGY

A solar photovoltaic (PV) power plant would consist of PV panels that would absorb solar radiation and convert it directly to electricity. The PV panels can be installed in two general ways:

- thin film installed on fixed metal racks, as proposed by OptiSolar, Inc. (see **Alternatives Figure 7**)
- concentrating photovoltaics installed in elevated groups of panels that track the sun. These technologies are available from SunPower and Cannon Solar Partners. SunPower's PowerTracker technology consists of a single-axis mechanism that rotates the PV panels to follow the sunlight. The Cannon Amonix technology allows tracking on two axes. See **Alternatives Figure 7**.

Photovoltaics, while used frequently in smaller scale, have been used infrequently for larger scale power plants. Examples of existing facilities are:

- Nellis Air Force Base (Nevada): Over 72,000 solar panels, generating 14 MW of energy, were constructed by Sunpower Corp. on 140 acres of Nellis land (Whitney 2007).
- GreenVolts in Tracy: GreenVolts is building a 2-MW facility near the intersection of Interstates 580 and 205 to demonstrate the commercial viability of its concentrating photovoltaic technology. The facility is comprised of CarouSol devices which magnify the sun rays 625 times onto a composite solar cell. It is expected be on line in 2009 (Nauman 2008).

Because PV technologies vary widely and few larger installations exist, the acreage required per MW of electricity produced from a large solar PV power plant is wide ranging. The land requirement varies from approximately 10 acres per MW produced, as at Nellis Air Force Base in Nevada, to over 40 acres per MW produced. Therefore, a nominal 400-MW solar PV power plant would require between 4,000 and 16,000 acres. Photovoltaics do not require water for electricity generation. Some water may be required to wash the solar panels to maintain efficiency.

Environmental Assessment

A nominal solar PV power plant would require at least as much land as the ISEGS site to generate an equivalent amount of power. The technologies vary in grading requirements, but in general the base of the solar PV panels is relatively small, and grading throughout the entire parcel would not be required. However, permanent access roads would be required as washing and maintenance of the solar panels are required.

Because most PV panels are black to absorb sun, rather than mirrored to reflect it, glare would not create visual impacts as with the power tower, Fresnel, and trough technologies. However, the large area of the PV panels would ensure its visibility to motorists and recreationists near Ivanpah.

Rationale for Elimination

The large land area required for PV development would result in similar impacts to recreation, land use, biological resources, and cultural resource as those of the ISEGS facility. In addition, the large facility would be highly visible. While solar PV technology is a viable renewable technology, its use would not reduce major impacts of the ISEGS facility because of the extent of land required. Therefore, this technology was eliminated from detailed analysis.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS – ALTERNATIVE RENEWABLE TECHNOLOGIES

Non-solar renewable generation technologies were considered as potential alternatives to the proposed project. The following renewable generation technologies were considered in this analysis:

- wind energy
- geothermal energy
- biomass energy
- tidal energy
- wave energy

WIND ENERGY

Wind carries kinetic energy that can be utilized to spin the blades of a wind turbine rotor and an electrical generator, which then feed alternating current (AC) into the utility grid. Most state-of-the-art wind turbines operating today convert 35 to 40 percent of the wind's kinetic energy into electricity. A single 1.5-MW turbine operating at a 40 percent

capacity factor generates 2,100 MWh annually. Modern wind turbines represent viable renewable alternatives to large solar energy projects within the region as exemplified by the number of wind projects applications pending to BLM within both California and Nevada. The BLM has received approximately 96 applications for wind projects within the California Desert District as of November 2008, for use of over 750,000 acres of land (BLM 2008b).

Wind turbines currently being manufactured have power ratings ranging from 250 watts to 5 MW, and units larger than 7 MW in capacity are now under development (AWEA 2008). The average capacity of wind turbines installed in the United States in 2007 was 1.65 MW (EERE 2008).

The perception of wind as an emerging energy source reached a peak in the early 1980s, when wind turbine generators to convert wind power into electricity were being installed in California at a rate of nearly 2,000 per year. Progress slowed a few years later, however, as start-up tax subsidies disappeared and experience demonstrated some deficiencies in design. At the present time, technological progress again has caught up, contributing lower cost, greater reliability, and reason for genuine optimism for the future.

The technology is now well developed and can be used to generate significant amounts of power. There are now approximately 2,490 MW of wind being generated in California (AWEA 2008).

Environmental Assessment

Wind turbines can create environmental impacts, as summarized below (AWEA 2008):

- Wind energy requires between 5 and 17 acres per MW of energy created. As such a nominal 400-MW power plant would require between 2,000 and 6,800 acres. However, wind turbine “footprints” typically use only 5 percent of the total area, or approximately 100 to 340 acres for a 400-MW power plant.
- Erosion can be a concern in certain habitats such as the desert or mountain ridgelines. Standard engineering practices can be used to reduce erosion potential.
- Birds collide with wind turbines. Avian deaths, particularly raptors, are a significant concern depending on raptor use of the area.
- Wind energy can negatively impact birds and other wildlife by fragmenting habitat, both through installation and operation of wind turbines themselves and through the roads and power lines that are required.
- Bats collide with wind turbines. The extent of bat mortality depends on turbine placement and bat flight patterns.
- Visual impacts of wind turbines can be significant, and installation in scenic and high traffic areas can result in strong local opposition. Other impressions of wind turbines are that they are attractive and represent clean energy.

Rationale for Elimination

Approximately 2,000 to 6,800 acres of land would be required for a 400-MW wind electricity power plant. While wind plants would not necessarily impact the same types of wildlife and vegetation as the ISEGS solar power tower plant, the significant acreage necessary for a 400-MW wind plant would still cause significant habitat loss in addition to potentially significant impacts from habitat fragmentation and bird and bat mortality.

Wind turbines are often over 400 feet high for 2-MW turbines. As such, any wind energy project would be highly visible, which is of special concern in scenic areas.

While wind electricity generation is a viable and important renewable technology in California, it would not reduce the large-scale ground disturbance and visual impacts associated with the ISEGS project. Therefore wind generation was eliminated from further consideration.

GEOTHERMAL ENERGY

Geothermal technologies use steam or high-temperature water obtained from naturally occurring geothermal reservoirs to drive steam turbine/generators. There are vapor dominated resources (dry, super-heated steam) and liquid-dominated resources where various techniques are utilized to extract energy from the high-temperature water.

Geothermal plants account for approximately 5 percent of California's power and range in size from under 1 MW to 110 MW. Geothermal plants typically operate as baseload facilities and require 0.2 to 0.5 acre per MW, so a 400-MW facility would require up to 200 acres. California is the largest geothermal power producer in the United States, with about 1,800 installed capacity; in 2007, 13,000 gigawatt hours of electricity were produced in California (CEC 2008). Geothermal plants provide highly reliable baseload power, with capacity factors from 90 to 98 percent.

Geothermal plants must be built near geothermal reservoir sites because steam and hot water cannot be transported long distances without significant thermal energy loss. Geothermal power plants are operating in the following California counties: Lake, Sonoma, Imperial, Inyo, Mono, and Lassen.

Environmental Assessment

Concerns regarding geothermal power plants include land use, water use, visibility, and hazardous materials, specifically gaseous emission. Geothermal power projects use less land than almost any other energy source, typically from about 0.2 to 0.5 acres per MW; however, geothermal plants must be built where the resource is since the steam cannot be piped long distances without significant heat loss. This results in a highly secure and predictable fuel supply and some inflexibility in siting. It may also result in a long interconnection requirement to reach a transmission system.

Drilling and operation of geothermal wells may also potentially degrade local groundwater aquifers. Geothermal wells are typically cased and cemented in a manner that precludes contamination of aquifers. Hot water and steam can only flow into the bottom of a geothermal well, significantly below cold water aquifers, and are confined

within one to three layers of casing cemented almost all the way down the well. If there were a natural connection (or one created by drilling) between the reservoir and a cold water aquifer, it could destroy the commercial viability of the geothermal reservoir. Operators avoid inflow of cold waters into a geothermal reservoir, or vice versa, both to comply with regulatory protections of groundwater aquifers and to protect the geothermal reservoir.

Geothermal plants can cause visual impacts; however, this can be reduced by careful siting of the power plant, using the natural screening of topography and trees, by painting facilities to blend with the surroundings and by locating them away from sensitive viewsheds. Very efficient water-cooled cooling towers can be designed so that vapor plumes from cooling towers are barely visible except on very cold, clear days.

Geothermal plant can also produce waste and byproducts that can have significant impacts. The most significant and potentially harmful gas generally encountered in geothermal systems is hydrogen sulfide (H_2S), which, at concentrations higher than 30 parts per million (ppm), is a toxic substance (CEC 2003). It can cause a variety of problems including dizziness, vomiting, and eventually death if one is exposed for long periods of time. In stronger concentrations above 100 ppm, H_2S can be fatal. H_2S is heavier than air and can accumulate in low-lying areas (equipment pits, ravines, and other depressions) and become concentrated over time.

H_2S releases could potentially be of concern during drilling, well testing, and plant start-up and shut-down operations, although recent technology improvements in atmospheric separators can significantly decrease emissions and noise during these operations. H_2S is now often abated at geothermal power plants, resulting in a conversion of close to 100 percent of the H_2S into elemental sulfur (GEA 2007). Since 1976, H_2S emissions have decreased from 1,900 pounds per hour to 200 pounds per hour despite an increase in geothermal power production from 500 MW to 2,000 MW (GEA 2007).

Rationale for Elimination

Geothermal is a commercially available technology and is important for California's renewable energy future because it provides baseload power. However, it is limited to areas with geologic conditions resulting in high subsurface temperatures. Even in areas where such conditions are present, there have been concerns about the reliability and corrosiveness of the steam supply. Additionally, while the technology is available, there are not enough geothermal resources to provide the renewable energy required to meet the California Renewable Portfolio Standard requirements, so additional technologies, like solar thermal generation, would also be required.

BIOMASS ENERGY

Electricity can be generated by burning organic fuels in a boiler to produce steam, which then turns a turbine; this is biomass generation. Biomass can also be converted into a fuel gas such as methane and burned to generate power. Wood is the most commonly used biomass for power generation. Major biomass fuels include forestry and mill wastes, agricultural field crop and food processing wastes, and construction and urban wood wastes. Several techniques are used to convert these fuels to electricity, including direct combustion, gasification, and anaerobic fermentation. Biomass facilities do not

require the extensive amount of land required by the other renewable energy sources discussed, but they generate much smaller amounts of electricity.

Currently, nearly 19 percent of the state's renewable electricity derives from biomass and waste-to-energy sources (CEC 2007). Most biomass plant capacities are in the 3- to 10-MW range and typically operate as baseload capacity. The average size of a sales generation biomass plant is 21 MW (CBEA 2008). Unlike other renewables, the locational flexibility of biomass facilities would reduce the need for significant transmission investments. Solid fuel biomass (555 MW) makes up about 1.75 percent of the state's electricity, and landfill gas generation (260 MW) makes up about 0.75 percent. Existing landfills not now producing electricity from gas could add a maximum of about 170 MW of new generation capacity (CBEA 2008).

Environmental Assessment

Generally, small amounts of land are required for biomass power facilities; however, a biomass facility should be sited near a relatively large source of biomass in order to minimize the cost of bringing the biomass waste to the facility.

Operational noise impacts may be a concern, originating from truck engines as a result hauling operations coming from and going to the facility repeatedly on a daily basis. Other operations of the biomass facilities, while internal to the main structure, can result in increased noise due to the material grinding equipment.

The emissions due to biomass fuel-fired power plant operation are generally unavoidable. Direct impacts of criteria pollutants could cause or contribute to a violation of the ambient air quality standards. Significant impacts can potentially occur for PM10 and ozone because emissions of particulate matter and precursors and ozone precursors would contribute to existing violations of the PM10 and ozone standards. Biomass/biogas facility emissions could also adversely affect visibility and vegetation in federal Class I areas or state wilderness areas, which would significantly deteriorate air quality related values in the wilderness areas. Toxic air contaminants from routine operation would also cause health risks that could locally adversely affect sensitive receptors.

Rationale for Elimination

Most biomass facilities produce only small amounts of electricity (in the range of 3 to 10 MW) and so could not meet project objectives. Biomass facilities also generate significant air emissions and require numerous truck deliveries to supply the plant with the waste. Also, in waste-to-energy facilities, there is some concern regarding the emission of toxic chemicals, such as dioxin, and the disposal of the toxic ash that results from biomass burning. Therefore, this technology is not analyzed in detail as an alternative to the ISEGS project.

TIDAL ENERGY

The oldest technology to harness tidal power for the generation of electricity involves building a dam, known as a *barrage*, across a bay or estuary that has large differences in elevation between high and low tides. Water retained behind a dam at high tide

generates a power head sufficient to generate electricity as the tide ebbs and water released from within the dam turns conventional turbines.

Certain coastal regions experience higher tides than others. This is a result of the amplification of tides caused by local geographical features such as bays and inlets. In order to produce practical amounts of power for tidal barrages, a difference between high and low tides of at least 5 meters is required. There are about 40 sites around the world with this magnitude of tidal range. The higher the tides, the more electricity can be generated from a given site and the lower the cost of electricity produced. Worldwide, existing power plants include a 240-MW plant in France, a 20-MW plant in Nova Scotia, and a 0.5-MW plant in Russia (EPRI 2006).

Tidal Fences

Tidal fences are effectively barrages that completely block a channel. If deployed across the mouth of an estuary, they can be very environmentally destructive. However, in the 1990s, their deployment in channels between small islands or in straights between the mainland and islands has increasingly been considered a viable option for generation of large amounts of electricity.

The advantage of a tidal fence is that all the electrical equipment (generators and transformers) can be kept high above the water. Also, by decreasing the cross-section of the channel, current velocity through the turbines is significantly increased.

The first large-scale commercial fences are likely to be built in Southeast Asia. The most advanced plan is a scheme for a fence across the Dalupiri Passage between the islands of Dalupiri and Samar in the Philippines, agreed upon by the Philippine government and Energy Engineering Company of Vancouver, Canada in late 1997. The site, on the south side of the San Bernardino Strait, is approximately 41 meters deep (with a relatively flat bottom) and has a peak tidal current of about 8 knots. As a result, the fence is expected to generate up to 2,200 MW of peak power (with a base daily average of 1,100 MW) (Osborne 2000).

Tidal Turbines

Tidal turbines are the chief competition to the tidal fence. Looking like an underwater wind turbine, they offer a number of advantages over the tidal fence. They are less disruptive to wildlife, allow small boats to continue to use the area, and have much lower material requirements than the fence.

Tidal turbines function well where coastal currents run at 2 to 2.5 meters per second (slower currents tend to be uneconomic while larger ones stress the equipment). Such currents provide an energy density four times greater than air, meaning that a 15-meter-diameter turbine will generate as much energy as a 60-meter-diameter windmill. In addition, tidal currents are both predictable and reliable, a feature which gives them an advantage over both wind and solar systems. The tidal turbine also offers significant environmental advantages over wind and solar systems; the majority of the assembly is hidden below the waterline, and all cabling is along the sea bed.

There are many sites around the world where tidal turbines could be effectively installed. The ideal site is close to shore (within 1 kilometer) in water depths of about 20 to 30 meters. In April 2007, the first major tidal-power project was installed in the United States off New York City's Roosevelt Island (Fairley 2007). Turbines such as those used in New York City use in-flow turbines, thereby lessening the environmental impacts. A study conducted in 2006, *System Level Design, Performance, Cost and Economic Assessment – San Francisco Tidal In-Stream Power Plant*, concluded that a tidal plant located under the Golden Gate Bridge could create approximately 35 MW of power with no significant impacts to the environment and recommended further research and development into both ocean energy technology and a pilot project in San Francisco (EPRI 2006a).

Environmental Assessment

Tidal technologies, especially tidal fences, have the potential to cause significant biological impacts, especially to marine species and habitats. Fish could be caught in the unit's fins by the sudden drop in pressure near the unit. The passageways, more than 15 feet high and probably sitting on the bay floor, could squeeze out marine life that lives there or alter the tidal flow, sediment build-up, and the ecosystem in general. Even the in-flow turbines can have environmental impacts on marine systems. The in-flow turbines off New York City must undergo environmental monitoring for 18 months to ensure the turbines will not create environmental impacts to the river's marine wildlife. Also, depending on the location of the tidal technology, commercial shipping could be disrupted during construction.

The reduced tidal range (difference between high and low water levels) resulting from tidal energy generation can destroy inter-tidal habitat used by wading birds. Sediment trapped behind the barrage could also reduce the volume of the estuary over time.

Rationale for Elimination

Tidal fence technology is a commercially available technology, although limited to areas that are adjacent to a body of water with a large difference between high and low tides, and it creates significant environmental impacts to ocean ecosystems. In-flow tidal turbines are a relatively new technology and are not considered an alternative to the ISEGS project because they are an unproven technology at the scale that would be required to replace the proposed project. Additionally, the environmental impacts of tidal turbines are still under review, as demonstrated by the pilot project under environmental monitoring in New York.

WAVE ENERGY

Wave power technologies have been around for nearly 30 years. Setbacks and a general lack of confidence have contributed to slow progress towards proven devices that would have a good probability of becoming commercial sources of electrical power.

The highest energy waves are concentrated off the western coasts in the 40° to 60° latitude range north and south. The power in the wave fronts varies in these areas between 30 and 70 kilowatts per meter (kW/m) with peaks to 100 kW/m in the Atlantic southwest of Ireland, the Southern Ocean and off Cape Horn. Many wave energy devices are still in the research and development stage and would require large

amounts of capital to get started. Additional costs from permitting and environmental assessments also make wave energy problematic (WEC 2007). Nonetheless, wave energy is likely to increase in use within the next 5 to 10 years.

The total power of waves breaking on the world's coastlines is estimated at 2 to 3 million megawatts. In favorable locations, wave energy density can average 65 MW per mile of coastline. Three approaches to capturing wave energy are:

Floats or Pitching Devices. These devices generate electricity from the bobbing or pitching action of a floating object. The object can be mounted to a floating raft or to a device fixed on the ocean floor.

Oscillating Water Columns. These devices generate electricity from the wave-driven rise and fall of water in a cylindrical shaft. The rising and falling water column drives air into and out of the top of the shaft, powering an air-driven turbine.

Wave Surge or Focusing Devices. These shoreline devices, also called "tapered channel" or "tapchan" systems, rely on a shore-mounted structure to channel and concentrate the waves, driving them into an elevated reservoir. Water flow out of this reservoir is used to generate electricity, using standard hydropower technologies.

In December 2007, PG&E signed a power purchase agreement with Finavera Renewables, which had planned to operate a wave farm approximately 2.5 miles off the coast of Eureka, California. The agreement was for 2 MW of power beginning in 2012. On October 16, 2008, the California Public Utilities Commission rejected PG&E's request for approval of a renewable resource procurement contract with Finavery Renewables because, among other reasons, the CPUC concluded the project had not been shown to be viable. As stated in the decision, there is significant uncertainty surrounding wave technology and the wave energy industry is at a beginning stage (CPUC 2008).

Environmental Assessment

The environmental impacts of wave power have yet to be fully analyzed. A recent study published by the U.S. Department of Commerce and National Oceanic and Atmospheric Administration listed a number of potentially significant environmental impacts created by wave power (Boehlert 2008). These include (Boehlert 2008):

- Significant reduction to waves with possible effects to beaches (e.g. changes to sediment transport processes).
- The use of buoys may have positive effects on forage fish species, which in turn could attract larger predators. Structures need to reduce potential entanglement of larger predators, especially marine turtle species.
- Modifications to water circulation and currents may result in changes to larval distribution and sediment transport.
- Wave energy development may affect community structures for fish and fisheries.
- Lighting and above-water structures may result in marine bird attraction and collisions and may alter food webs and beach processes.

- A diversity of concerns would arise regarding marine mammals including entanglement issues.
- Energy-absorbing structures may affect numerous receptors and should avoid sensitive habitats.
- Chemicals used in the process must be addressed both for spills and for a continuous release such as in fouling paints.
- New hard structures and lighting may break loose and increase debris accumulation.
- Impacts on fish and marine mammals caused by noise coming from the buoys should be understood and mitigated.
- Electromagnetic effects may affect feeding or orientation and should be better understood.
- Impact thresholds need to be established. As projects scale up in location or implementation, new risks may become evident.

Rationale for Elimination

Wave energy is new and may not be technologically feasible. Additionally, wave power must be located where waves are consistently strong; even then, the production of power depends on the size of waves, which result in large differences in the amount of energy produced. Wave technology is not considered an alternative to the ISEGS project because is an unproven technology at the scale that would be required to replace the proposed project and because it may also result in significant environmental impacts as evidenced in the “Environmental Assessment” discussion.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS – ALTERNATIVE METHODS OF GENERATING OR CONSERVING ELECTRICITY

Nonrenewable generation technologies that require use of natural gas, coal, or nuclear energy would not achieve the key project objective for ISEGS: to safely and economically construct and operate a nominal 400-megawatt, renewable power generating facility in California capable of selling competitively priced renewable energy consistent with the needs of California utilities.

While these generation technologies would not achieve this key objective, they are presented here in brief for the benefit of the public and decision makers. Conservation and demand-side management is also briefly addressed in this section.

The following topics are considered in this analysis:

- natural gas
- coal
- nuclear energy
- conservation and demand-side management

NATURAL GAS GENERATION

Natural gas power generation accounts for approximately 22 percent of all the energy used in the United States and comprises 40 percent of the power generated in California (CEC 2007). Natural gas power plants typically consist of combustion turbine generators, heat recovery steam generators, a steam turbine generator, wet or dry cooling towers, and associated support equipment. An interconnection with a natural gas pipeline, a water supply, and electric transmission are also required.

A gas-fired power plant generating 400 MW would generally require less than 40 acres of land.

Environmental Assessment

Natural gas power plants may result in numerous environmental impacts such as the following.

Overall air quality impacts would increase because natural gas-fired power plants contribute to local violations of PM10 and ozone ambient air quality standards, and operational emissions could result in toxic air contaminants that could adversely affect sensitive receptors. Net increases in greenhouse gas emissions due to natural gas-firing in the conventional power plants would also be significant.

Environmental justice may be a concern. Gas-fired power plants tend to be located in developed urban areas that are zoned for heavy industry. In some instances, low-income and minority populations are also located in such areas.

In order to avoid land use impacts, natural gas-fired power plants must be consistent with local jurisdictions' zoning.

Several hazardous materials, including regulated substances (aqueous ammonia, hydrogen, and sulfuric acid), would be stored at a natural gas power plant during operation. Aqueous ammonia would be stored in amounts above the threshold quantity during the final stages of construction, initial start-up, and operations phase. Transport of hazardous materials during power plant operation includes delivery of aqueous ammonia and removal of wastes. During operation, the aqueous ammonia transporter would be required to obtain a Hazardous Material Transportation License in accordance with California Vehicle Code section 32105 and would be required to follow appropriate safety procedures and routes.

Cultural impacts can be severe depending on the power plant siting; however, because natural gas power plants require significantly fewer acres per megawatt of power generated, impacts to cultural resources would be expected to be fewer than with solar facilities.

Power plant siting may result in the withdrawal of agriculture lands. However, because natural gas power plants require significantly fewer acres per megawatt of power generated, impacts to agriculture would be expected to be less than with solar facilities should they be sited on agriculture lands.

Visual impacts may occur with natural gas power plants because they introduce large structures with industrial character. The most prominent structures are frequently the cooling towers, which may reach 100 feet tall, and the power plant stacks, which may reach over 100 feet tall. Visible plumes from the cooling tower would also potentially occur.

Rationale for Elimination

Although natural gas generation is clearly a viable technology, it is not a renewable technology, so it would not attain the objective of generating renewable power meeting California's renewable energy needs. The air quality impacts of gas-fired plants include greenhouse gases and are one major reason that California's Renewable Portfolio Standard was developed. Therefore, this alternative is not considered in detail as an alternative to the ISEGS project.

COAL GENERATION

Coal-fired electric generating plants are the cornerstone of America's central power system. Traditional coal-fired plants generate large amounts of greenhouse gases. New "clean coal technology" includes a variety of energy processes that reduce air emission and other pollutants from coal-burning power plants. The Clean Coal Power Initiative is providing government co-financing for new coal technologies that help utilities meet the Clear Skies Initiative to cut sulfur, nitrogen, and mercury pollutants by nearly 70 percent by 2018. The Clean Coal Power Initiative is now focusing on developing projects that utilize carbon sequestration technologies and/or beneficial reuse of carbon dioxide (DOE 2008). However, these technologies are not yet in use.

In 2006, approximately 15.7 percent of the energy used in California came from coal fired sources; 38 percent of this was generated in state, and 62 percent was imported (CEC 2007). The in-state coal-fired generation includes electricity generated from out-of-state, coal-fired power plants owned by and reported by California utilities (CEC 2007). In 2006, California enacted SB 1368 (Perata, Chapter 598, Statutes of 2006), which prohibits utilities from making long-term commitments for electricity generated from plants that create more carbon dioxide (CO_2) than clean-burning natural gas plants (CEC 2007).

Environmental Assessment

Coal-fired power plants may also result in numerous environmental impacts such as the following.

Overall, air quality impacts would increase because coal-fired power plants contribute carbon dioxide, sulfur dioxide, nitrogen oxides, mercury, and fly ash (USEPA 2008a). Mining, cleaning, and transporting coal to the power plants generates additional emissions. Average emissions of a coal-fired power plant are 2,249 pounds per megawatt hour of carbon dioxide, 13 pounds per megawatt hour of sulfur dioxide and 6 pounds per megawatt hour of nitrogen oxides (EPA 2008a). Net increases in greenhouse gas emissions due to coal-firing in the conventional power plants would be significant.

Health risks associated with power plants have also been documented, including problems associated with exposure to fine particle pollution or soot, an increase in asthma, and an increase in non-fatal heart attacks.

Large quantities of water are generally required to produce steam and for cooling. When coal-fired power plants use water from a lake or river, fish or other aquatic life can be impacted (EPA 2008).

Rationale for Elimination

Although coal generation is a viable technology, it is not a renewable technology, so it would not attain the objective of generating renewable power meeting California's renewable energy needs. Existing technology for coal-fired plants results in high greenhouse gas emissions. Therefore, coal generation was eliminated from detailed analysis.

NUCLEAR ENERGY

Due to environmental and safety concerns, California law currently prohibits the construction of any new nuclear power plants in California until the California Energy Commission finds that the federal government has approved and there exists a demonstrated technology for the permanent disposal of spent fuel from these facilities (CEC 2006). In June 1976, California enacted legislation directing the Energy Commission to perform an independent investigation of the nuclear fuel cycle. This investigation was to assess whether the technology to reprocess nuclear fuel rods or to dispose of permanently high-level nuclear waste had been demonstrated and approved and was operational (Public Resources Code 25524.1 (a) (1), 25524.1 (b), and 25524.2 (a)). After extensive public hearings, the Energy Commission determined that it could not make the requisite affirmative findings concerning either reprocessing of nuclear fuel or disposal of high-level waste. This information was published in a report: *Status of Nuclear Fuel Reprocessing, Spent Fuel Storage and High-level Waste Disposal*, Energy Commission publication P102-78-001, January 1978.) As a result, the development of new nuclear energy facilities in California was prohibited by law.

It has been more than 25 years since the last comprehensive Energy Commission assessment of nuclear power issues. The *Nuclear Power in California: 2007 Status Report* was published in October of 2007, and gives a detailed description of the current nuclear waste issues and their implications for California. This was prepared as part of the development of the Energy Commission's *2007 Integrated Energy Policy Report* (CEC 2007a).

Rationale for Elimination

The permitting of new nuclear facilities in California is currently illegal, so this technology is infeasible.

CONSERVATION AND DEMAND-SIDE MANAGEMENT

Conservation and demand-side management consist of a variety of approaches to reduction of electricity use, including energy efficiency and conservation, building and appliance standards, and load management and fuel substitution. In 2005 the Energy

Commission and CPUC's Energy Action Plan II declared cost effective energy efficiency as the resource of first choice for meeting California's energy needs. The Energy Commission noted that energy efficiency helped flatten the state's per capita electricity use and saved consumers more than $56 billion since 1978 (CPUC 2008). The investor-owned utilities' 2006-2008 efficiency portfolio marks the single-largest energy efficiency campaign in U.S. history, with a $2 billion investment by California's energy ratepayers (CPUC 2008). However, with population growth, increasing demand for energy, and the need to reduce greenhouse gases, there is a greater need for energy efficiency.

The CPUC, with support from the Governor's Office, the Energy Commission, and the California Air Resources Board, among others, adopted the California Long-Term Energy Efficiency Strategy Plan for 2009 to 2020 in September 2008 (CPUC 2008). The plan is a framework for all sectors in California including industry, agriculture, large and small businesses, and households. Major goals of the plan include:

- All new residential construction will be zero net energy by 2020;
- All new commercial construction will be zero net energy by 2030;
- Heating, ventilation, and air conditioning industries will be re-shaped to deliver maximum performance systems;
- Eligible low-income customers will be able to participate in the Low Income Energy Efficiency program and will be provided with cost-effective energy efficiency measures in their residences by 2020.

Rationale for Elimination

Conservation and demand-side management is important for California's energy future and cost effective energy efficiency is considered as the resource of first choice for meeting California's energy needs. However, with population growth and increasing demand for energy, conservation and demand-management alone is not sufficient to address all of California's energy needs. Additionally, it will not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements, so technologies, like solar thermal generation, would be required.

CONCLUSIONS OF ALTERNATIVES ANALYSIS

Based on the CEQA requirements that a range of alternatives be considered in a PSA, this section considers several types of potential alternatives to the proposed ISEGS project:

- alternative sites for the project using the technology proposed;
- alternative solar generation technologies that could be implemented at the proposed site;
- other alternative renewable technologies that could generate 400 MW of electricity and would help meet the Renewable Portfolio Standard (RPS);
- alternative methods of generating electricity that would not meet RPS goals.

While several of the alternative sites or alternative technologies would reduce some impacts in comparison with those of the proposed ISEGS project, no feasible site or technology appears to have the potential to reduce impacts overall. The analysis concludes that none of these alternatives has the potential to reduce or eliminate the significant impacts of the project as proposed.

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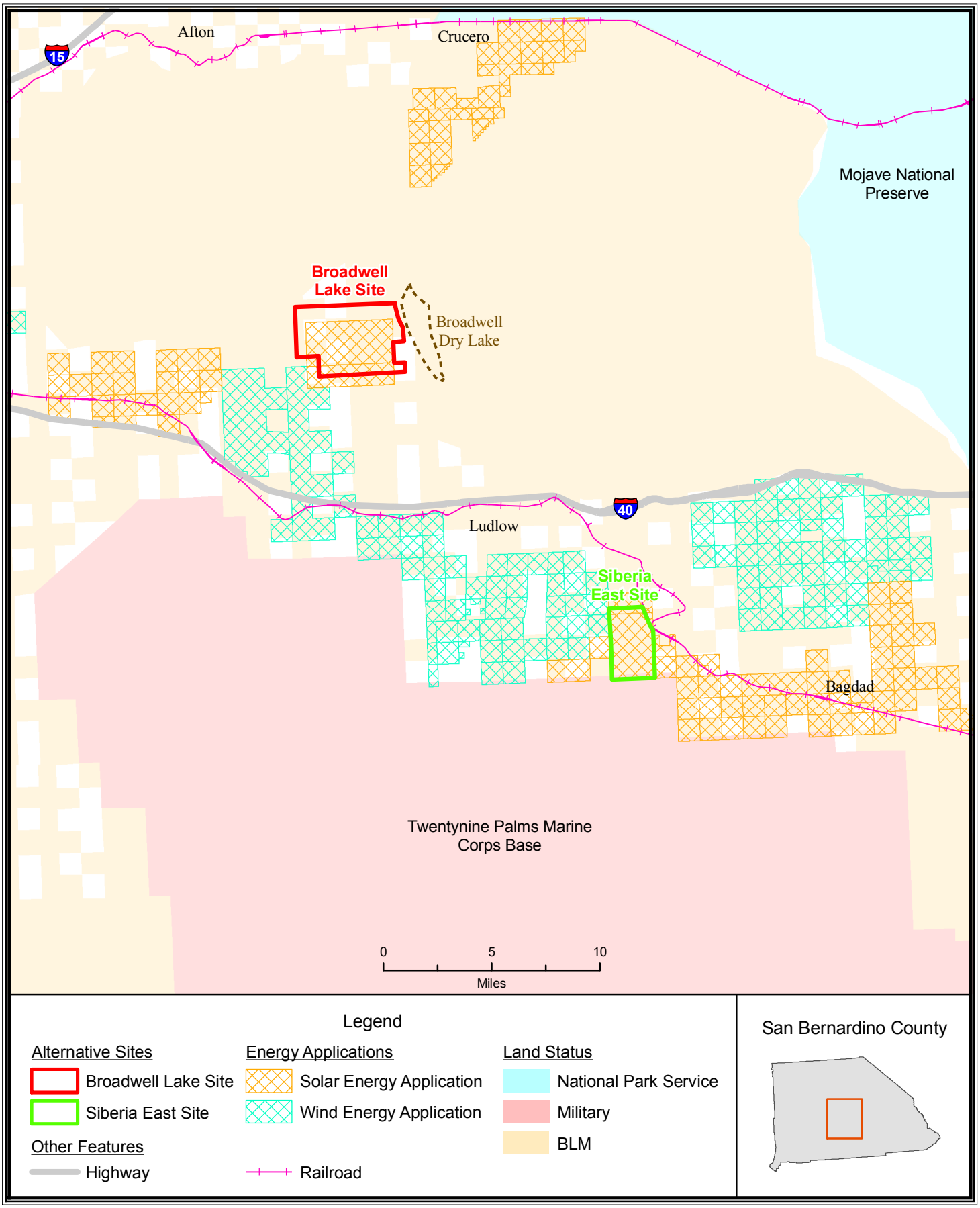
ALTERNATIVES - FIGURE 1

ISEGS - Alternative Regional Locations

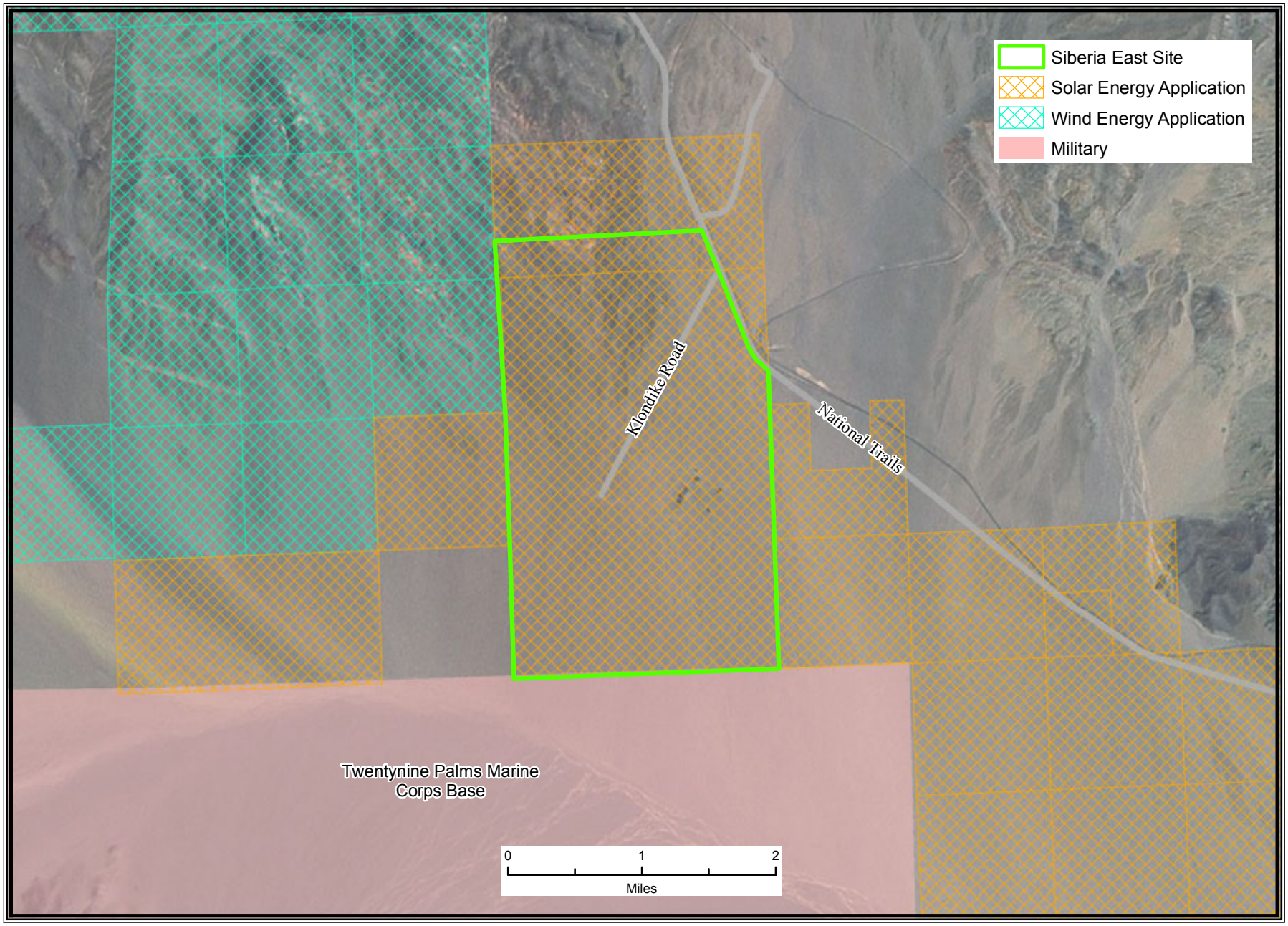


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: BLM, 2008

ALTERNATIVES - FIGURE 2

ISEGS - Siberia East Alternative

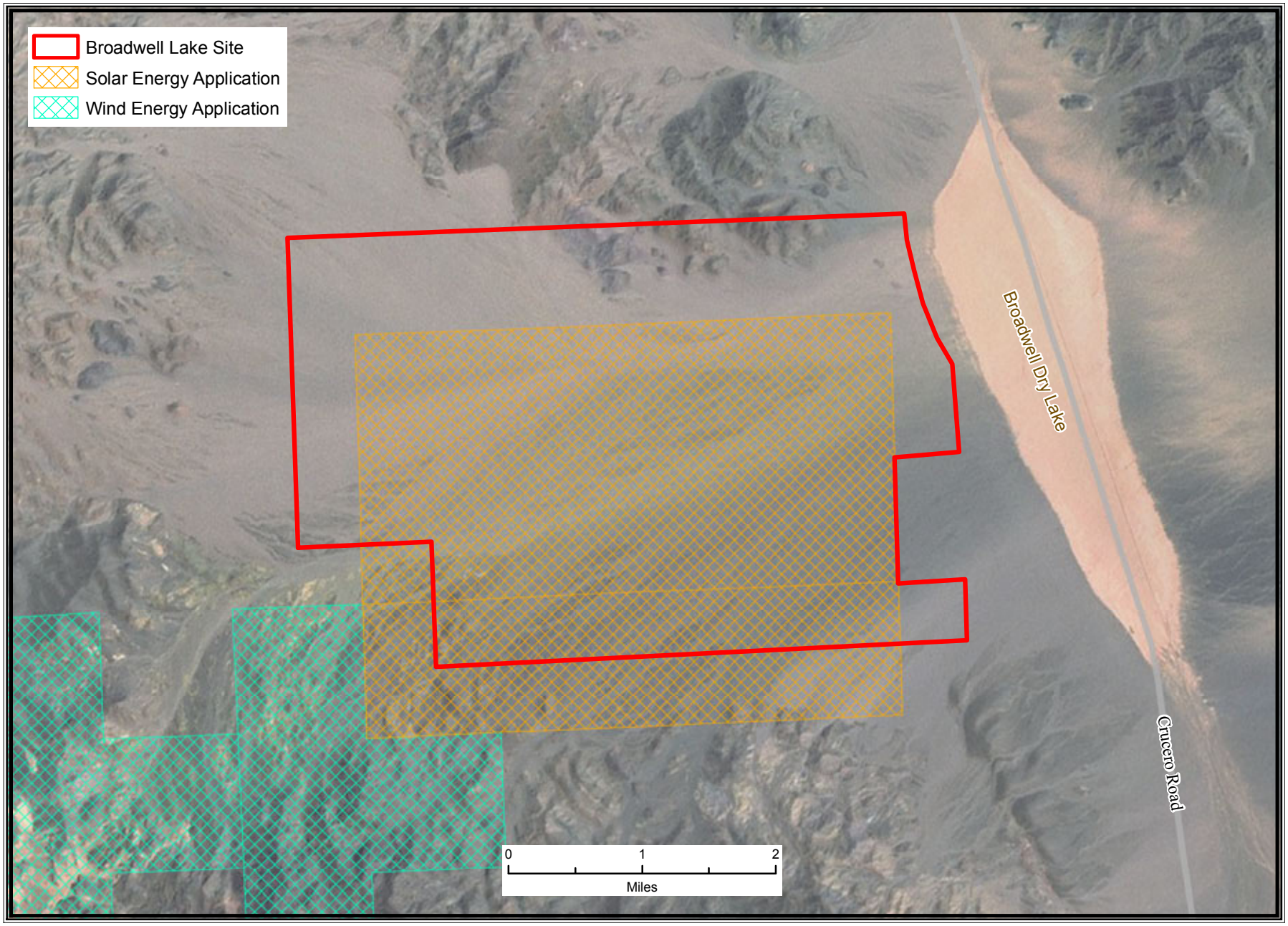


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: BLM, 2008

ALTERNATIVES - FIGURE 3

ISEGS - Broadwell Lake Alternative

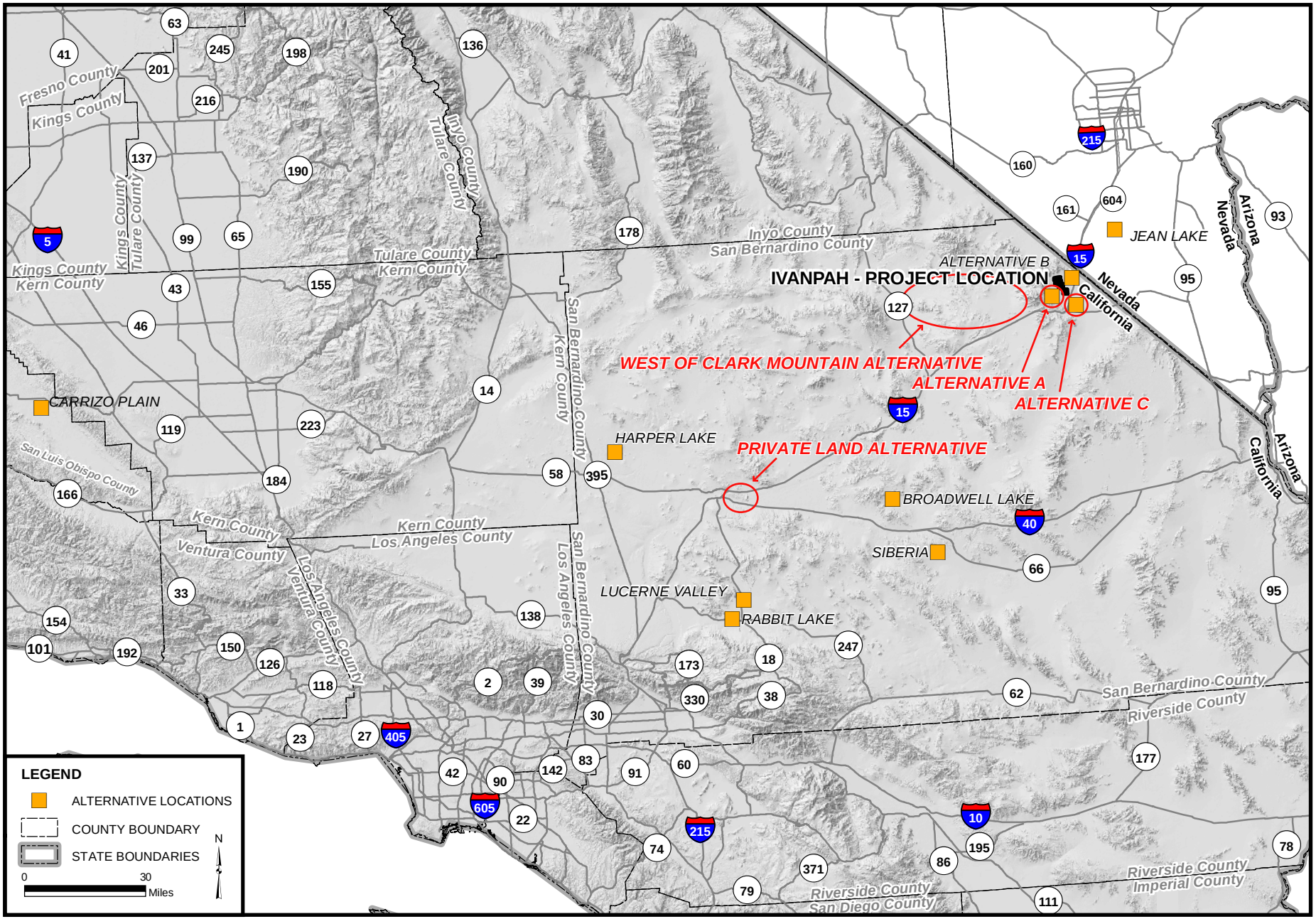


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: BLM, 2008

ALTERNATIVES - FIGURE 4

ISEGS - Locations of Alternatives Eliminated (in red)

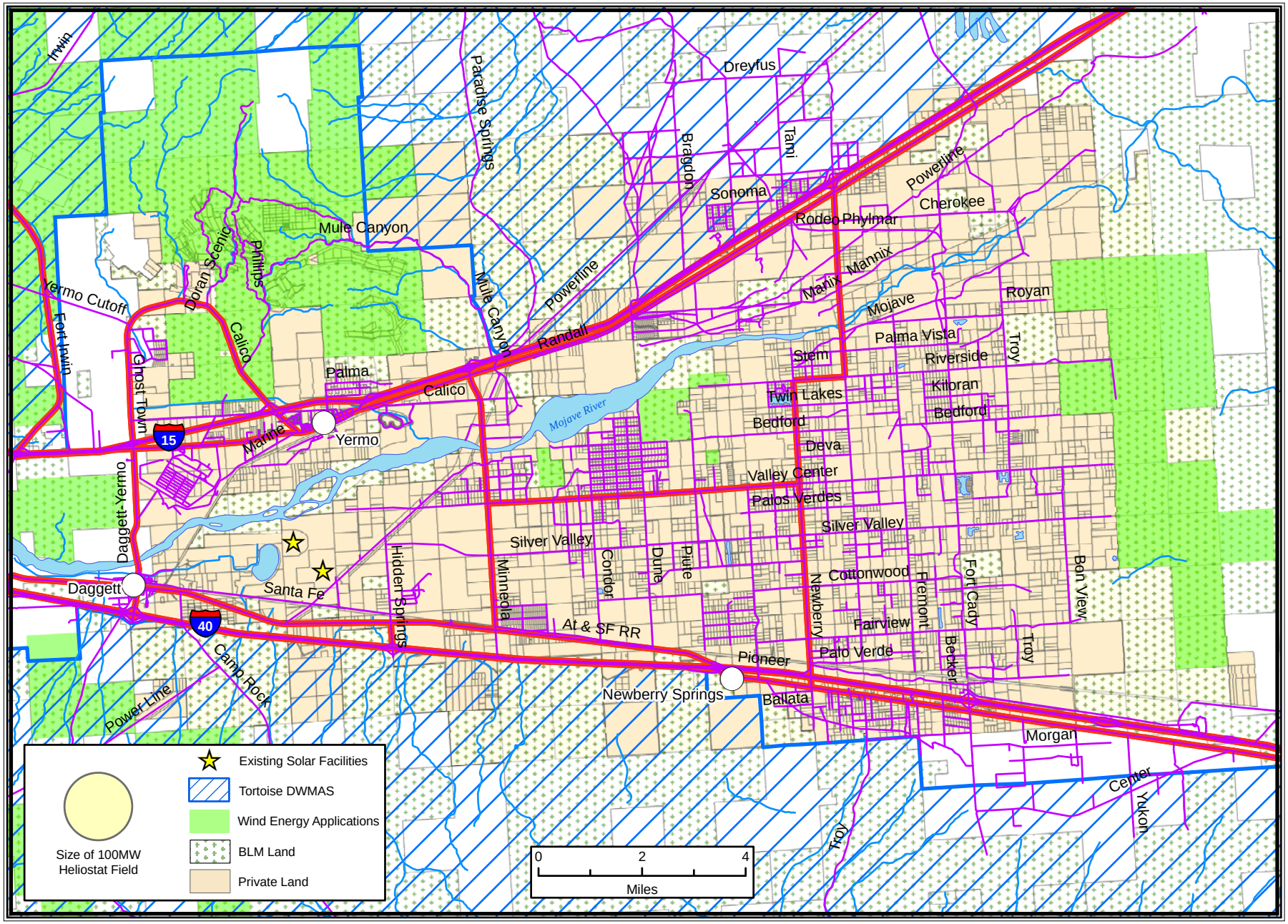


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, DECEMBER 2008

SOURCE: BSE, 2007a

ALTERNATIVES - FIGURE 5

ISEGS - Private Land Alternative



CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, DECEMBER 2008

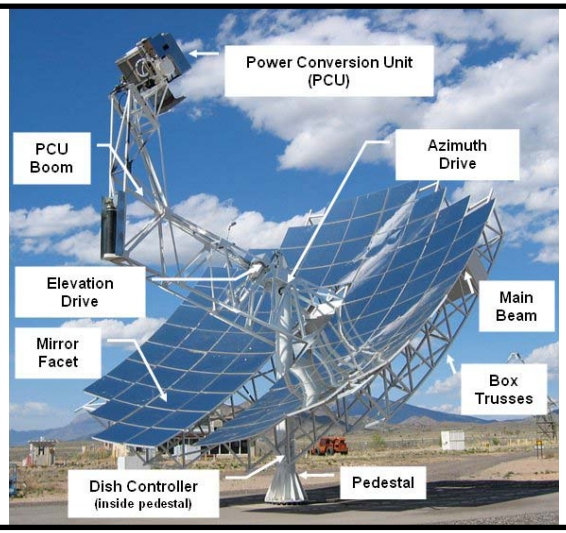
SOURCE: California Energy Commission - Tele Atlas Data - San Bernardino County

ALTERNATIVES - FIGURE 6

ISEGS - Solar Generation Technologies

Parabolic through technology as used in Daggett, CA

Parabolic through technology in a 64 MW field
(Nevada SolarOne in Boulder City, NV)



Stirling Dish

SOURCE:Sunray Energy, Inc., SolarOne website, Stirling Energy Systems website

ALTERNATIVES - FIGURE 7

ISEGS - Linear Fresnel and Photovoltaic Technologies

Linear Fresnel Technology

OptiSolar's thin film solar vphotovoltaic field

Canon Solar Partners proposes to use the 35 kW Amonix System

SunPower's PowerTracker Solar in Gwangju City Power Plant, South Korea - 1 MW

SOURCE: Wikipedia.org, Fresnel_reflectors_ausra.jpg, www.optisolar.com/topaz.htm, Canon 2008, www.sunpowercorp.com/For-Power-Plants.aspx

GENERAL CONDITIONS
INCLUDING
COMPLIANCE MONITORING AND CLOSURE PLAN

Prepared by: Steve Munro

INTRODUCTION

The project's General Compliance Conditions of Certification, including Compliance Monitoring and Closure Plan (Compliance Plan) have been established as required by Public Resources Code section 25532. The plan provides a means for assuring that the facility is constructed, operated and closed in compliance with public health and safety, environmental and other applicable regulations, guidelines, and conditions adopted or established by the California Energy Commission and specified in the written decision on the Application for Certification or otherwise required by law.

The Compliance Plan is composed of elements that:

- set forth the duties and responsibilities of the Compliance Project Manager (CPM), the project owner, delegate agencies, and others;
- set forth the requirements for handling confidential records and maintaining the compliance record;
- state procedures for settling disputes and making post-certification changes;
- state the requirements for periodic compliance reports and other administrative procedures that are necessary to verify the compliance status for all Energy Commission approved conditions of certification;
- establish requirements for facility closure plans; and
- specify conditions of certification for each technical area containing the measures required to mitigate any and all potential adverse project impacts associated with construction, operation and closure below a level of significance. Each specific condition of certification also includes a verification provision that describes the method of assuring that the condition has been satisfied.

DEFINITIONS

The following terms and definitions are used to establish when Conditions of Certification are implemented.

PRE-CONSTRUCTION SITE MOBILIZATION

Site mobilization is limited preconstruction activities at the site to allow for the installation of fencing, construction trailers, construction trailer utilities, and construction trailer parking at the site. Limited ground disturbance, grading, and trenching associated with the above mentioned pre-construction activities is considered part of site mobilization. Walking, driving or parking a passenger vehicle, pickup truck and light vehicles is allowable during site mobilization.

CONSTRUCTION

Onsite work to install permanent equipment or structures for any facility.

Ground Disturbance

Construction-related ground disturbance refers to activities that result in the removal of top soil or vegetation at the site beyond site mobilization needs, and for access roads and linear facilities.

Grading, Boring, and Trenching

Construction-related grading, boring, and trenching refers to activities that result in subsurface soil work at the site and for access roads and linear facilities, e.g., alteration of the topographical features such as leveling, removal of hills or high spots, moving of soil from one area to another, and removal of soil.

Notwithstanding the definitions of ground disturbance, grading, boring and trenching above, construction does **not** include the following:

1. the installation of environmental monitoring equipment;
2. a soil or geological investigation;
3. a topographical survey;
4. any other study or investigation to determine the environmental acceptability or feasibility of the use of the site for any particular facility; and
5. any work to provide access to the site for any of the purposes specified in "Construction" 1, 2, 3, or 4 above.

START OF COMMERCIAL OPERATION

For compliance monitoring purposes, "commercial operation" begins after the completion of start-up and commissioning, when the power plant has reached reliable steady-state production of electricity at the rated capacity. At the start of commercial operation, plant control is usually transferred from the construction manager to the plant operations manager.

COMPLIANCE PROJECT MANAGER RESPONSIBILITIES

The Compliance Project Manager (CPM) shall oversee the compliance monitoring and is responsible for:

1. Ensuring that the design, construction, operation, and closure of the project facilities are in compliance with the terms and conditions of the Energy Commission Decision
2. Resolving complaints
3. Processing post-certification changes to the conditions of certification, project description (petition to amend), and ownership or operational control (petition for change of ownership) (See instructions for filing petitions)

4. Documenting and tracking compliance filings

5. Ensuring that compliance files are maintained and accessible

The CPM is the contact person for the Energy Commission and will consult with appropriate responsible agencies, Energy Commission, and staff when handling disputes, complaints, and amendments.

All project compliance submittals are submitted to the CPM for processing. Where a submittal required by a condition of certification requires CPM approval, the approval will involve all appropriate Energy Commission staff and management. All submittals must include searchable electronic versions (pdf or word files).

PRE-CONSTRUCTION AND PRE-OPERATION COMPLIANCE MEETING

The CPM usually schedules pre-construction and pre-operation compliance meetings prior to the projected start-dates of construction, plant operation, or both. The purpose of these meetings is to assemble both the Energy Commission's and project owner's technical staff to review the status of all pre-construction or pre-operation requirements, contained in the Energy Commission's conditions of certification. This is to confirm that all applicable conditions of certification have been met, or if they have not been met, to ensure that the proper action is taken. In addition, these meetings ensure, to the extent possible, that Energy Commission conditions will not delay the construction and operation of the plant due to oversight and to preclude any last minute, unforeseen issues from arising. Pre-construction meetings held during the certification process must be publicly noticed unless they are confined to administrative issues and processes.

ENERGY COMMISSION RECORD

The Energy Commission shall maintain the following documents and information as a public record, in either the Compliance file or Dockets file, for the life of the project (or other period as required):

- All documents demonstrating compliance with any legal requirements relating to the construction and operation of the facility;
- All monthly and annual compliance reports filed by the project owner;
- All complaints of noncompliance filed with the Energy Commission; and
- All petitions for project or condition of certification changes and the resulting staff or Energy Commission action.

PROJECT OWNER RESPONSIBILITIES

The project owner is responsible for ensuring that the compliance conditions of certification and all other conditions of certification that appear in the Commission Decision are satisfied. The compliance conditions regarding post-certification changes specify measures that the project owner must take when requesting changes in the project design, conditions of certification, or ownership. Failure to comply with any of the conditions of certification or the compliance conditions may result in reopening of the case and revocation of Energy Commission certification; an administrative fine; or other

action as appropriate. A summary of the Compliance Conditions of Certification is included as **Compliance Table 1** at the conclusion of this section.

COMPLIANCE CONDITIONS OF CERTIFICATION

Unrestricted Access (COMPLIANCE-1)

The CPM, responsible Energy Commission staff, and delegated agencies or consultants shall be guaranteed and granted unrestricted access to the power plant site, related facilities, project-related staff, and the records maintained on-site, for the purpose of conducting audits, surveys, inspections, or general site visits. Although the CPM will normally schedule site visits on dates and times agreeable to the project owner, the CPM reserves the right to make unannounced visits at any time.

Compliance Record (COMPLIANCE-2)

The project owner shall maintain project files on-site or at an alternative site approved by the CPM for the life of the project, unless a lesser period of time is specified by the conditions of certification. The files shall contain copies of all “as-built” drawings, documents submitted as verification for conditions, and other project-related documents.

Energy Commission staff and delegate agencies shall, upon request to the project owner, be given unrestricted access to the files maintained pursuant to this condition.

Compliance Verification Submittals (COMPLIANCE-3)

Each condition of certification is followed by a means of verification. The verification describes the Energy Commission’s procedure(s) to ensure post-certification compliance with adopted conditions. The verification procedures, unlike the conditions, may be modified as necessary by the CPM.

Verification of compliance with the conditions of certification can be accomplished by the following:

1. Monthly and/or annual compliance reports, filed by the project owner or authorized agent, reporting on work done and providing pertinent documentation, as required by the specific conditions of certification;

2. Appropriate letters from delegate agencies verifying compliance;

3. Energy Commission staff audits of project records; and/or

4. Energy Commission staff inspections of work, or other evidence that the requirements are satisfied.

Verification lead times associated with start of construction may require the project owner to file submittals during the certification process, particularly if construction is planned to commence shortly after certification.

A cover letter from the project owner or authorized agent is required for all compliance submittals and correspondence pertaining to compliance matters. **The cover letter**

subject line shall identify the project by AFC number, the appropriate condition(s) of certification by condition number(s), and a brief description of the subject of the submittal. The project owner shall also identify those submittals not required by a condition of certification with a statement such as: "This submittal is for information only and is not required by a specific condition of certification." When submitting supplementary or corrected information, the project owner shall reference the date of the previous submittal and CEC submittal number.

The project owner is responsible for the delivery and content of all verification submittals to the CPM, whether such condition was satisfied by work performed by the project owner or an agent of the project owner.

All hardcopy submittals shall be addressed as follows:

> **Compliance Project Manager**
> **(07-AFC-2C)**
> **California Energy Commission**
> **1516 Ninth Street (MS-2000)**
> **Sacramento, CA 95814**

Those submittals shall be accompanied by a searchable electronic copy, on a CD or by e-mail, as agreed upon by the CPM.

If the project owner desires Energy Commission staff action by a specific date, that request shall be made in the submittal cover letter and shall include a detailed explanation of the effects on the project if that date is not met.

Pre-Construction Matrix and Tasks Prior to Start of Construction (COMPLIANCE-4)

Prior to commencing construction, a compliance matrix addressing only those conditions that must be fulfilled before the start of construction shall be submitted by the project owner to the CPM. This matrix will be included with the project owner's first compliance submittal or prior to the first pre-construction meeting, whichever comes first. It will be submitted in the same format as the compliance matrix described below.

Construction shall not commence until the pre-construction matrix is submitted, all pre-construction conditions have been complied with, and the CPM has issued a letter to the project owner authorizing construction. Various lead times for submittal of compliance verification documents to the CPM for conditions of certification are established to allow sufficient staff time to review and comment and, if necessary, allow the project owner to revise the submittal in a timely manner. This will ensure that project construction may proceed according to schedule.

Failure to submit compliance documents within the specified lead-time may result in delays in authorization to commence various stages of project development.

If the project owner anticipates commencing project construction as soon as the project is certified, it may be necessary for the project owner to file compliance submittals prior to project certification. Compliance submittals should be completed in advance where the necessary lead time for a required compliance event extends beyond the date

anticipated for start of construction. The project owner must understand that the submittal of compliance documents prior to project certification is at the owner's own risk. Any approval by Energy Commission staff is subject to change, based upon the Commission Decision.

Compliance Reporting

There are two different compliance reports that the project owner must submit to assist the CPM in tracking activities and monitoring compliance with the terms and conditions of the Energy Commission Decision. During construction, the project owner or authorized agent will submit Monthly Compliance Reports. During operation, an Annual Compliance Report must be submitted. These reports, and the requirement for an accompanying compliance matrix, are described below. The majority of the conditions of certification require that compliance submittals be submitted to the CPM in the monthly or annual compliance reports.

Compliance Matrix (COMPLIANCE-5)

A compliance matrix shall be submitted by the project owner to the CPM along with each monthly and annual compliance report. The compliance matrix is intended to provide the CPM with the current status of all conditions of certification in a spreadsheet format. The compliance matrix must identify:

1. the technical area;
2. the condition number;
3. a brief description of the verification action or submittal required by the condition;
4. the date the submittal is required (e.g., 60 days prior to construction, after final inspection, etc.);
5. the expected or actual submittal date;
6. the date a submittal or action was approved by the Chief Building Official (CBO), CPM, or delegate agency, if applicable; and
7. the compliance status of each condition, e.g., "not started," "in progress" or "completed" (include the date).
8. if the condition was amended, the date of the amendment.

Satisfied conditions shall be placed at the end of the matrix.

Monthly Compliance Report (COMPLIANCE-6)

The first Monthly Compliance Report is due one month following the Energy Commission business meeting date upon which the project was approved, unless otherwise agreed to by the CPM. The first Monthly Compliance Report shall include the AFC number and an initial list of dates for each of the events identified on the **Key Events List. The Key Events List Form is found at the end of this section.**

During pre-construction and construction of the project, the project owner or authorized agent shall submit an original and an electronic searchable version of the Monthly Compliance Report within 10 working days after the end of each reporting month. Monthly Compliance Reports shall be clearly identified for the month being reported. The reports shall contain, at a minimum:

1. A summary of the current project construction status, a revised/updated schedule if there are significant delays, and an explanation of any significant changes to the schedule;

2. Documents required by specific conditions to be submitted along with the Monthly Compliance Report. Each of these items must be identified in the transmittal letter, as well as the conditions they satisfy and submitted as attachments to the Monthly Compliance Report;

3. An initial, and thereafter updated, compliance matrix showing the status of all conditions of certification (fully satisfied conditions do not need to be included in the matrix after they have been reported as completed);

4. A list of conditions that have been satisfied during the reporting period, and a description or reference to the actions that satisfied the condition;

5. A list of any submittal deadlines that were missed, accompanied by an explanation and an estimate of when the information will be provided;

6. A cumulative listing of any approved changes to conditions of certification;

7. A listing of any filings submitted to, or permits issued by, other governmental agencies during the month;

8. A projection of project compliance activities scheduled during the next two months. The project owner shall notify the CPM as soon as any changes are made to the project construction schedule that would affect compliance with conditions of certification;

9. A listing of the month's additions to the on-site compliance file; and

10. A listing of complaints, notices of violation, official warnings, and citations received during the month, a description of the resolution of the resolved actions, and the status of any unresolved actions.

All sections, exhibits, or addendums shall be separated by tabbed dividers or as acceptable by the CPM.

Annual Compliance Report (COMPLIANCE-7)

After construction is complete, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports. The reports are for each year of commercial operation and are due to the CPM each year at a date agreed to by the CPM. Annual Compliance Reports shall be submitted over the life of the project unless

otherwise specified by the CPM. Each Annual Compliance Report shall include the AFC number, identify the reporting period and shall contain the following:

1. An updated compliance matrix showing the status of all conditions of certification (fully satisfied conditions do not need to be included in the matrix after they have been reported as completed);

2. A summary of the current project operating status and an explanation of any significant changes to facility operations during the year;

3. Documents required by specific conditions to be submitted along with the Annual Compliance Report. Each of these items must be identified in the transmittal letter, with the condition it satisfies, and submitted as attachments to the Annual Compliance Report;

4. A cumulative listing of all post-certification changes approved by the Energy Commission or cleared by the CPM;

5. An explanation for any submittal deadlines that were missed, accompanied by an estimate of when the information will be provided;

6. A listing of filings submitted to, or permits issued by, other governmental agencies during the year;

7. A projection of project compliance activities scheduled during the next year;

8. A listing of the year's additions to the on-site compliance file;

9. An evaluation of the on-site contingency plan for unplanned facility closure, including any suggestions necessary for bringing the plan up to date [see Compliance Conditions for Facility Closure addressed later in this section]; and

10. A listing of complaints, notices of violation, official warnings, and citations received during the year, a description of the resolution of any resolved matters, and the status of any unresolved matters.

Confidential Information (COMPLIANCE-8)

Any information that the project owner deems confidential shall be submitted to the Energy Commission's Dockets Unit with an application for confidentiality pursuant to Title 20, California Code of Regulations, section 2505(a). Any information that is determined to be confidential shall be kept confidential as provided for in Title 20, California Code of Regulations, section 2501 et. seq.

Annual Energy Facility Compliance Fee (COMPLIANCE-9)

Pursuant to the provisions of Section 25806(b) of the Public Resources Code, the project owner is required to pay an annual compliance fee, which is adjusted annually. The amount of the fee for FY2007-2008 was $17,676. The initial payment is due on the date the Energy Commission adopts the final decision. You will be notified of the amount due. All subsequent payments are due by July 1 of each year in which the facility retains its certification. The payment instrument shall be made payable to the

California Energy Commission and mailed to: Accounting Office MS-02, California Energy Commission, 1516 9th St., Sacramento, CA 95814.

Reporting of Complaints, Notices, and Citations (COMPLIANCE-10)

Prior to the start of construction, the project owner must send a letter to property owners living within one mile of the project notifying them of a telephone number to contact project representatives with questions, complaints or concerns. If the telephone is not staffed 24 hours per day, it shall include automatic answering with date and time stamp recording. All recorded complaints shall be responded to within 24 hours. The telephone number shall be posted at the project site and made easily visible to passersby during construction and operation. The telephone number shall be provided to the CPM who will post it on the Energy Commission's web page at:

http://www.energy.ca.gov/sitingcases/power_plants_contacts.html

Any changes to the telephone number shall be submitted immediately to the CPM, who will update the web page.

In addition to the monthly and annual compliance reporting requirements described above, the project owner shall report and provide copies to the CPM of all complaint forms, including noise and lighting complaints, notices of violation, notices of fines, official warnings, and citations, within 10 days of receipt. Complaints shall be logged and numbered. Noise complaints shall be recorded on the form provided in the **NOISE** conditions of certification. All other complaints shall be recorded on the complaint form (Attachment A).

FACILITY CLOSURE

At some point in the future, the project will cease operation and close down. At that time, it will be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts. Although the project setting for this project does not appear, at this time, to present any special or unusual closure problems, it is impossible to foresee what the situation will be in 30 years or more when the project ceases operation. Therefore, provisions must be made that provide the flexibility to deal with the specific situation and project setting that exist at the time of closure. Laws, Ordinances, Regulations and Standards (LORS) pertaining to facility closure are identified in the sections dealing with each technical area. Facility closure will be consistent with LORS in effect at the time of closure.

There are at least three circumstances in which a facility closure can take place: planned closure, unplanned temporary closure and unplanned permanent closure**.**

CLOSURE DEFINITIONS

Planned Closure

A planned closure occurs when the facility is closed in an anticipated, orderly manner, at the end of its useful economic or mechanical life, or due to gradual obsolescence.

Unplanned Temporary Closure

An unplanned temporary closure occurs when the facility is closed suddenly and/or unexpectedly, on a short-term basis, due to unforeseen circumstances such as a natural disaster or an emergency.

Unplanned Permanent Closure

An unplanned permanent closure occurs if the project owner closes the facility suddenly and/or unexpectedly, on a permanent basis. This includes unplanned closure where the owner implements the on-site contingency plan. It can also include unplanned closure where the project owner fails to implement the contingency plan, and the project is essentially abandoned.

COMPLIANCE CONDITIONS FOR FACILITY CLOSURE

Planned Closure (COMPLIANCE-11)

In order to ensure that a planned facility closure does not create adverse impacts, a closure process that provides for careful consideration of available options and applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of closure, will be undertaken. To ensure adequate review of a planned project closure, the project owner shall submit a proposed facility closure plan to the Energy Commission for review and approval at least 12 months (or other period of time agreed to by the CPM) prior to commencement of closure activities. The project owner shall file 120 copies (or other number of copies agreed upon by the CPM) of a proposed facility closure plan with the Energy Commission.

The plan shall:

1. identify and discuss any impacts and mitigation to address significant adverse impacts associated with proposed closure activities and to address facilities, equipment, or other project related remnants that will remain at the site;

2. identify a schedule of activities for closure of the power plant site, transmission line corridor, and all other appurtenant facilities constructed as part of the project;

3. identify any facilities or equipment intended to remain on site after closure, the reason, and any future use; and

4. address conformance of the plan with all applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of facility closure, and applicable conditions of certification.

Prior to submittal of the proposed facility closure plan, a meeting shall be held between the project owner and the Energy Commission CPM for the purpose of discussing the specific contents of the plan.

In the event that there are significant issues associated with the proposed facility closure plan's approval, or the desires of local officials or interested parties are inconsistent with the plan, the CPM shall hold one or more workshops and/or the Energy Commission may hold public hearings as part of its approval procedure.

As necessary, prior to or during the closure plan process, the project owner shall take appropriate steps to eliminate any immediate threats to public health and safety and the environment, but shall not commence any other closure activities until the Energy Commission approves the facility closure plan.

Unplanned Temporary Closure/On-Site Contingency Plan (COMPLIANCE-12)

In order to ensure that public health and safety and the environment are protected in the event of an unplanned temporary facility closure, it is essential to have an on-site contingency plan in place. The on-site contingency plan will help to ensure that all necessary steps to mitigate public health and safety impacts and environmental impacts are taken in a timely manner.

The project owner shall submit an on-site contingency plan for CPM review and approval. The plan shall be submitted no less than 60 days (or other time agreed to by the CPM) prior to commencement of commercial operation. The approved plan must be in place prior to commercial operation of the facility and shall be kept at the site at all times.

The project owner, in consultation with the CPM, will update the on-site contingency plan as necessary. The CPM may require revisions to the on-site contingency plan over the life of the project. In the annual compliance reports submitted to the Energy Commission, the project owner will review the on-site contingency plan, and recommend changes to bring the plan up to date. Any changes to the plan must be approved by the CPM.

The on-site contingency plan shall provide for taking immediate steps to secure the facility from trespassing or encroachment. In addition, for closures of more than 90 days, unless other arrangements are agreed to by the CPM, the plan shall provide for removal of hazardous materials and hazardous wastes, draining of all chemicals from storage tanks and other equipment, and the safe shutdown of all equipment. (Also see specific conditions of certification for the technical areas of Hazardous Materials Management and Waste Management.)

In addition, consistent with requirements under unplanned permanent closure addressed below, the nature and extent of insurance coverage, and major equipment warranties must also be included in the on-site contingency plan. In addition, the status of the insurance coverage and major equipment warranties must be updated in the annual compliance reports.

In the event of an unplanned temporary closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the circumstances and expected duration of the closure.

If the CPM determines that an unplanned temporary closure is likely to be permanent, or for a duration of more than 12 months, a closure plan consistent with the

requirements for a planned closure shall be developed and submitted to the CPM within 90 days of the CPM's determination (or other period of time agreed to by the CPM).

Unplanned Permanent Closure/On-Site Contingency Plan (COMPLIANCE-13)

The on-site contingency plan required for unplanned temporary closure shall also cover unplanned permanent facility closure. All of the requirements specified for unplanned temporary closure shall also apply to unplanned permanent closure.

In addition, the on-site contingency plan shall address how the project owner will ensure that all required closure steps will be successfully undertaken in the event of abandonment.

In the event of an unplanned permanent closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the status of all closure activities.

A closure plan, consistent with the requirements for a planned closure, shall be developed and submitted to the CPM within 90 days of the permanent closure or another period of time agreed to by the CPM.

Post Certification Changes to the Energy Commission Decision: Amendments, Ownership Changes, Insignificant Project Changes and Verification Changes (COMPLIANCE-14)

The project owner must petition the Energy Commission pursuant to Title 20, California Code of Regulations, section 1769, in order to modify the project (including linear facilities) design, operation or performance requirements, and to transfer ownership or operational control of the facility. **It is the responsibility of the project owner to contact the CPM to determine if a proposed project change should be considered a project modification pursuant to section 1769.** Implementation of a project modification without first securing Energy Commission, or Energy Commission staff approval, may result in enforcement action that could result in civil penalties in accordance with section 25534 of the Public Resources Code.

A petition is required for **amendments** and for **insignificant project changes** as specified below. Both shall be filed as a "Petition to Amend." Staff will determine if the change is significant or insignificant. For verification changes, a letter from the project owner is sufficient. In all cases, the petition or letter requesting a change should be submitted to the CPM, who will file it with the Energy Commission's Dockets Unit in accordance with Title 20, California Code of Regulations, section 1209.

The criteria that determine which type of approval and the process that applies are explained below. They reflect the provisions of Section 1769 at the time this condition was drafted. If the Commission's rules regarding amendments are amended, the rules in effect at the time an amendment is requested shall apply.

Amendment

The project owner shall petition the Energy Commission, pursuant to Title 20, California Code of Regulations, Section 1769(a), when proposing modifications to the project (including linear facilities) design, operation, or performance requirements. If a proposed modification results in deletion or change of a condition of certification, or makes changes that would cause the project not to comply with any applicable laws, ordinances, regulations or standards, the petition will be processed as a formal amendment to the final decision, which requires public notice and review of the Energy Commission staff analysis, and approval by the full Commission. The petition shall be in the form of a legal brief and fulfill the requirements of Section 1769(a). Upon request, the CPM will provide you with a sample petition to use as a template.

Change of Ownership

Change of ownership or operational control also requires that the project owner file a petition pursuant to section 1769(b). This process requires public notice and approval by the full Commission. The petition shall be in the form of a legal brief and fulfill the requirements of Section 1769(b). Upon request, the CPM will provide you with a sample petition to use as a template.

Insignificant Project Change

Modifications that do not result in deletions or changes to conditions of certification, and that are compliant with laws, ordinances, regulations and standards may be authorized by the CPM as an insignificant project change pursuant to section 1769(a) (2). This process usually requires minimal time to complete, and it requires a 14-day public review of the Notice of Insignificant Project Change that includes staff's intention to approve the modification unless substantive objections are filed. These requests must also be submitted in the form of a "petition to amend" as described above.

Verification Change

A verification may be modified by the CPM without requesting an amendment to the decision if the change does not conflict with the conditions of certification and provides an effective alternate means of verification.

CBO DELEGATION AND AGENCY COOPERATION

In performing construction and operation monitoring of the project, Energy Commission staff acts as, and has the authority of, the Chief Building Official (CBO). Energy Commission staff may delegate CBO responsibility to either an independent third party contractor or the local building official. Energy Commission staff retains CBO authority when selecting a delegate CBO, including enforcing and interpreting state and local codes, and use of discretion, as necessary, in implementing the various codes and standards.

Energy Commission staff may also seek the cooperation of state, regional and local agencies that have an interest in environmental protection when conducting project monitoring.

ENFORCEMENT

The Energy Commission's legal authority to enforce the terms and conditions of its Decision is specified in Public Resources Code sections 25534 and 25900. The Energy Commission may amend or revoke the certification for any facility, and may impose a civil penalty for any significant failure to comply with the terms or conditions of the Energy Commission Decision. The specific action and amount of any fines the Energy Commission may impose would take into account the specific circumstances of the incident(s). This would include such factors as the previous compliance history, whether the cause of the incident involves willful disregard of LORS, oversight, unforeseeable events, and other factors the Energy Commission may consider.

NONCOMPLIANCE COMPLAINT PROCEDURES

Any person or agency may file a complaint alleging noncompliance with the conditions of certification. Such a complaint will be subject to review by the Energy Commission pursuant to Title 20, California Code of Regulations, section 1237, but in many instances the noncompliance can be resolved by using the informal dispute resolution process. Both the informal and formal complaint procedure, as described in current State law and regulations, are described below. They shall be followed unless superseded by future law or regulations.

The Energy Commission has established a toll free compliance telephone number of **1-800-858-0784** for the public to contact the Energy Commission about power plant construction or operation-related questions, complaints or concerns.

Informal Dispute Resolution Process

The following procedure is designed to informally resolve disputes concerning the interpretation of compliance with the requirements of this compliance plan. The project owner, the Energy Commission, or any other party, including members of the public, may initiate an informal dispute resolution process. Disputes may pertain to actions or decisions made by any party, including the Energy Commission's delegate agents.

This process may precede the more formal complaint and investigation procedure specified in Title 20, California Code of Regulations, section 1237, but is not intended to be a substitute for, or prerequisite to it. This informal procedure may not be used to change the terms and conditions of certification as approved by the Energy Commission, although the agreed upon resolution may result in a project owner, or in some cases the Energy Commission staff, proposing an amendment.

The process encourages all parties involved in a dispute to discuss the matter and to reach an agreement resolving the dispute. If a dispute cannot be resolved, then the matter must be brought before the full Energy Commission for consideration via the complaint and investigation procedure.

Request for Informal Investigation

Any individual, group, or agency may request the Energy Commission to conduct an informal investigation of alleged noncompliance with the Energy Commission's terms

and conditions of certification. All requests for informal investigations shall be made to the designated CPM.

Upon receipt of a request for informal investigation, the CPM shall promptly notify the project owner of the allegation by telephone and letter. All known and relevant information of the alleged noncompliance shall be provided to the project owner and to the Energy Commission staff. The CPM will evaluate the request and the information to determine if further investigation is necessary. If the CPM finds that further investigation is necessary, the project owner will be asked to promptly investigate the matter. Within seven working days of the CPM's request, provide a written report to the CPM of the results of the investigation, including corrective measures proposed or undertaken. Depending on the urgency of the noncompliance matter, the CPM may conduct a site visit and/or request the project owner to also provide an initial verbal report, within 48 hours.

Request for Informal Meeting

In the event that either the party requesting an investigation or the Energy Commission staff is not satisfied with the project owner's report, investigation of the event, or corrective measures proposed or undertaken, either party may submit a written request to the CPM for a meeting with the project owner. Such request shall be made within 14 days of the project owner's filing of its written report. Upon receipt of such a request, the CPM shall:

1. immediately schedule a meeting with the requesting party and the project owner, to be held at a mutually convenient time and place;

2. secure the attendance of appropriate Energy Commission staff and staff of any other agencies with expertise in the subject area of concern, as necessary;

3. conduct such meeting in an informal and objective manner so as to encourage the voluntary settlement of the dispute in a fair and equitable manner;

4. After the conclusion of such a meeting, promptly prepare and distribute copies to all in attendance and to the project file, a summary memorandum that fairly and accurately identifies the positions of all parties and any understandings reached. If an agreement has not been reached, the CPM shall inform the complainant of the formal complaint process and requirements provided under Title 20, California Code of Regulations, section 1230 et seq.

Formal Dispute Resolution Procedure-Complaints and Investigations

Any person may file a complaint with the Energy Commission's Dockets Unit alleging noncompliance with a Commission decision adopted pursuant to Public Resources Code section 25500. Requirements for complaint filings and a description of how complaints are processed are in Title 20, California Code of Regulations, section 1237.

KEY EVENTS LIST

PROJECT: _____

DOCKET #: _____

COMPLIANCE PROJECT MANAGER: _____

EVENT DESCRIPTION	DATE
Certification Date	
Obtain Site Control	
Online Date	
POWER PLANT SITE ACTIVITIES	
Start Site Mobilization	
Start Ground Disturbance	
Start Grading	
Start Construction	
Begin Pouring Major Foundation Concrete	
Begin Installation of Major Equipment	
Completion of Installation of Major Equipment	
First Combustion of Gas Turbine	
Obtain Building Occupation Permit	
Start Commercial Operation	
Complete All Construction	
TRANSMISSION LINE ACTIVITIES	
Start T/L Construction	
Synchronization with Grid and Interconnection	
Complete T/L Construction	
FUEL SUPPLY LINE ACTIVITIES	
Start Gas Pipeline Construction and Interconnection	
Complete Gas Pipeline Construction	
WATER SUPPLY LINE ACTIVITIES	
Start Water Supply Line Construction	
Complete Water Supply Line Construction	

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-1	Unrestricted Access	The project owner shall grant Energy Commission staff and delegate agencies or consultants unrestricted access to the power plant site.
COMPLIANCE-2	Compliance Record	The project owner shall maintain project files on-site. Energy Commission staff and delegate agencies shall be given unrestricted access to the files.
COMPLIANCE-3	Compliance Verification Submittals	The project owner is responsible for the delivery and content of all verification submittals to the CPM, whether such condition was satisfied by work performed or the project owner or his agent.
COMPLIANCE-4	Pre-construction Matrix and Tasks Prior to Start of Construction	Construction shall not commence until the all of the following activities/submittals have been completed: • property owners living within one mile of the project have been notified of a telephone number to contact for questions, complaints or concerns, • a pre-construction matrix has been submitted identifying only those conditions that must be fulfilled before the start of construction, • all pre-construction conditions have been complied with, • the CPM has issued a letter to the project owner authorizing construction.
COMPLIANCE-5	Compliance Matrix	The project owner shall submit a compliance matrix (in a spreadsheet format) with each monthly and annual compliance report which includes the status of all compliance conditions of certification.
COMPLIANCE-6	Monthly Compliance Report including a Key Events List	During construction, the project owner shall submit Monthly Compliance Reports (MCRs) which include specific information. The first MCR is due the month following the Energy Commission business meeting date on which the project was approved and shall include an initial list of dates for each of the events identified on the Key Events List.
COMPLIANCE-7	Annual Compliance Reports	After construction ends and throughout the life of the project, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports.

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-8	Confidential Information	Any information the project owner deems confidential shall be submitted to the Energy Commission's Dockets Unit with a request for confidentiality.
COMPLIANCE-9	Annual fees	Payment of Annual Energy Facility Compliance Fee
COMPLIANCE-10	Reporting of Complaints, Notices and Citations	Within 10 days of receipt, the project owner shall report to the CPM, all notices, complaints, and citations.
COMPLIANCE-11	Planned Facility Closure	The project owner shall submit a closure plan to the CPM at least 12 months prior to commencement of a planned closure.
COMPLIANCE-12	Unplanned Temporary Facility Closure	To ensure that public health and safety and the environment are protected in the event of an unplanned temporary closure, the project owner shall submit an on-site contingency plan no less than 60 days prior to commencement of commercial operation.
COMPLIANCE-13	Unplanned Permanent Facility Closure	To ensure that public health and safety and the environment are protected in the event of an unplanned permanent closure, the project owner shall submit an on-site contingency plan no less than 60 days prior to commencement of commercial operation.
COMPLIANCE-14	Post-certification changes to the Decision	The project owner must petition the Energy Commission to delete or change a condition of certification, modify the project design or operational requirements and/or transfer ownership of operational control of the facility.

ATTACHMENT A

COMPLAINT REPORT/RESOLUTION FORM

PROJECT NAME: AFC Number:
COMPLAINT LOG NUMBER _____ Complainant's name and address: Phone number: _____
Date and time complaint received: Indicate if by telephone or in writing (attach copy if written): Date of first occurrence:
Description of complaint (including dates, frequency, and duration):
Findings of investigation by plant personnel: Indicate if complaint relates to violation of a CEC requirement: Date complainant contacted to discuss findings: _____
Description of corrective measures taken or other complaint resolution: Indicate if complainant agrees with proposed resolution: If not, explain: Other relevant information:
If corrective action necessary, date 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: _____ Date:

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

APPENDIX A
DOWNSTREAM IMPACTS ANALYSIS

Hedy Koczwara

INTRODUCTION AND PURPOSE

Energy Commission staff has prepared this Appendix to the Staff Assessment for the Ivanpah Solar Electric Generating System (ISEGS) project to examine the potential indirect impacts of future transmission line, fiber optic, and substation construction, line removal, and other upgrades that may be required by Southern California Edison Company (SCE) as a result of the ISEGS project.

The SCE upgrades are a reasonably foreseeable event if the ISEGS project is approved and constructed. The California Environmental Quality Act (CEQA) requires examination of foreseeable subsequent projects that result from a project under consideration, so Energy Commission staff has analyzed the general impacts of the SCE project. Because the SCE project itself is not before the Energy Commission for approval and it is in the preliminary planning stages, the level of impact analysis presented for the SCE project is less detailed than that done for the ISEGS project itself. The purpose of this analysis is to inform the Energy Commission Committee, interested parties and the general public of the potential indirect environmental and public health effects that may result from the approval of the ISEGS project. This analysis examines the construction and operational impacts of the SCE transmission line, substation and telecommunications system upgrades, and the nature and scope of the probable impacts of the project, should it occur as a result of approval of the ISEGS project.

The California Public Utility Commission (CPUC) and Bureau of Land Management (BLM) will be the lead agencies for compliance with CEQA and the National Environmental Policy Act (NEPA), respectively. The CPUC and BLM have agreed to prepare a combined Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) presenting the proposed SCE project and evaluating impacts of the project on the existing environment. SCE is preparing a Proponent's Environmental Assessment (PEA), which will define the project, present SCE's data collection of environmental resources of the study area, present SCE's evaluation of potential impacts and list SCE's proposed Applicant Proposed Measures (APMs) to reduce impacts. The PEA has not yet been submitted to the CPUC. Therefore, the details of the project have not yet been finalized and will likely be subject to change.

This analysis draws conclusions as to the likelihood that the SCE project could be accomplished with no significant environmental impacts, and identifies types of mitigation measures that could be enacted to reduce impacts or to ensure the project would not cause significant impacts. Because the potential for impacts in several technical areas would not occur, several of the areas normally studied in a Staff Assessment have been eliminated from this analysis. The areas not included are Facility Design, Power Plant Efficiency, and Power Plant Reliability.

CONCEPTUAL PROJECT DESCRIPTION

SCE proposes to construct a new 220 kilovolt (kV) transmission line and a new 220 kV/115 kV substation in California near Primm, Nevada. The new double-circuit 220 kV transmission line would be approximately 35 miles long, and would be located between the existing Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California. The Eldorado-Ivanpah portion of the existing Eldorado–Baker–Coolwater-Dunn Siding-Mountain Pass 115 kV transmission line would be removed and replaced with the 220 kV transmission line. The rest of the 115 kV line would remain unchanged west of the new Ivanpah Substation (SCE 2008).

The proposed 220/115 kV Ivanpah Substation would be constructed to accommodate an ultimate 1120 MVA facility to be owned, operated and maintained by SCE. The grading of the Ivanpah Substation site would be completed as a component of the early interconnect work activities and is already considered for each environmental discipline in the ISEGS Staff Assessment. This component would include the 885-foot by 850-foot substation site, the 10-foot perimeter buffer and the area containing cut and fill slopes resulting from grading. In addition, it would include a 24-foot wide paved road to provide vehicular access to the substation, fencing, a portion of the 115 kV switchrack, the mechanical electrical equipment room (MEER) approximately 65 feet by 55 feet, and cable trenches. The remaining 115 kV switchrack, the 220 kV switchrack and the transformer banks would be installed as part of the Eldorado-Ivanpah Project and this is the only portion of the new Ivanpah Substation construction that is considered in this Appendix.

The SCE project would also include:

- Replacement of an overhead ground wire (OHGW) with Optical Ground Wire (OPGW) on an approximately 30-mile section of the Eldorado–Lugo 500 kV line;
- Installation of between 22 to 30 miles of All Dielectric Self Supporting (ADSS) and fiber optic cable between Nipton and Ivanpah Substation;
- Construction of an approximately 1 mile section of the 33 kV Nipton distribution line; and
- Changes inside the Eldorado substation to accommodate the new 220 kV lines.

Additional upgrades may be required as mitigation prior to final approval of interconnection to California Independent System Operator (California ISO) and Non-California ISO controlled facilities.

ANALYSIS OF RECONDUCTORING

AIR QUALITY

Environmental Setting

California and Nevada

The SCE 220 kV transmission upgrades would occur in San Bernardino County, California (7 miles) and in Clark County, Nevada (28 miles). The transmission upgrades would cross BLM lands including the Ivanpah Dry Lake and some private land. These areas are largely open space, recreation, and some minimal private development within the Primm, Nevada region. The proposed route would be southwest of Las Vegas, where ozone, particulate matter, and carbon monoxide levels violate ambient standards, despite the very low population density outside of Las Vegas itself. The SCE electrical upgrades and telecommunications installations would be located within the Mojave Desert Air Basin, administered by the Mojave Desert Air Quality Management District.

Environmental Impacts

The construction and structure removal activities caused by the project would generate emissions at the locations of the work along the transmission line and telecommunication right of way (ROW) and at substation sites. The impacts would principally consist of exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment (*e.g.,* ozone precursors, Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC), other criteria pollutants, such as CO and PM10, and toxic diesel particulate matter emissions) and fugitive particulate matter (dust) from travel on unpaved surfaces. Beyond the boundaries of the ROW and substations, exhaust emissions would also be caused by workers commuting to and from the work sites, from trucks hauling conductor, pole segments, and other equipment and supplies to the sites, and crew trucks (*e.g.,* derrick trucks, bucket trucks, pickups).

Odors of diesel exhaust from construction equipment would be reduced by the California's requirements for mandatory use of either low-sulfur or ultra-low-sulfur fuel. No substances used or activities involved with the project would have the capability to produce offensive odors. As such, the impacts of odors would be less than significant.

Once construction and structure removal is complete, operational emissions would result from vehicle and helicopter use for periodic maintenance, repair, and inspection of the system components. These mobile source emissions would be the only direct source of emissions related to project operation, and they would be minor. System monitoring, control, and inspections would induce light and medium-heavy duty truck traffic and periodic helicopter use. The air quality impact caused by emissions from project vehicular traffic for maintenance activities would be less than significant.

Mitigation

Construction phase emissions are generally short-term in duration. Effective and comprehensive control measures would be needed to reduce equipment emissions to the extent feasible. Implementing appropriate dust control measures would eliminate the

possibility of emissions during project construction to potentially violate air quality standards or contribute substantially to existing violations.

Water trucks may be used to minimize the quantity of airborne dust created by construction activities. Energy Commission staff recommends that dust emissions from any concrete batch plants be mitigated by watering the area around the plants and by sealing the silos and transferring the fine particulates pneumatically between the silos and the mixers.

The project would be required to comply with Mojave Desert Air Quality Management District rules and portable equipment rules, which would dictate how the equipment could be operated. Finally, with effective and comprehensive control measures such as those recommended by Energy Commission staff for the proposed ISEGS project, dust and equipment exhaust impacts could likely be reduced to a less than significant level.

Conclusion

The construction and structure removal activities associated with SCE's upgrades would cause emissions due to heavy-duty diesel and gasoline-powered construction equipment and fugitive particulate matter (dust) emissions from activity on unpaved surfaces. With effective and comprehensive control measures such as those recommended by Energy Commission staff for the proposed ISEGS project, dust and equipment exhaust impacts could likely be reduced to a less than significant level.

BIOLOGICAL RESOURCES

Environmental Setting

California

The SCE transmission line upgrade would be located in California for approximately 7 miles. The existing SCE 115 kV transmission line is located in the southeastern portion of the Northern and Eastern Mojave Planning Area (NEMO) in the desert region of San Bernardino County. The desert regional habitat of San Bernardino County includes soils that are predominantly sandy gravel, and include major dune formations, desert pavement, and dry alkaline lake beds (SB County 2007). The Mojave Desert region is characterized by arid conditions with low precipitation. The entire NEMO planning region is crossed by expansive alluvial washes.

Vegetation Communities

The project would occur along an alluvial fan that extends eastward from the Clark Mountains to the Ivanpah Dry Lake. The alluvial fan's topography slopes gradually and the fan is dissected by several desert washes. The predominant vegetation is the Mojave creosote bush scrub and is typical of the arid Mojave Desert region (BSE2007A). Mojave creosote bush scrub is composed of evergreen and drought-deciduous shrubs, cacti and yucca (BSE2007A). Creosote bush (*Larrea tridentata)* is the dominant species in this region. Other vegetation types include the burrobush (*Ambrosia dumosa)*, cheesebush (*Hymenoclea salsola)*, Nevada ephedra (*Ephedra nevadensis)*, and Mojave yucca (*Yucca schidigera)* (BSE2007A). Mojave creosote bush scrub habitat supports high densities of barrel cactus (*Echinocactus polycephalus* and

Ferocactus cylindraceus var. *lecontei)*. The transmission line also would traverse the Ivanpah Dry Lake. Dry lake beds support a vegetation community of primarily fleshy salt-tolerant plants such as iodine bush and seepweed (SB County 2006). The density and variety of plants found in such regions are naturally low. Please see the **Biological Resources** section within this Staff Assessment for a complete list of the common vegetation species that are expected to occur within the Ivanpah Valley region.

Wildlife species

Wildlife of the Mojave Desert scrub occurs at low densities and is highly specialized for the arid environment. It includes several rare, unusual, or protected species, including the desert tortoise (*Gopherus agassizii*). The desert tortoise, which occurs throughout most of San Bernardino County's deserts, is fully protected by the California Endangered Species Act, and the federal Endangered Species Act. Numerous other common wildlife species were observed or are expected to occur at the ISEGS site, and as such would be expected along the corridors and substation sites. Please see the Biological Resources section within this Staff Assessment for a complete list of the common wildlife species that are expected to occur within the Ivanpah Valley region.

Nevada

The SCE transmission upgrades would be located in Nevada for approximately 28 miles beginning at Eldorado Substation. The existing Eldorado Substation and SCE 115 kV transmission line are located in the southwestern portion of Clark County, Nevada. Clark County is located within the Sonoran Basin and Range Province or Mojave Desert Shrub Biotic Communities. The regional habitat of Clark County includes soils that are predominantly Entisols, located in areas where soils are actively eroding (such as on steep slopes) or receiving new soil materials (such as alluvial fans), and Aridisols, often associated with desert pavement (LVMP 1998). The Mojave Desert region is characterized by arid conditions with low precipitation. The climate of Southern Nevada has an average precipitation of four to eight inches at lower elevations and from 12 to 20 inches at higher elevations. Maximum precipitation falls between November and March.

Vegetation Communities

The SCE 115 kV to 220 kV transmission upgrade is located within the Mojave Desert Shrub Biotic communities with hot, dry summers and mild winters. Southern Nevada has a high percentage of sunny days per year (LVMP, 1998). According to generalized vegetation mapping of the Las Vegas Resource Management Plan, the SCE 115 kV transmission upgrade would traverse Southern desert shrub and Mojave desert shrub communities. The Southern desert shrub occurs primarily at elevations below 4,000 feet, with annual rainfall averaging less than six inches and temperatures ranging from over 100 degrees Fahrenheit in the summer to 25 degrees in the winter (LVMP 1998). Creosote bush (*Larrea tridentate)* is the dominant species, and may occur with yucca (*Yucca schidigera)* depending on elevation. Additional vegetation found in the Southern desert shrub includes white bursage (*Ambrosia dumosa)*. Catclaw acacia (*Acacia greggii)* is found in dry washes at lower elevations.

Mojave desert shrub is made up of a mixture of shrubs characteristic of mid-elevation Mojave desert. The species occur on tuff or alluvial deposits at elevations between

4,000 and 5,000 feet (LVMP, 1998). Joshua tree (*Yucca brevifolia)* is one of the dominant species of the overstory. Common shrubs include horsebrush (*Tetradymia glabrata),* spiny menodora (*Menodora spinescens),* burrobrush (*Hymenoclea salsola)*, box thorn (*Lycium andersonii)*, green ephedra, green rabbitbrush (*Chrysothamnus viscidiflorus),* Mormon tea (*Ephedra nevadensis)*, and four-wing saltbush. Blackbrush (*Coleogyne ramossissima)* and sagebrush (*Artemisia* sp.) become the dominant shrubs at higher elevations. Cacti species are also part of this community including cottontop barrel cactus (*Echinocactus polycephalus),* prickly pear (*Opuntia echinocarpa*), and various cholla species (*Opuntia* sp.) (LVMP 1998).

Pinyon-Juniper Woodland is found in the McCullough range south of the SCE 115 kV transmission upgrade. The singleleaf pinyon pine (*Pinus monophylla)* and Utah juniper (*Juniperus osteosperma)* are the dominant components of this community.

The SCE upgrades would be located in between the North McCullough Mountain Wilderness Area and the South McCullough Mountain Wilderness Area in an already designated transmission line corridor.

Wildlife Species

According to the Las Vegas Management Plan, the SCE 220 kV transmission line upgrade would cross desert bighorn sheep (*Ovis canadensis nelsoni)* habitat, quail (*callipepla gambelli)* habitat, and would be north of mule deer (*Odocoileus hemionus)* winter rangeland; all of which are considered species of concern. The upgrades would be located north of the Piute-El Dorado desert tortoise Desert Wildlife Management Area (DWMA).

The following non-listed, special status animal species have moderate to high potential to occur along the 220 kV transmission line upgrade: chuckwalla (BLM sensitive) and gila monster (State of Nevada protected).

Environmental Impacts

Potential impacts to biological resources caused by the project could occur as a result of construction disturbance at or near the construction work sites that would be established for the project components. These sites include the pull and tensioning sites used to pull the new conductors onto the towers and potential sites for staging or marshalling yards. Temporary construction yards would be established in both California and Nevada along the route. Generally these yards range in size from a few acres to up to approximately 30 acres. Construction of the Ivanpah Substation would require a temporary laydown area located at or near the existing roadway at the site. Upgrades at Eldorado Substation would be within the existing substation property, and construction of the remaining 115 kV switchrack, the 220 kV switchrack and the transformer banks at Ivanpah Substation would be on already-disturbed/graded land that was analyzed as part of this Staff Assessment.

For the proposed 220 kV route, new dulled galvanized 220 kV lattice steel towers (LSTs) and H-frame structures would be installed in the existing and new ROWs. Permanent loss of habitat would occur at each of these structure sites.

Few main access roads are expected to be required for the proposed route, because it would largely follow an existing transmission corridor; however, spur roads to individual towers would be required. Where overland vehicle travel is not possible, upgrades to main access roads and extensions to existing spur roads would be needed to allow passage of construction vehicles. Such upgrades may require vegetation clearing and grading based on site conditions. During transmission line construction, most of the spur roads built to accommodate new construction are usually left in place to facilitate future access for operations and maintenance purposes. Thus for the purposes of this analysis, the disturbance is assumed to be permanent.

Impacts that could occur include disturbance of habitat caused by movement of the construction equipment, disturbance of nesting activities caused by construction noise and movement of machinery, and potential take of listed species caused by construction activities at the structure locations. Therefore, the project could potentially impact special status species and sensitive habitats. Recommended mitigation measures would be needed to avoid, eliminate, reduce to a less-than-significant level or compensate for those impacts.

Mitigation

Approximately 24 to 48 hours prior to construction equipment being moved on to an individual site, a team of biologists should inspect each site to detect and remove desert tortoises. If a tortoise burrow is detected, it would be cleared of tortoises that could be inside and then closed to prevent additional tortoises from entering the burrow. This should be accomplished consistent with U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) incidental take authorizations.

Energy Commission staff recommends mitigation such that breeding birds would be avoided by limiting construction periods or by installing noise attenuation on construction equipment. Vehicle use would be limited in areas where sensitive habitats are located. If the aforementioned means of impact avoidance were found to be infeasible at the time of construction, a helicopter could be used to minimize ground disturbances. Use of helicopters for installation would eliminate land disturbance associated with crane pads, structure laydown areas, and the trucks and tractors used for steel delivery to structure sites.

Further, construction activities would need to be monitored by qualified personnel. However, no formal construction plan would be developed until SCE submits its application to the CPUC and BLM and they conduct their own environmental review of the project, which could require implementation of mitigation measures for any identified potentially significant impacts. With implementation of measures that would address potential impacts specific to this upgrade project on a tower-by-tower basis for the 220 kV line upgrade and for each individual project component, it is likely that impacts to biological resources would be reduced. However, before mitigation can be proposed, the project and its potential impacts must be clearly defined, including exact identification of work site locations.

As mentioned above Energy Commission staff recommends mitigation that includes identification of and avoidance of critical habitat and endangered species. Construction

activities would be limited during the nesting season in compliance with the Migratory Bird Treaty Act and recommendations to avoid electrocution by maintaining optimal phase separation between new phase conductors or a phase conductor and grounded hardware/conductor would be implemented. An additional biological survey should also be conducted prior to initiation of the project to ensure there are no nesting birds on subtransmission or 115 kV towers or conductors that are being removed. Finally, the following general measures, should be implemented during construction to minimize impacts to sensitive biological resources.

- ***Establish Environmentally Sensitive Areas.*** Additional direct and indirect impacts to sensitive biological resources throughout the project corridors should be avoided or minimized by designating these features outside of the construction impact area as environmentally sensitive areas (ESAs) on project plans and in project specifications. Information related to the locations of ESAs and their treatment should be shown on contract plans and discussed in the Environmental Awareness Training. ESA provisions should include, but are not limited to, the use of temporary high-visibility orange fencing to delineate the proposed limit of work in areas adjacent to sensitive resources, and to delineate and exclude sensitive resources from potential construction impacts. Contractor encroachment into ESAs should be restricted (including the staging/operation of heavy equipment or casting of excavation materials). ESA provisions should be implemented as a first order of work, and remain in place until all construction activities have been completed.
- ***Biological Monitor*.** A qualified biologist should monitor all construction activities. Construction activities should not proceed without presence of a biological monitor. The biological monitor should have the authority to stop construction, if necessary, to avoid impacts to special status species or sensitive habitats.
- ***Environmental Awareness Training.*** All construction personnel working in the project corridor should be required to attend environmental awareness training. At a minimum, the training should include: (1) an overview of the regulatory requirements for the project components, (2) descriptions of the special-status species in the project area and the importance of these species and their habitats, (3) the general measures that are being implemented by SCE to minimize environmental impacts, and (4) the boundaries within which equipment and personnel would be allowed to work during construction. SCE should maintain a record of all workers who have completed the program.
- ***Limit Vegetation Removal*.** Vegetation removal should be limited to the absolute minimum amount required for construction.
- ***Erosion Control.*** Temporary erosion control devices should be installed on slopes where erosion or sedimentation could degrade sensitive biological resources.
- ***Construction Clean-up*.** All temporary fill and construction debris should be removed from the project site after completion of construction activities.
- ***Construction Scheduling.*** Construction should be timed to minimize potential impacts to sensitive biological resources.

Conclusion

Because it appears some of the construction work would occur in or near sensitive species, habitats, and/or waters of the U.S., Energy Commission staff concludes that the upgrades could adversely impact sensitive biological resources in and/or adjacent to the transmission line corridor and substation sites. Potential impacts include construction noise effects on nesting activities, and construction activity physical effects on habitats.

It is Energy Commission staff's opinion that impact avoidance measures would help reduce potentially significant biological impacts to levels less than significant. However, there would also be permanent habitat disturbances at tower locations, at the Ivanpah Substation and with the construction of new access and spur roads.

Energy Commission staff recommends that after construction plans are finalized, a complete project description (including results of all sensitive species surveys, and a revised assessment of potential impacts) be developed as part of the CPUC EIR and BLM EIS.

Activities associated with upgrading the transmission line, substations and telecommunication facilities would require compliance with applicable Federal, State and local laws, ordinances and regulations, including: Federal and State Endangered Species Acts, Federal Migratory Bird Treaty Act, and Federal and State Clean Water Acts. Specific agency permits would be required before any work could commence. To determine which permits may be applicable to the upgrades, Energy Commission staff recommends that SCE should consult with applicable local, state and federal agencies.

Even if the upgrades work complies with all applicable laws, ordinances, regulations and standards (LORS), absent biological survey information, Energy Commission staff conservatively concludes that the SCE upgrades may create significant impacts to biological resources due to the permanent loss of habitat and the disturbance to sensitive plant and wildlife species during construction.

CULTURAL RESOURCES

Environmental Setting

California

The regional setting for archaeological resources in the Ivanpah Valley is presented in the **Cultural Resources** section of this Staff Assessment. Prior to CEQA and NEPA permitting, cultural surveys would need to be conducted along the proposed 220 kV ROW within California and Nevada, as well as along the telecommunications facilities pathways and at the substation sites.

Nevada

All prehistoric Native Americans in southern Nevada, in the vicinity of the project, used hunting and gathering methods to acquire at least some of their foods. Hunters-gatherers moved seasonally within a series of environmental zones, and the adaptation to arid land resources is placed by archaeologists in the period called the Archaic

(LVMP 1998). Heaviest use of the southern Nevada region is thought to have occurred within the last 5,000 years. Southern Nevada was used by three distinct groups (Lower Colorado, Virgin Anasazi, and Southern Paiute peoples). Lower Colorado tribes such as the Mojave conducted floodwater farming along the Colorado River south of the Las Vegas Valley and exploited resources in the surrounding ranges and valleys. The Lower Colorado people lived in open camps and rancherias, making their archaeological record similar to that of the Archaic hunter-gatherers (LVMP 1998). The Virgin Anasazi tribes are characterized by use of agriculture (maize, gourds, and possibly cotton), pit structures and aboveground masonry structures, possibly the use of kivas, and ceramics. They lived in isolated villages. The southern Paiute are considered descendants of the Archaic hunter-gatherers in southern Nevada and lived in temporary brush structures, foraging among the diverse environmental zones of the region (LVMP 1998).

Historic use of southern Nevada began with the exploration of routes such as the *Old Spanish Trail/Mormon Road* (1844 to the early 1900s). Potosí mine, the first mine in the region, dates to 1861 and ranching was underway in the late 1800s. Historic foundations such as mining sites, ranches, and quarries are found within southern Nevada.

Environmental Impacts

Ground disturbance, the presence of vehicles driving over the top of sites and the installation of new towers could damage archaeological resources. After the work area is defined and after archaeological and historic surveys are complete in any areas that have not been protocol-level surveyed previously by SCE, archaeological sites or historic resources within the built environment may be identified. Depending on when they were built, if the existing SCE 115 kV line or the Eldorado Substation are determined eligible for the National Register of Historic Places (NRHP), the upgrades and removal effort would result in an impact to historical resources. Whether the impact is significant would need to be determined after the line or substations are evaluated.

Some new underground and overhead lines would be installed in places where there previously were none, and some existing overhead lines would have poles replaced or new poles installed along the existing line. The trench for undergrounding would normally be excavated within or adjacent to a roadway, and trenching would not come within 12 inches from any existing fence, wall, or outbuilding associated with an adjacent property. Therefore, there would be no potential to adversely impact the physical condition of existing above-ground cultural resources. The only potential to adversely impact existing above-ground cultural resources would arise from a change in the visual setting of the property due to the addition of taller poles or new poles, new overhead lines, and new substation equipment depending on the location in the project area.

Any potential for the project to impact cultural resources would be limited to undiscovered below-ground cultural deposits. It is possible that buried cultural deposits could be encountered during ground disturbing project activities including trenching for the installation of underground fiber optic cables, during ground disturbance associated with the replacement or installation of new poles, or ground disturbance associated with the construction at the substations.

Mitigation

During the CEQA/NEPA environmental permitting process, cultural resources sites would likely be identified and then would be avoided by vehicles and construction activities.

Energy Commission staff recommends that after the construction area has been identified, and after work for Section 106 has been completed, that archaeological sites be evaluated for eligibility for listing in the NRHP or Califorina Register of Historic Resources (CRHR) if it appears that any would be affected by the project. Sites that have been evaluated as “not eligible” would warrant no further consideration and avoidance would not be required. Sites that have not been evaluated and sites that are considered “potentially eligible” should be treated as eligible resources pending formal evaluation.

Data recovery should be conducted as a recommended mitigation measure for archaeological sites that are recommended as eligible to the CRHR or NRHP and would be impacted by the project. Monitoring of project-related excavation within an archaeological site is not appropriate mitigation and may destroy the site. SCE should comply with provisions of the National Historic Preservation Act and should consult with a California State Historic Preservation Officer regarding appropriate mitigation should any cultural materials be encountered during construction or other ground-disturbing activities.

Conclusion

While SCE would avoid effects to known cultural sites, it is possible that the corridors have sensitive cultural resources that could be affected. Energy Commission staff believes that it will be possible to mitigate all impacts to cultural resources to less than a significant level through the Section 106 process and implementation of recommended measures that apply to cultural resources. Known sensitive areas would be avoided, construction activities would be monitored and other appropriate mitigation similar to the conditions of certification identified in the **Cultural Resources** section of the Staff Assessment would be implemented.

GEOLOGY AND PALEONTOLOGY

Environmental Setting

California

The regional setting for the geological and paleontological resources in the Ivanpah Valley is presented in the **Geology and Paleontology** section of this Staff Assessment.

Nevada

The topography of Clark County is characteristic of the Basin and Range Province, with internally draining basins separated by ranges, hills, and mesas. The Las Vegas Valley cuts diagonally across Clark County following a north-trending ridge (LVMP 1998). The mountain ranges are primarily composed of exposed bedrock, are steep and cut by deep valleys. The geologic history of southern Nevada includes periods of deposition,

uplift, igneous activity and erosion since the Paleozoic time (LVMP 1998). Marine sedimentary deposits accumulated during Paleozoic and Mesozoic times. Approximately 50 million years ago, volcanic materials extruded over much of the region, then were uplifted and deformed by faulting (LVMP 1998). Since this period, southern Nevada has been geologically calm, with largely depositional and erosional forces.

No active or potentially active faults are known to cross the transmission line corridor (USGS 2008). The USGS National Seismic Hazards Maps – 2008, predicts a peak ground acceleration with a 10 percent probability of exceedance in 50 years of between 5% and 7% for the project corridor.

According to the BLM Las Vegas Management Plan, a minimal amount of paleontological research has been conducted in this region although fossilized vertebrae bones and invertebrate fossils have been uncovered in the southern Nevada region.

Environmental Impacts

Energy Commission staff recommends that that soils testing should be conducted and analyzed by a professional, licensed Geotechnical Engineer or Geologist, to determine existing soil conditions. Borings in a sufficient quantity to adequately gather variations in the site soils should be conducted to remove sample cores for testing. The type of soils, soil pressure, relative compaction, resistively and percolation factor are among the items that should be tested. The results of the Geotechnical investigation would then be applied to the project's engineering design and this would ensure that potential impacts associated with problematic soils and slope instability are reduced to less than significant levels.

Excavation and grading for structure foundations, work areas, access roads, and spur roads could loosen soil and accelerate erosion. In addition, the potential disturbance of desert pavement areas is a special concern in the desert areas along the proposed route. Desert pavement is a unique geologic/soil feature that takes thousands to tens of thousands of years to form and protects the underlying silty and sandy soils from excessive wind and water erosion. Damage to desert pavement could result in an extreme acceleration of erosion. Depending on the soil associations along the proposed route and whether desert pavement is present along the project corridor, mitigation would be recommended to protect desert pavement.

There are no known active faults crossing the proposed route and the area is considered to have a low potential for seismic hazard. Therefore, there would not likely be any impacts related to fault rupture, liquefaction, strong groundshaking, or earthquake-induced landslides. The structures would be constructed to comply with all applicable LORS.

Construction of the transmission line could also destroy or disturb significant paleontological resources located within the project area with construction-related ground disturbances, such as the building or improvement of access and spur roads, borehole drilling, trenching, excavating, grading, and vegetation removal.

Mitigation

Implementation of mitigation measures discussed under Soils and Water in Chapter 3.9 of this Appendix would reduce the amount of erosion that would result from construction. In addition, compliance with a Stormwater Pollution Prevention Plan (SWPPP) would limit erosion from the construction site. If desert pavement is located along the proposed route, mitigation would be recommended by Energy Commission staff to protect desert pavement through avoidance or use of temporary mats. With implementation of measures and best management practices that would ensure proper re-vegetation, erosion control, and drainage, among other requirements, SCE's project upgrades would create a less than significant impact to geology and paleontology.

Impacts to paleontological resources that may exist would be potentially significant. Energy Commission staff recommends mitigation that would provide for a paleontological resources inventory after final project design, pre-construction planning for monitoring and treatment of paleontological resources, and for monitoring during construction. The mitigation should require a qualified paleontological monitor and qualified paleontologist to monitor for significant subsurface fossils and then collect, analyze and curate any significant fossils found. Implementation of this suggested paleontological mitigation would reduce project impacts to paleontological resources to a less than significant level.

Conclusion

SCE would comply with applicable LORS as related to the identified upgrades project. No significant geologic or paleontologic resources have been identified in the project area; however, technical investigations/surveys have not yet been performed. The upgraded lines and substation equipment would be designed and constructed in accordance seismic requirements of SCE's Construction Standards and CPUC General Order 95. The project would have no adverse impact with respect to geologic and paleontologic resources if it implements the recommended mitigation and complies with applicable LORS.

HAZARDOUS MATERIALS MANAGEMENT

Environmental Setting

California and Nevada

The SCE transmission and telecommunication upgrades would be located in northeastern San Bernardino County, California and southwest Clark County, Nevada predominantly on undeveloped BLM desert. Expansive, primarily undeveloped desert and mountainous areas characterize this portion of the Mojave Desert. Interstate 15 and Highway 95 are the primary highways providing vehicular access throughout this region. The threading step of wire installation, some tower installation, and maintenance patrols would require helicopter use. Helicopter staging would occur at staging areas or at local airports and would be supervised by the helicopter fuel service provider.

A number of hazardous chemicals would be used during construction of the SCE transmission upgrades in small quantities. Proposed safeguards and measures to

greatly reduce the opportunity for, or the extent of, exposure to hazardous materials or other hazards would be put in place.

Location of Exposed Populations and Sensitive Receptors

The general population includes many sensitive subgroups that may be at a greater health risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. In addition, the location of the population in the area surrounding a project site may have a large bearing on health risk. There are no sensitive receptors along the California portion of the SCE transmission upgrades. The nearest residences along the Nevada portion of the SCE transmission upgrades would be located in Primm, Nevada.

Environmental Impacts

Hazardous materials such as fuels, oils, and other vehicle and equipment maintenance fluids would be used during the construction phase of the project and stored at the project substation sites and construction staging areas. Improperly maintained vehicles and equipment could leak fluids during construction activities and while parked. There would be a potential for incidents involving release of gasoline, diesel fuel, oil, hydraulic fluid, and/or lubricants from vehicles or other equipment at the staging areas and/or the project sites. Spills and leaks of hazardous materials during construction activities could potentially result in soil or groundwater contamination. Improper handling of hazardous materials could expose project workers or the nearby public to hazards.

In addition, although Polychlorinated biphenyls (PCB) have been banned from use with electrical distribution and substation transformers by the U.S. EPA since 1985 (U.S. EPA, 2005), some older pieces of electrical equipment within SCE's system may still contain PCBs. There is a likelihood that some PCB containing equipment would need to be removed from some of the project locations during the construction of the project and removal of the existing line. Therefore, there would be a potential for a PCB release to contaminate the environment in the event of a spill while handling and transporting PCBs.

Excavation required to construct the components of the project would primarily be limited to areas at existing and proposed tower, pole, and H-frame structure locations, at underground fiber optic trench locations, and at the existing Eldorado Substation and proposed Ivanpah Substation locations. A contamination site record search would need to be conducted to determine existing known contaminated sites in the project vicinity. Therefore, it is possible that subsurface construction activities could accidentally disturb documented contamination sites, potentially mobilizing soil and/or groundwater contamination.

Finally, previously undocumented soil and or groundwater contamination could be encountered during tower and pole installation, trenching, grading, or other excavation related activities, particularly at the existing Eldorado Substation, despite the steps taken to identify and avoid contamination.

The presence of oil in a quantity greater than 1,320 gallons invokes Spill Prevention Control and Countermeasures (SPCC) regulations. The quantity of oil contained in any

one of the planned 220/115 kV transformers would be in excess of the minimum quantity that requires such regulations.

Mitigation

To identify and avoid documented contamination sites relative to the project sites, record searches specifically for the project locations would need to be conducted. Implementation of mitigation measures should require identification and avoidance of documented contamination sites, thus ensuring that the potential impacts caused by documented contaminated sites would be reduced to less than significant levels.

Energy Commission staff recommends that soils testing should be conducted and analyzed by a professional, licensed Geotechnical Engineer or Geologist, to determine existing soil conditions. Borings in a sufficient quantity to adequately gather variations in the site soils should be conducted to remove sample cores for testing. The type of soils, soil pressure, relative compaction, resistivity, and percolation factor are among the items that should be tested for. If contaminants are encountered, special studies and remediation measures in compliance with environmental regulations should be implemented by qualified professionals.

During trenching, grading, or excavation work for the project, mitigation measures should be developed that would require the contractor to observe the exposed soil for visual evidence of contamination. If visual contamination indicators are observed during construction, Energy Commission staff recommends that the contractor should be required to stop work until the material is properly characterized and appropriate measures are taken to protect human health and the environment. The contractor would also have to comply with the all local, State, and federal requirements for sampling and testing, and subsequent removal, transport, and disposal of hazardous materials.

Helicopter fueling should occur at staging areas or at a local airport using the helicopter contractor's fuel truck, should be supervised by the helicopter fuel service provider, and Storm Water Pollution Prevention Plan (SWPPP) measures should be followed, as applicable. The helicopter and fuel truck would likely stay overnight at a local airport or at a staging area if adequate security is in place.

Ivanpah Substation

SCE would follow SPCC regulations and the control of oils spills through secondary containment would be designed by a licensed California Registered Professional Engineer. Permanent or temporary SPCC measures should be in place prior to the delivery of transformers to the site. Improvements may consist of, but not be limited to, trenches, holding areas, retention basins and curbs. An SPCC plan would be prepared and maintained on-site. Substation operating personnel will be trained in the execution of the plan.

Conclusion

Implementing mitigation measures similar to the conditions of certification that are proposed in the Staff Assessment for construction of the ISEGS, and implementation of SWPPP and a SPCC plans would avoid potential significant hazard impacts from work associated with the SCE upgrades.

LAND USE

Environmental Setting

California

As stated in the **Land Use** Section of this Staff Assessment, the Ivanpah Valley area has approximately 37,280 acres of land bounded by the Mojave National Preserve at Nipton Road on the south and southwest, a power line road parallel to and south of I-15 across Ivanpah Dry Lake on the northwest and north, and the Nevada border on the east. It is also adjacent to the Stateline and Mesquite Wilderness Areas.

The SCE upgrades would be located in the Ivanpah Valley, in the Mojave Desert (San Bernardino County) and the 220 kV line would run approximately 7 miles northeast entirely on federal land managed by the BLM. The 220 kV transmission line would be located entirely on federal land in California and would be under federal jurisdiction and would be located within or parallel to an existing expanded transmission ROW. There are no schools, day-care facilities, convalescent centers, or hospitals within the immediate vicinity of the project study area in California. The project would cross the I-15 ROW; I-15 provides access from southern California to Nevada.

Recreation

The 220 kV transmission line would run approximately 0.5 mile northwest of the Primm Valley Golf Club at its closest point and a remote control switch (RCS) associated with the 33 kV distribution line upgrades would be installed underground next to the golf course as well. The golf course is affiliated with the Primm Valley Casino Resorts located in Las Vegas, Nevada and is a public course. The SCE existing 115 kV transmission line also crosses the Ivanpah Dry Lake, which covers approximately 35 square miles. This area is open to non-motorized vehicles and is a popular destination for recreational activities such as land sailing, archery, and kite demonstrations and it is estimated that the Ivanpah Dry Lake receives approximately 5,000 visitors annually. The transmission line upgrade would be located in the NEMO boundaries. The California desert, including the NEMO planning area, offers multiple recreational opportunities such as casual vehicle touring, nature studies, hiking, camping, and lakebed activities as mentioned previously.

Nevada

The SCE 220 kV transmission line upgrade would traverse BLM land in Clark County for approximately 20 miles and would traverse private land in Clark County for approximately seven miles until reaching the Eldorado Substation. Immediately upon crossing the California/Nevada boundary, the transmission line would run just south of developed, private land in Primm, Nevada. The majority of the BLM land is undeveloped open space.

The existing SCE 115 kV transmission line crosses the Union Pacific Railroad ROW in Nevada approximately two miles from the Nevada/California border. As stated above, at the Nevada/California border the transmission line would be located just east of Primm, Nevada and would be adjacent to the Primm Outlet Mall, an existing shopping outlet with over 100 stores owned by MGM Mirage, and the Primm Valley Resort and Casino.

Upon entering Nevada, the transmission line would traverse or be adjacent to the Jean Lake and Hidden Valley Grazing Allotments and would be adjacent to or cross numerous other transmission lines.

Recreation

Much of the BLM land in southern Nevada is dedicated to recreation, however the SCE 220 kV transmission line would not cross or be adjacent to any designated recreational lands. The transmission line would pass approximately 1 mile south of the Sloan Canyon National Conservation Area, including the North McCullough Wilderness Area, and approximately 1 mile north of the South McCullough Wilderness Area, both used frequently for recreational purposes, including historic cultural resources, camping, and rock climbing.

Environmental Impacts

Most of the project components would be within existing utility corridors, existing roadways and substation sites. This transmission system upgrade would not involve changing existing or planned land uses in California or Nevada. The construction yards would be temporary and most disturbance impacts to land use would be short-term during construction.

The upgrades would also require access to the existing transmission line ROW by construction vehicles and equipment, which would use existing access roads where possible. However, SCE would need to acquire rights for any new spur roads. Any additional impacts to land use would be temporary and confined to the work areas. There would be no displacement of any existing land use. The development of spur roads along an existing ROW would not be considered a significant impact to land uses in the area. Furthermore, since the utility corridor and the substation sites are established land uses, upgrading of the Ivanpah-Eldorado line and installing the 115/220 kV switchrack are not expected to conflict with applicable LORS, including the General Plans of Clark or San Bernardino Counties or Primm, Nevada.

The noise and presence of heavy equipment associated with project construction may temporarily reduce visitation to recreational areas. Recreationists may cancel or schedule their visits to avoid construction periods thereby resulting in temporarily reduced visitation, especially to Ivanpah Dry Lake, where construction could pose a safety hazard to land sailors and other recreationists. However, due to the size of the dry lake, it is assumed that recreationists would not be precluded from those non-motorized activities.

Mitigation

Energy Commission staff recommends that SCE should post notices on the ROW or at other sites where the public would be affected by construction activities. Notices should be posted approximately one month prior to commencing work. At ROW ingress and egress points, postings should be placed along the ROW and at work sites approximately two weeks prior to the closing of public access. Energy Commission staff also recommends mitigation that would require SCE to identify and provide a public liaison person before and during construction to respond to public concerns about construction disturbances.

Energy Commission staff recommends mitigation measures that would require SCE to coordinate construction activities and the project construction schedule with the authorized BLM officer for the Ivanpah Dry Lake area, and require SCE to identify alternative recreation facilities that may be used by the public during construction.

Conclusion

The SCE upgrades would not cause a change in land use except there may be a slight change in land use designation in areas where the corridor would be widened. Once construction is completed, there would not be a change in access for recreation in and across the corridor. Since the line and telecommunication upgrades would mostly be within or parallel to an existing and established, yet widened, ROW, on existing towers, or would be underground, the project components would not disrupt or divide the physical arrangement of an established community. Also for these reasons, the upgraded transmission line would not restrict existing or future land uses along the route.

NOISE

Environmental Setting

SCE's ROW for the Eldorado-Ivanpah portion of the existing Eldorado–Baker–Coolwater-Dunn Siding-Mountain Pass 115 kV transmission line corridor is 75 feet, and would be widened for the new line. At crossing locations, an even larger ROW would be required for side-by-side single circuit 220 kV H-frame structures. SCE would remove the existing structures and the new structures would be installed.

California

The entire area within the ROW is undeveloped, with the exception of the crossing of I-15, approximately 0.5 mile before the California/Nevada border. There are a no residences within 500 feet of the transmission line ROW. The Primm Valley Golf Club is located 0.5 miles northeast of the ISEGS project. The SCE transmission line upgrade would cross 0.5 miles north of the golf club and the 33 kV distribution line upgrades may be installed underground next to the golf course as well.

As stated in the **Noise and Vibration** section of this Staff Assessment, the Primm Valley Gold Club is considered a less noise-sensitive land use. SCE would use existing ROW access roads to complete the work wherever possible, and minimal new access roads would be constructed. Where needed, the existing access roads would be improved to support heavy construction equipment. New spur roads to the structure sites would need to be constructed.

The SCE transmission line would cross the Ivanpah Dry Lake, used for recreational purposes. Because once construction is completed recreational users of Ivanpah Dry Lake would have unrestricted public access to areas within and at the edge of the SCE transmission line ROW, the nearest noise-sensitive locations are from recreational users at the edge of the ROW.

The upgrades to the SCE Eldorado-Ivanpah transmission line would require operation of heavy equipment to remove and replace the existing structures, and at pull and tensioning sites. There is potential for heavy equipment operation to disturb adjacent noise-sensitive land uses during construction of the SCE 220 kV transmission line upgrade.

Nevada

The entire area within and adjacent to the ROW is undeveloped, with the exception of the private development at Primm, Nevada immediately adjacent to the California/Nevada border. The 220 kV transmission upgrade would be located within 100 feet of the Primm Valley Casino Resort along Fashion Outlet Way and the existing ROW is located approximately 150 feet of houses in Primm for approximately 0.2 miles.

Upgrading the SCE Eldorado-Ivanpah transmission line would require operation of heavy equipment to remove and replace the existing structures, and at pull and tensioning sites. There is potential for heavy equipment operation to disturb adjacent noise-sensitive land uses during construction of the SCE 220 kV transmission line upgrade.

Environmental Impacts

Construction of the project and tower removal would require short-term use of heavy-duty equipment such as trenchers, excavators, drill rigs, cranes, and trucks. A few residences lie within 500 feet of the transmission line ROW in Primm and the closest residence is approximately 150 feet from the line. In general, construction work within 200 feet of any location would cause noise levels averaging around 65 dBA, with intermittent peaks up to about 88 dBA. This would be a noticeable (more than five dBA) temporary increase in the ambient noise levels near the work that would fade into quiet background noise at distances over one-quarter mile. Although construction noise would be required to comply with local ordinances, it may still be disruptive.

After installation of the new line is complete and the line operational, there may be a change in corona noise levels. Corona noise is a function of the line voltage and the condition of the line. The voltage would be increased, but the condition of the line would be improved, so the net change in corona noise may minor.

Mitigation

Energy Commission staff recommends implementation of mitigation measures similar to the proposed conditions of certification from the ISEGS Staff Assessment to minimize potential impacts. These conditions would require notification of affected residents of impending construction, establishing a noise complaint resolution process, and limiting noisy construction to daytime hours.

Energy Commission staff also recommends implementation of mitigation that would require all vehicles and equipment to be equipped with exhaust noise abatement devices and would require landowner notification. To minimize disturbance, mitigation should also be implemented that would limit work to daytime hours, as specified in Condition of Certification **NOISE-6** for ISEGS.

Conclusion

Implementing mitigation measures similar to the conditions of certification that are proposed in the Staff Assessment for construction of the ISEGS would avoid potential significant noise impacts from work associated with the SCE upgrades.

SOCIOECONOMICS

Environmental Setting

California and Nevada

The SCE transmission line upgrades would be located in the Ivanpah Valley in San Bernardino County, California and in southern Clark County, Nevada. The regional setting for Socioeconomics, including demographics, utilities, school districts, wastewater, law enforcement and fire protection, for both San Bernardino County, California and Clark County, Nevada is presented in the Socioeconomics section of this PSA.

The construction activity that would likely require the largest workforce would be the installation of the conductors and OPGW. In addition, at some stages of the project, multiple locations would be under construction simultaneously. This may involve independent construction teams throughout the project area, and so the overall peak number of workers may be greater.

Environmental Impacts

Because few, if any, workers are expected to relocate to the area, no new housing would be needed for the project, no housing would be displaced, and no new competition for existing housing would likely occur. Construction employees would likely already live within commuting distance to the project area in Primm, Nevada, the Las Vegas area, less than 40 miles to the north, or San Bernardino County in California. Even if new permanent housing was required, if new permanent employees are hired, it would not affect the housing market in the area. Temporary accommodations may also be needed during construction, but with numerous hotels and motels in the area, impacts are expected to be less than significant, and mitigation measures are not required.

The addition of project-related children to schools that are at or over capacity may increase costs in terms of supplies, equipment, and/or teachers but the impact would be minimal. Even so, this worst-case scenario is unlikely to occur since any non-local construction workers would not likely relocate family members for the relatively short duration of construction and very few if any new permanent employees would be hired by SCE for operation of the project.

Likewise impacts to law enforcement and public utilities would be minimal. Water and wastewater discharge is discussed in the **Soil and Water Resources** section of this Staff Assessment and solid waste removal is discussed in the **Waste Management** section of this Staff Assessment. Because of the on-site security during construction and operation and other safety procedures described in the **Worker Safety and Health** section of the this Staff Assessment, Energy Commission staff concludes that the

emergency medical services resources would be adequate to meet the needs of the proposed upgrades project during construction and operation.

Energy Commission staff does not expect the construction or operation workforces to have a significant adverse impact on parks and recreation because of the number and variety of parks within the regional project area. In addition, construction workers are unlikely to bring their families to a work site, and therefore, impact existing park services would be less than significant.

Mitigation

Compliance with LORS discussed in the **Soil and Water Resources**, **Worker Safety and Fire Protection**, **Waste Management**, and **Reliability** sections of this Staff Assessment would ensure that impacts from SCE upgrades would be less than significant. No additional mitigation is recommended.

Conclusion

All impacts to socioeconomics resources would be less than significant.

SOIL AND WATER RESOURCES

Environmental Setting

California

The project would occur along an alluvial fan that extends eastward from the Clark Mountains to the Ivanpah Dry Lake. The alluvial fan's topography slopes gradually and the fan is dissected by several desert washes.

The transmission line ROW would be located within the existing BLM Clark Mountain Allotment Grazing Lease (Clark Mountain, allocation #09003), a 97,560 acre allotment used for cattle grazing (BLM 2002).

The regional setting for soil and water resources in the Ivanpah Valley is presented in the **Soil and Water Resources** section of this Staff Assessment.

Nevada

Throughout the Clark County region, there is a sharp contrast between the mountainous areas and the lowlands. The SCE transmission upgrades would be located both on relatively flat lands such as near the Roach Lake, and would traverse mountainous locals such as within the McCullough Range. Because of the arid conditions throughout the majority of Southern Nevada, there is little downward leaching (LVMP 1998). Because of the climate, rocks tend to disintegrate rather than decompose and are then swept by rain and storms into ravines and valleys, creating alluvial fans. Clark County includes soils that are predominantly Entisols, located in areas where soils are actively eroding (such as on steep slopes) or receiving new soil materials (such as alluvial fans), and Aridisols, often associated with desert pavement (LVMP 1998). The Mojave Desert region is characterized by arid conditions with low precipitation. The climate of Southern Nevada has an average precipitation of four to eight inches at lower elevations and from

12 to 20 inches at higher elevations. Maximum precipitation falls between November and March.

Several mines and/or mine workings are located in the vicinity of the alignment. The land is primarily BLM or private undeveloped land. The transmission line ROW would be located within the existing Roach Lake Allotment (allocation #15421) Grazing Lease, a cattle allotment of 20,752 acres, and the existing Jean Lake Allotment (allocation #15416), a cattle grazing allotment for approximately 141,000 acres (LVMP 1998 and BLM 2008).

According to the Las Vegas Management Plan (1998), the transmission line would cross soils with low and moderate erosion susceptibility with shallow-very shallow gravelly course texture and shallow – moderately deep rocky-gravelly coarse texture.

Environmental Impacts

For the proposed 220 kV route, new dulled galvanized 220 kV lattice steel towers (LSTs) and H-frame structures would be installed in the existing and new ROW. Most of the structure sites would likely require minor to substantial grading and new or re-developed access and spur roads. A portion of the completed Ivanpah Substation would consist of impervious materials such as concrete foundations and asphalt concrete paving.

Construction activities would involve earth disturbance that would increase the potential for erosion. Construction activities associated with new LSTs, tubular steel poles and H-frame structures would not occur within any watercourses; therefore, impacts to water quality for construction and operation of the transmission lines would be less than significant. Implementation of mitigation for temporary erosion control measures would ensure less than significant impacts to soils associated with new structure construction.

Work sites using larger truck-mounted equipment would likely be limited to areas near angle and/or dead-end towers. Temporary pull and tensioning sites would require an area of about 100 by 200 feet (0.5 acre) for equipment setup. Typically, wire pulls occur every 15,000 to 18,000 feet on flat terrain or less in rugged terrain. Wire splices typically occur every 7,500 feet on flat terrain or less in rugged terrain. These temporary sites would be susceptible to erosion from minor soil disturbance and compaction as a result of the vehicular traffic and hilly terrain.

There are two grazing allotments on BLM lands within the transmission corridor. Construction activities may disrupt grazing activities, which could result in the temporary reduction of agricultural productivity. However, once the project is completed, cattle would be free to graze within and across the corridor.

Mitigation

Storm Water Pollution Prevention Plan (SWPPP). The Clean Water Act (CWA) (33 U.S.C. Section 1251 *et seq*.), formerly the Federal Water Pollution Control Act of 1972, regulates discharges through the National Pollutant Discharge Elimination System (NPDES) permit process (CWA Section 402). Pursuant to NPDES permit requirements, SCE would be required to prepare and adhere to a SWPPP that would minimize construction

erosion. During construction activities, measures would be in place to insure that contaminates would not be discharged from the construction site. The SWPPP would define areas where hazardous materials, such as concrete, would be stored; where trash would be placed; where rolling equipment would be parked, fueled and serviced and where construction materials such as reinforcing bars and structural steel members would be staged. Erosion control during grading of the unfinished site and during subsequent construction would be in place and monitored as specified by the SWPPP. A silting basin(s) would be established to capture silt and other materials which might otherwise be carried from the site by rainwater surface runoff.

In addition to conformance with SCE's SWPPP, for temporary disturbance areas, Energy Commission staff recommends similar mitigation measures to the following:

- On completing the work, all work areas except access trails should be scarified or left in a condition that would facilitate natural or appropriate vegetation, provide for proper drainage, and prevent erosion.
- Disturbance and removal of soils and vegetation should be limited to the minimum area necessary for access and construction.
- Vehicles should be inspected daily for fluid leaks before leaving the staging area.
- All spills of fuel or hydraulic fluid should be cleaned up immediately according to SCE's guidelines for hazardous waste handling.
- Nonbiodegradable debris should not be deposited in the ROW.

The additional the following suggested mitigation measures or similar should be implemented for earth disturbance activities associated with work on tower footings:

- All soil excavated for structure foundations should be backfilled and tamped around the foundations, and used to provide positive drainage around the structure foundations.
- Use of ground-disturbing mechanical equipment to remove vegetation should be avoided on slopes over 40 percent, unless the threat of erosion would be minimal because of bedrock, or reseeding would be performed.
- All activity should be minimized during winter and other wet periods to prevent damage (excessive rutting, unacceptable erosion of fines from road surface, excessive soil compaction).
- Where soil has been severely disturbed and the establishment of vegetation is needed to minimize erosion, appropriate measures, as approved by the land manager, should be implemented to establish an adequate cover of grass or other vegetation as needed. Soil preparation, seeding, mulching, and fertilizing should be repeated as necessary to secure soil stabilization and revegetation acceptable to the land manager.
- Grading should be minimized to the extent possible. When required, grading should be conducted away from watercourses/washes to reduce the potential for material to enter the watercourse.

- Should SCE need to relocate or construct a structure or access/spur road, SCE should consult with the United States Army Corps of Engineers (USACE) to locate all new structures and access roads outside floodplains to the extent feasible.
- Sediment control devices, such as placement of native rock, should be used at all dry wash crossings.
- Run-off control structures, diversion ditches, and erosion-control structures should be cleaned, maintained, repaired, and replaced whenever necessary.
- All discharge water created by construction (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) should be treated before discharge.

The following mitigation measures should be implemented for construction activities in and around any water bodies or desert washes associated with the new tower footings, if necessary:

- Any discharge of material (displaced soils and, in certain circumstances, vegetation debris) within waters of the United States may be subject to USACE regulations under the Clean Water Act.
- If wet areas cannot be avoided, SCE should use wide-track and/or balloon tire vehicles and equipment and or timber mats.
- All fill or rip-rap placed within a stream or river channel should be limited to the minimum area required for access or protection of existing SCE facilities.

Energy Commission staff also recommends that SCE should be required to coordinate with grazing operators to ensure that agricultural productivity and animal welfare are maintained both during and after construction to the maximum extent feasible. Coordination efforts should address issues including, but not necessarily limited to:

- Interference with access to water (e.g., provide alternate methods for livestock access to water)
- Impairment of cattle movements (e.g., provide alternate routes; reconfigure fencing/gates)
- Removal and replacement of fencing (e.g., during construction install temporary fencing/barriers, as appropriate, and following construction restore equal or better fencing to that which was removed or damaged)
- Impacts to facilities such as corrals and watering structures, as well as related effects such as ingress/egress, and management activities (e.g., replacement of damaged/removed facilities in kind; provide alternate access)

During operation cattle would likely be free to move across the transmission ROW and thus impacts to agricultural resources during operation would be less than significant.

Conclusion

Significant environmental impacts to soil and water resources would be avoided by implementing best management practices, the SWPPP, and/or similar mitigation, as

listed above. The project would not cause a displacement of agricultural land use, and neither construction nor operation of the transmission line would cause a significant impact to agricultural resources.

TRAFFIC AND TRANSPORTATION

Environmental Setting

California and Nevada

The existing SCE 115 kV transmission lines are situated within an established 75-foot ROW. The existing transportation network that would be affected by the SCE transmission upgrades would be located in San Bernardino County in California and in Clark County in Nevada. The environmental setting for the **Traffic and Transportation** section of this Staff Assessment gives detailed information regarding the local and regional roadways that would be used to reach the construction areas, including the traffic conditions of I-15. At this location I-15 consists of two lanes in each direction. As stated in the Traffic and Transportation section, although I-15 operates at LOS C or better most days of the week (Monday through Thursday), northbound I-15 experiences increased traffic volumes on Friday afternoons, because of commuter and tourist traffic from California to Las Vegas, Nevada. Once in Nevada, the SCE 220 kV transmission corridor would not cross any roadways other than access roads.

An active Union Pacific Railroad (UPRR) line exists approximately one mile south of I-15 (BNSF2005). The SCE transmission upgrades would cross the UPRR railroad ROW approximately two miles northeast of the California/Nevada border in Nevada, and the telecommunication facilities upgrades would cross and potentially parallel UPRR for 2.5 miles southwest of the California/Nevada border in California.

About 1 mile of new underground 33 kV circuitry and two new Remote Control Switches (RCS) would be built in order to close the loop in the Nipton 33 kV circuit. The proposed work would be done next to Densmore Drive Road. In addition, depending on the route selected portions of the fiber optic cable installation may also be located underground in roadways.

Environmental Impacts

The reconductoring project could affect the level of service (LOS) for transportation facilities under the jurisdiction of Caltrans, Nevada Department of Transportation, and the local communities. On most days, as presented in **TRAFFIC AND TRANSPORTATION Table 3** in this Staff Assessment, I-15 experiences approximately 60,000 ADT—or an hourly average of approximately 1,200 trips per lane. However, on Fridays from approximately 12 p.m. to 10 p.m., northbound I-15 experiences an hourly average of approximately 2,000 trips per lane and operates at LOS F (BSE2007A).

The construction activity that would require the largest workforce would likely be the installation of the conductors and optical ground wire (OPGW). In addition, at some stages of the project, multiple locations would be under construction simultaneously. This may involve independent construction teams throughout the project area, and so the overall peak number of workers may be greater. The area's roadways would also be

used for transportation of equipment and access to the temporary staging areas and the transmission and telecommunication corridors. Finally, the movement of heavy machinery or the possible need to use rail lines, such as the UPRR tracks that bisects the project area, to deliver equipment or materials to the project site could also affect the surrounding transportation system.

It is assumed that some workers would carpool, and not all workers would be commuting from the project site on northbound I-15, however, at the end of the work day on Fridays, an estimated additional 30 personnel on I-15 northbound would only represent a 0.75 percent increase in peak traffic volume (between 12 p.m. and 10 p.m.). The number of vehicles added to northbound I-15 on Friday afternoons as a result of the project would be minor compared to the number of vehicles traveling on northbound I-15 during the same time.

However, the project would exacerbate existing congestion on I-15 and may result in potentially significant impacts to traffic flow. In addition, large vehicles delivering materials and oversized vehicles used in the construction process may affect traffic flow on one or more of the roadways, resulting in a safety hazard. These potential impacts can be avoided through mitigation, which is discussed below. In addition, there is potential for unexpected damage to roads by vehicles and equipment (overhead line trucks, crew trucks, concrete trucks, etc.) that would be entering and leaving roads within the project area.

Helicopters would be used to support construction during stringing activities, in areas where access is limited (e.g., no suitable access road, limited pad area to facilitate onsite structure assembly area), where there are environmental constraints to accessing the project area with standard construction vehicles and equipment, and periodically for maintenance during operation. Project activities potentially facilitated by helicopters may include delivery of construction laborers, equipment and materials to structure sites, structure placement, hardware installation, and wire stringing operations. The operations area of the helicopters would be limited to helicopter staging areas near construction locations that are considered safe for landing. Final siting of staging areas for the SCE project would be conducted with the input of the helicopter contractor, affected private landowners and land management agencies.

Mitigation

Because northbound I-15 is already highly congested on Friday afternoons, and project-related construction traffic would exacerbate congestion, project impacts on northbound I-15 on Fridays are considered potentially significant. To limit SCE's project's contribution to existing congestion on northbound I-15 on Friday afternoons, Energy Commission staff recommends implementation of mitigation similar to Condition of Certification **TRANS-1** in this Staff Assessment, which would require development and Energy Commission staff approval of a traffic control plan that must include methods to substantially reduce the project's impact on I-15 traffic, such as staggering the departure of construction workers from the project area on Friday afternoons and/or establishing a carpool/vanpool incentive program. Energy Commission staff believes that with proper implementation of the traffic control plan, the project's direct impact during construction can be reduced to a less than significant level.

Temporary guard structures should be constructed across roads and other potentially inhabited areas to protect those areas in the unlikely event that a conductor breaks and the line falls to the ground. This safety precaution would reduce the potential for construction materials falling on any intersecting roadways during the tensioning/cable pulling process. The following possible locations would be where guard structures may be installed to facilitate construction crossings: existing distribution lines, dirt roads, I-15, Lotto Shore Road, Fashion Outlet Way, E. Primm Boulevard, and the UPRR. The types of guard structures that would be required for crossings and the number of crossings necessary should be field verified upon completion of final design. Installation of guard structures would also help to ensure that access for emergency service providers is maintained to the maximum extent feasible.

All access and spur road improvements and construction, whether on or off of the ROW, would comply with applicable permits and approvals, and SCE has preliminarily stated that any damage to existing roads as a result of construction would be repaired once construction is complete.

The use of helicopters for the erection of LSTs, tubular steel H-frame structures, or tubular steel poles would be in accordance with SCE specifications and would be similar to methods detailed in IEEE 951-1966, Guide to the Assembly and Erection of Metal Transmission Structures, Section 9, Helicopter Methods of Construction. The upgrades, including all helicopter construction activities, would also be required to comply with all appropriate regulations of the Federal Aviation Administration (FAA), such as restrictions on helicopter flights within 1,500 feet of residential dwellings. To offset potential impacts from helicopter use, Energy Commission staff recommends that helicopter use be included in the Traffic Management Plan, which should be developed as part of the mitigation similar to Condition of Certification **TRANS-1** in this Staff Assessment.

Conclusion

The intersection of a new access road with an existing public road would be constructed in accordance with the requirements of the agency having authority over the existing public road. Any activity that would need to occur outside of the existing transmission line ROW would require landowner notification and permission for access. Since the majority of the upgrade activities would take place in undeveloped areas on BLM land, it is projected that the activities would have minimal impact on the traffic level of service for the roadways in the project vicinity, except during Friday afternoons. Movement of heavy machinery on local roads would occur intermittently, but infrequently over the construction period. Based on the temporary nature of the construction activities and the minor staffing and equipment expected to be required compared to the traffic volumes on I-15, coupled with implementation of mitigation measures similar to conditions of certification concerning peak hour traffic would ensure that any potential impacts of SCE's upgrades to traffic and transportation would be less than significant.

TRANSMISSION LINE SAFETY AND NUISANCE

Environmental Setting

California and Nevada

In addition to subtransmission and distribution line upgrades, the SCE transmission upgrades would require approximately seven miles of an upgraded transmission line in San Bernardino County, California and approximately 28 miles of an upgraded transmission line in Clark County, Nevada. The transmission upgrades would be located primarily on undeveloped BLM land paralleling a major existing transmission line corridor. The nearest community is Primm, Nevada, with a population of 436 people. The transmission line upgrade would be located approximately 150-feet from the nearest residence for 0.2 mile at Primm. The City of San Bernardino is approximately 145 miles southwest and the Edwards Air Force Base is approximately 145 miles west-southwest of the project. All portions of the line located within the State of California are designed to CPUC General Order 95 standards. All portions of the line located within the State of Nevada are designed to National Electric Safety Code (NESC) standards.

Environmental Impacts

Since the upgraded 220 kV line would be operated at a higher voltage than the existing 115 kV line, the magnitude of the electric field along the line route would increase. The magnetic field may also change, because its intensity depends directly on current levels, however, phasing with the other existing lines in the corridor can actually reduce magnetic fields in some instances. SCE would prepare an Electric and Magnetic Field (EMF) Management Plan as part of its project application to the CPUC that would include changes in EMF levels associated with the upgrades.

There remains a lack of consensus in the scientific community in regard to public health impacts due to EMF at the levels expected from electric power facilities. Since the work would largely be within existing corridors, the upgrade-related increases in EMF intensity would lead to corresponding increases in human exposure to the line's magnetic fields. The nearest residences to the line are approximately 150 feet away. Line workers would also be exposed to EMF in close proximity to the lines; however, this type of short-term exposure is not significantly related to the present health concern.

There are no federal or State standards limiting human exposure to EMFs from transmission lines or substation facilities in California or Nevada. For those reasons, EMF is not considered in this appendix as a CEQA/NEPA issue and no impact significance is presented.

Other potential impacts related to electric power facility projects, are both safety and nuisance issues, and include: radio/television/electronic equipment interference; induced currents and shock hazards and potential effects on cardiac pacemakers.

Mitigation

Because there is no agreement among scientists that exposure to EMF creates any potential health risk, and because CEQA and NEPA do not define or adopt any

standards to address the potential health risk impacts of possible exposure to EMFs, this analysis does not consider magnetic fields in the context of CEQA/NEPA and determination of environmental impacts.

However, recognizing that public concern remains, the CPUC does require, pursuant to GO 131-D, Section X.A, that all applications for a Certificate of Public Convenience and Necessity (CPCN) include a description of the measures taken or proposed by the utility to reduce the potential for exposure to EMFs generated by the project. The CPUC has developed an interim policy that requires utilities, among other things, to identify the no-cost measures undertaken, and the low-cost measures implemented, to reduce the potential EMF impacts. The benchmark established for low-cost measures is four percent of the total budgeted project cost that results in an EMF reduction of at least fifteen percent (as measured at the edge of the utility ROW). Therefore, SCE would need to incorporate specific field-reducing measures into the design of the 220 kV upgraded line prior of its submittal of its CPCN application to the CPUC.

Other public concerns related to electric power facility projects, are both safety and nuisance issues, and include: radio/television/electronic equipment interference; induced currents and shock hazards and potential effects on cardiac pacemakers. SCE is under jurisdiction of the CPUC and the upgraded facilities would be designed and operated according to CPUC General Order 95 in California.

The NESC specifies that transmission lines be designed to limit short circuit current from vehicles or large objects near the line to no more than 5 milliampere (mA). CPUC General Order 95 and the NESC also address shock hazards to the public by providing guidelines on minimum clearances to be maintained for practical safeguarding of persons during the installation, operation, or maintenance of overhead transmission lines and their associated equipment.

Energy Commission staff's recommended conditions of certification in the ISEGS Staff Assessment are intended to ensure compliance with CPUC policy as related to field strengths, perceivable field effects, electric shocks, and human exposure. Energy Commission staff would expect that the line would be operated according to SCE's guidelines, which would be in compliance with the applicable (non-EMF) health and safety LORS.

Conclusion

The upgraded 220 kV transmission line would be designed, built and operated (largely within the existing ROW) according to SCE's requirements, reflecting compliance with the health and safety (non-EMF) LORS of concern to Energy Commission staff. Therefore, Energy Commission staff would not expect its operation to pose a significant health and safety hazard to individuals in the area.

TRANSMISSION SYSTEM ENGINEERING

Environmental Setting

Construction activities would occur in a manner that complies with applicable safety and reliability standards in order to increase transmission capacity. At MP 28.6 (near tower

195), the new ROW would cross from Clark County, Nevada into San Bernardino County, California. As stated above, all portions of the line located within the State of California are designed to CPUC General Order 95 standards and all portions of the line located within the State of Nevada are designed to NESC standards. Specific documents that will be presented in SCE's Application and PEA to the CPUC will give specifications for the transmission line, including engineering drawings and construction guidelines. Plan and Profile drawings and Technical Specifications will also be part of the supplement documents.

Environmental Impacts

During construction, applicable safety and reliability LORS must be met following SCE's Construction Standards, which reflect CPUC and NESC requirements. SCE would schedule any outages in a manner such that maintains system reliability. Applicable LORS also include North American Electric Reliability Council (NERC) Planning Standards, Western Electric Coordinating Council (WECC) Reliability Criteria, which insure continuity of load service and protection of the interconnected grid, and the NESC 1999 standards.

All of SCE's electrical and telecommunication upgrades would result in local system benefits, in that they would provide considerably greater flexibility in routing power in the regional transmission network, even if ISEGS is not built. The SCE project would ensure that ISEGS could generate at its rated capacity as it would mitigate overloads on the existing Eldorado–Baker–Coolwater-Dunn Siding-Mountain Pass 115 kV transmission line between Eldorado and Ivanpah Substations.

Mitigation

To mitigate potential safety and reliability impacts, the above-stated LORS, CPUC and NESC regulations and SCE scheduling protocols would be used. SCE would need to assure conformance with the above safety and reliability requirements.

Conclusion

Conformance with applicable safety and reliability is required by several LORS, and would be successful in mitigating any safety or reliability implications of the upgrades.

VISUAL RESOURCES

Environmental Setting

California and Nevada

As stated in the **Visual Resources** analysis in the ISEGS Staff Assessment, the regional landscape is part of the Great Basin section of Fenneman's Basin and Range physiographic province, a vast desert area of the western U.S. extending from eastern Oregon to western Texas, characterized by periodic mountain ranges separated by desert plain (Fenneman, 1931). It is also located within the Mojave Desert, immediately north and east of the northernmost portions of the Mojave National Preserve. Locally, the site is situated within the Ivanpah Valley, notable for the level playa or dry lakebed of Ivanpah Lake. Steeply rising, barren slopes and ridges of the Clark, Spring, and

Ivanpah Mountains to the south, west, and north, and the Lucy Gray, McCullough, and New York Mountains to the east, define the Ivanpah Valley in the project vicinity.

The transmission line would be located approximately 30 miles south of the City of Las Vegas, and would cross within several hundred feet of Primm, Nevada, and along I-15 becoming increasingly urbanized and less scenically intact as one progresses northward. However, upon leaving Primm, Nevada, the transmission line upgrades would be located on undeveloped BLM land. The transmission line upgrades would be located approximately one mile south of the Red Rock Canyon National Conservation Area that is managed primarily for its visual resources. However, the transmission line upgrades would occur within an existing transmission line corridor adjacent as many as five additional transmission lines. Thus, in a regional context, the site is located at the outer edge of urban influence of the City of Las Vegas metropolitan area. I-15 adjacent to the project site is the principal travel route for visitors to Las Vegas from southern California. There are no California Officially-Designated or Eligible State Scenic Highways in the project vicinity (Caltrans 2008).

Environmental Impacts

For the proposed 220 kV route, new dulled galvanized 220 kV LSTs and H-frame structures would be installed in the existing and new ROW. Double-circuit LSTs generally range in height between 100 feet and 200 feet. Single-circuit H-frame structures generally would be less than 100 feet tall. Most of the structure sites would likely require minor to substantial grading and new or re-developed access and spur roads.

The project would require temporary staging areas for equipment and materials storage along the transmission line route in both California and Nevada. Generally these yards range in size from a few acres to up to approximately 30 acres. Construction of the Ivanpah Substation would likely require a temporary laydown area located at or near the existing roadway at the site. Materials stored at the construction yards would include:

- Hardware
- Steel
- Insulators
- Signage
- Consumables, such as fuel and joint compound
- SWPPP materials, such as straw wattles, gravel, and silt fences
- Waste materials for recycling or disposal.

Conductor pulling and tensioning equipment would be located at various sites along the transmission line ROW. Depending on the terrain and the number of angles and dead-end sites, numerous pull sites would likely be needed.

Construction equipment and activities would be visible to motorists on I-15 and other local roadways, as well as to residents living near the construction activities in Primm, Nevada. Due to temporary duration of the project construction, the adverse visual

impacts that would occur during construction would not be significant. This conclusion assumes that construction areas and the ROW would be restored to their pre-project conditions, as discussed below.

However, the upgrades would include the construction of new permanent spur and access roads to the individual structure sites and Ivanpah Substation, which could create permanent visual scars across the undeveloped landscape.

Construction of the 220 kV line would be largely within an existing, but widened ROW across undeveloped BLM lands, and would parallel a major existing utility corridor with up to five existing transmission lines for its length. Because the existing transmission lines and towers are an established part of the setting and the project would include removal of the existing 115 kV line and poles, the adverse visual impacts that would occur due to installation of the new line, and any incremental changes in tower height or design, would likely not be significant. This conclusion assumes that the new wires and towers would incorporate typical measures to mitigate potentially significant adverse visual impacts, such as those listed below.

Mitigation

With the inclusion of mitigation measures similar to those listed below, visual impacts from construction activities related to the upgrades would likely not be significant:

- During project construction, the work site should be kept clean of debris and construction waste. Material and construction storage areas should be selected to minimize views from public roads, trails, and nearby residences.
- For areas where excavated materials would be visible from sensitive viewing locations, excavated materials should be disposed of in a manner that is not visually evident and does not create visual contrasts.
- Maintenance operations work should be conducted in a manner that limits unnecessary scarring or defacing of the natural surroundings to preserve the natural landscape to the extent possible.
- The project owner should revegetate disturbed soil areas to the greatest practical extent. In particular, the area of disturbed soils used for laydown, project construction, and siting of the substation and other ancillary operations and support structures should be revegetated. This measure is included in Condition of Certification **VIS-4** within this Staff Assessment.

With the inclusion of the mitigation measures similar to those listed below, and because the new lines would follow existing utilities corridors or be located within existing substation properties, operation of the facilities would likely not cause significant adverse visual impacts:

- Non-specular and non-reflective conductors should be used in order to reduce conductor visibility and visual contrast;
- Insulators should be non-reflective and non-refractive; and
- Any surface coatings on structures should be applied to new or replacement structures that are visible from sensitive viewing locations with appropriate colors,

finishes, and textures to most effectively blend the structures with the visible backdrop landscape. For structures that are visible from more than one sensitive viewing location, if backdrops are substantially different when viewed from different vantage points, the darker color shall be selected, because dark colors tend to blend into landscape backdrops more effectively than lighter colors, which may contrast and produce glare.

Conclusion

Construction of the SCE upgrades project would require temporary disturbance during construction (i.e., heavy equipment, tensioning, and pull sites). After rehabilitation of temporary construction yards and pulling sites, as required by the suggested mitigation, the transmission line would appear largely as it does now, except for the construction of new and permanent spur and access roads, which would permanently scar the fragile desert landscape.

The SCE upgrades project would have the potential to cause adverse long-term visual impacts, such as through the use of reflective conductors and/or insulators that would make existing or new structures more dominant in the existing viewshed, and through the construction of new and larger structures. However, project design features and feasible mitigation measures would be available that would ensure that visual impacts of the project would be reduced. With use of non-specular conductors and non-reflective and non-refractive insulators, potential long-term impacts associated with this activity would be reduced as well. Because the upgrades would be in a largely undeveloped area on BLM land, would parallel an existing utility corridor or be on/within existing facilities, and would include removal of the existing line, it is expected that visual impacts would be reduced to less than significant.

WASTE MANAGEMENT

Environmental Setting

The transmission lines and related facilities would be routed mostly through undeveloped publicly-owned desert and mountainous land with relatively few activities that could generate the hazardous wastes or contaminated areas that are of specific concern in this analysis. Specific site surveys for contamination sites would be required prior to any permitting, which are discussed in the Hazardous Materials Management section.

As stated in Chapter 2 of this Appendix, all existing 115 kV structures on the 35.5-mile Eldorado-Ivanpah portion of the existing Eldorado–Baker–Coolwater-Dunn Siding-Mountain Pass 115 kV transmission line would be removed. Transmission line equipment to be removed would include existing 115 kV lattice steel H-frame structures, LSTs, wood pole H-frame structures, wood poles, and associated hardware (i.e., cross arms, insulators, vibration dampeners, suspension clamps, ground wire clamps, shackles, links, nuts, bolts, washers, cotters pins, insulator weights, and bond wires), as well as the transmission line conductor. Steel lattice tower footings, concrete caps and anchors would likely be cut/removed below ground level. Holes would be filled and compressed, and then the area would be smoothed to match surrounding grade. The disposal of or recycling of these structures would occur at permitted facilities.

In addition, at the transition point going north into the Ivanpah Substation, existing subtransmission structures may be removed and replaced as well. At the Ivanpah Substation, any excavated soil would likely be spread on a portion of the substation property. At the end of construction, all construction materials and debris would be removed from the area and recycled or properly disposed of offsite.

California

The closest landfill within San Bernardino County, California, is Baker Medium Volume Transfer Processing, which allows a maximum of 25 tons/day and accepts Metals, Mixed Municipal, and Tires. Other landfills include the Newberry Springs Med. Vol. T/P Facility in Newberry Springs (108 miles from Primm), which allows Mixed Municipal waste, and the Barstow Sanitary Landfill, which is approximately 117 miles from Primm along I-15, allows a maximum permitted throughput of 750 tons/day and has a remaining capacity of 924,401 cubic yards. The Barstow Sanitary Landfill accepts the following waste types: Agricultural, Construction/demolition, Industrial, Mixed municipal, Other designated, and Sludge (BioSolids) (CIWMB 2008). There are also two landfills in Fort Irwin (Fort Irwin Sanitary Landfill and Fort Irwin Composting Facility), which are located about 117 miles west-southwest of Primm, NV.

Nevada

The following permitted and operating Southern Nevada Health District Class I and Class III solid waste facilities are located near the project area in Nevada (NDEP 2008):[1]

- ***Las Vegas area*** (~40 miles north-northeast of the project area): Wells Cargo Class III Landfill, Timet J-2 Class III Landfill, Boulder City Class I Landfill, Southern Nevada Water Authority Class III Landfill, Nellis AFB Class III Landfill, Apex Class I Landfill;
- **Laughlin/*Bullhead City area***: (~75 miles southeast of the project area): Laughlin Class I Landfill, and SCE Mojave Generating Station Class III Landfill; and
- **Pahrump** (~90 miles northwest of the project area): Pahrump Valley Class I Landfill.

Environmental Impacts

Construction would generate waste largely in the form of soil from structure excavation, concrete from existing foundations, utility line cable, and scrap metal/wood from the replacement of existing structures. Chapter 3.5 (Hazardous Materials Management) in this Appendix discusses impacts in the event contaminated soil is encountered. 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.

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[1] NAC 444.5705 “Class I site” defined. (NRS 444.560) “Class I site” means a disposal site which:
(1) Is comprised of at least one municipal solid waste landfill unit including all contiguous land and structures, other appurtenances and improvements on the land used for the disposal of solid waste; and
(2) Is not a Class II or Class III site.
NAC 444.5715 “Class III site” defined. (NRS 444.560) “Class III site” means a disposal site which accepts only industrial solid waste.

The wood, lattice, and H-frame structures, insulators, cross arms and all other associated hardware would be disposed of at an offsite location. Because wood poles are treated, they may need to be disposed of at a facility that accepts treated wood.

Due to the number and capacity of landfills serving the project area, capacity for materials generated from construction of the upgrades would be available. Because the exact amount of material recycling is unknown, the total amount of waste requiring landfill disposal is unknown. Recycling activities would greatly reduce the quantity of construction-related materials transported to local landfills.

As the waste generated by the upgrades would occur over the entire construction period and could be dispersed among the various landfills serving the entire project area, the daily waste exported off site would be a fraction of the maximum daily throughput for any of the landfills in the area. Therefore, construction waste generated by the project would not substantially affect the remaining capacities of local landfills to serve local demands.

Mitigation

Mitigation is recommended that would ensure that all construction materials and debris would be removed from the area and recycled or properly disposed of offsite. Although impacts to solid waste facilities and waste management would not be significant and no mitigation measure would be required, to further reduce adverse effects of the overall volume of waste from all of the project components, mitigation that would require SCE to recycle construction waste where feasible is recommended for implementation by Energy Commission staff to ensure that maximum recycling activities would occur over the course of the entire project.

SCE would also be required to properly store, package, and label all hazardous waste; use only approved transporters; prepare hazardous waste manifests; keep detailed records; and appropriately train employees, in accordance with state and federal hazardous waste management requirements. Hazardous wastes would be accumulated onsite in accordance with accumulation time limits and then properly manifested, transported to, and disposed of at a permitted hazardous waste management facility by licensed hazardous waste collection and disposal companies. To help ensure and facilitate ongoing project compliance with LORS, Energy Commission staff recommends mitigation similar to the conditions of certification included in the **Waste Management** section of the ISEGS Staff Assessment.

Conclusion

Energy Commission staff concludes that the SCE transmission upgrades would comply with all applicable LORS regulating the management of hazardous and non-hazardous wastes during both project construction and operation. Energy Commission staff recommends that in addition to the conditions of certification included in the **Waste Management** section of this Staff Assessment, SCE should be required to recycle construction waste where feasible.

WORKER SAFETY AND FIRE PROTECTION

Environmental Setting

California and Nevada

Fire support services along the SCE transmission upgrades would be under the jurisdiction of the San Bernardino County Fire Department (SBCFD) in California and under Clark County Fire Department (CCFD) in Nevada. Station #53 is 40 miles from the ending point of the transmission upgrades site at the ISEGS project site, located at 65 Kingston Circle, Baker, California, and would be the first responder in California, with a response time of approximately 45 minutes. Station #53 has a Type 1 engine and a brush patrol vehicle. It has three staff on duty at all times (a captain, an engineer, and a firefighter). San Bernardino County Fire Department also has a Mutual Aid Agreement with Clark County (Nevada) Fire Department for responses requiring more assistance. Station #87, located at 20400 S. Las Vegas Blvd. in Clark County, would be the nearest fire station (Clark County 2008).

As stated in the PSA, in San Bernardino County, hazardous materials permits and spills are handled and investigated by San Bernardino County. Because of the highly remote and rural area of ISEGS, services are limited and spread out. San Bernardino County firefighters receive specialized training to address emergency responses to industrial hazards. The response time to the project site, with full resources capabilities, would be three to four hours. There are roughly 150 members (10 Registered Environmental Health Specialists and the rest, firefighters), and the organization is a full Level A response team capable of handling all types of chemical, biological, radiological, and nuclear responses. Hazardous materials service is provided out of the county station in Fontana, Station #78.

In Clark County, hazardous spills are reported to the police or fire department and are handled and investigated by the Clark County Office of Emergency Management. Hazardous materials are regulated according to Clark County Code, Chapter 3.04 (Clark County 2008).

Environmental Impacts

Industrial environments are potentially dangerous during both construction and operation. Workers at the project site would be exposed to loud noises, moving equipment, trenches, and confined space entry and egress. Workers may sustain falls, trips, burns, lacerations, and other injuries. They may be exposed to falling equipment or structures, chemical spills, hazardous waste, fires, explosions, and electrical sparks or electrocution. It is important that SCE has well-defined policies and procedures, training, and hazard recognition and control to minimize these hazards and protect workers. If the project complies with all LORS, workers would be adequately protected from health and safety hazards.

During construction and operation of the upgrades 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 substations, or flammable liquids; explosions; and overheated equipment may cause small fires. Major structural fires are unlikely along

transmission lines and at substations. Fires and explosions of flammable gasses or liquids are rare. Compliance with all LORS would be adequate to ensure protection from all fire hazards.

The project would 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 and/or the CCFD depending on the location of the fire in the project area. Both would be called upon if needed and as available through a Mutual Aid Agreement between SBCFD and CCFD (BSE2007a).

Mitigation

Energy Commission staff recommends mitigation similar to the conditions of certification in the **Worker Safety and Fire Protection** of this Staff Assessment that would require SCE to provide a project construction safety and health program and a project operations and maintenance safety and health program.

To ensure the safety of workers and the public, SCE has stated that safety devices such as traveling grounds, guard structures, and radio-equipped public safety roving vehicles and linemen would be in place prior to the initiation of wire-stringing activities.

In mountainous areas, benching may be required to provide access for footing construction, assembly, erection, and wire-stringing activities during line construction. It would be used minimally to help ensure the safety of personnel during construction activities.

Construction of the project and construction equipment may impede emergency access through the area. Energy Commission staff recommends implementation of mitigation that would require SCE to coordinate construction schedules, lane closures, and other activities associated with installation of the project with emergency and police services to ensure minimal disruption to response times and access for these services. As is discussed in Chapter 3.10 (Traffic and Transportation) of this Appendix, because guard structures would be installed over roadway crossings such impacts would also be reduced. Therefore, impacts to emergency access and/or public services and facilities would be less than significant.

Conclusion

Incorporation of the measures discussed above and the Conditions of Certification included in the **Worker Safety** section of this Staff Assessment would ensure adequate levels of industrial safety and would comply with applicable LORS. Energy Commission staff also concludes that the project would not have significant impacts on local emergency and fire protection services.

CONCLUSION

Chapters 2 and 3 of this Appendix describe the project and the potential impacts of SCE's electric and telecommunication upgrades. This study was undertaken to inform

the Energy Commission and the general public of the potential indirect environmental and public health effects caused by the approval of the ISEGS project.

The environmental and engineering disciplines can be divided into two groups: those with the potential for significant impacts that would require mitigation, and those in which impacts are easily mitigable or clearly less than significant. This analysis determined that impacts in the following areas would likely be less than significant for this upgrades project (some with implementation of standard mitigation measures): Facility Design, Power Plant Efficiency, and Power Plant Reliability.

Although implementation of mitigation may reduce potential impacts to less than significant levels, the disciplines where potential impacts are of most concern are Air Quality, Biological Resources, Cultural Resources, and Visual Resources. The conclusions of these analyses are described below.

AIR QUALITY

The construction and structure removal activities associated with SCE's upgrades would cause emissions due to heavy-duty diesel and gasoline-powered construction equipment and fugitive particulate matter (dust) emissions from activity on unpaved surfaces. With effective and comprehensive control measures such as those recommended by Energy Commission staff for the proposed ISEGS project, dust and equipment exhaust impacts could likely be reduced to a less than significant level.

BIOLOGICAL RESOURCES

Because some of the construction work would occur in or near sensitive species and/or habitats and would result in the permanent loss of vegetation at structure locations and new spur roads, Energy Commission staff concludes that project activities could adversely impact sensitive biological resources in and/or adjacent to the transmission/distribution line corridor. Impact avoidance measures would help reduce potentially significant biological impacts to less than significant levels. Energy Commission staff recommends that after construction plans are finalized, a complete project description (including results of all sensitive species surveys, and a revised assessment of potential impacts) be submitted as part of SCE's PEA to the CPUC/BLM, which would ensure the upgrades comply with applicable federal, State and local laws, ordinances and regulations. Energy Commission staff also recommends consultation with applicable federal, state and local agencies to identify potential impacts and develop additional mitigation measures that would avoid, eliminate, reduce to a less-than-significant level or compensate for those impacts. Even if the upgrades work complies with all applicable LORS, absent biological survey information, Energy Commission staff conservatively concludes that the SCE upgrades may create significant impacts to biological resources due to the permanent loss of habitat associated with new structures and roads, and the temporary disturbance to sensitive plant and wildlife species during construction.

CULTURAL RESOURCES

Prior to construction, a data search and field surveys should be performed to identify known cultural resources that may be adversely impacted. In the absence of this information, it should be assumed that the areas of upgrades would be sensitive for

cultural resources, and some of the resources may be impacted as a result of the construction activities. Energy Commission staff believes that it would be possible to mitigate all impacts to cultural resources to less than a significant level through the Section 106 process and implementation of measures that apply to cultural resources. Known sensitive areas would be avoided, construction activities would be monitored and other appropriate mitigation similar to the conditions of certification identified in the **Cultural Resources** section of the Staff Assessment would be implemented.

GEOLOGY AND PALEONTOLOGY

Geotechnical and paleontological investigations for geologic or paleontologic resources have not yet been performed in the project area; however, fossilized vertebrae bones and invertebrate fossils have been uncovered in the southern Nevada region. There are no known active faults crossing the proposed route and the area is considered to have a low potential for seismic hazard. Therefore, there would not likely be any impacts related to fault rupture, liquefaction, strong groundshaking, or earthquake-induced landslides. The structures would be constructed to comply with all applicable LORS. With implementation of measures and best management practices that would ensure proper re-vegetation, erosion control, and drainage, among other geologic and paleontologic requirements, SCE's project upgrades would create a less than significant impact to geology and paleontology.

HAZARDOUS MATERIALS MANAGEMENT

Spills and leaks of hazardous materials during construction activities could potentially result in soil or groundwater contamination. Improper handling of hazardous materials could expose project workers or the nearby public to hazards and/or known or previously undocumented soil and or groundwater contamination could be encountered during ground disturbing activities. Implementing mitigation measures similar to the Conditions of Certification that are proposed in the Staff Assessment for construction of the ISEGS, as well as implementation of SWPPP and SPCC plans, would avoid potential significant hazard impacts from work associated with the SCE upgrades.

LAND USE

The SCE 220 kV transmission upgrades project would parallel an established and major utility corridor across BLM land. Generally all of the upgrades would parallel existing utility or transportation corridors and so they would not disrupt or divide the physical arrangement of an established community. Also for these reasons, the SCE upgrades would not restrict existing or future land uses along the route. To reduce recreation impacts, Energy Commission staff recommends mitigation measures that would require SCE to coordinate construction activities and the project construction schedule with the authorized BLM officer for the Ivanpah Dry Lake area, and require SCE to identify alternative recreation facilities that may be used by the public during construction.

NOISE

The entire area within the ROW is undeveloped, with the exception of a few roads that pass underneath the transmission line. There are a few residences within 500 feet of the transmission line ROW in the area of Primm, NV at the California/Nevada state line. Short-term noise impacts to these residences may occur during the construction from

operation of heavy equipment throughout the project area. SCE would largely use existing ROW access roads to complete work, but they would also need improvement and construction of new spur and access roads. Implementing mitigation measures similar to the conditions of certification that are proposed in the Staff Assessment for construction of the ISEGS would avoid potential significant noise impacts from work associated with the proposed project. After the construction work is complete and the line operational, there may be a change in corona noise levels in portions along the new corridor.

SOCIOECONOMICS

Because few, if any, workers are expected to relocate to the area, no new housing would be needed for the project, no housing would be displaced, and no new competition for existing housing would likely occur. Construction employees would likely already live within commuting distance to the project area in Primm, Nevada, the Las Vegas area, which is less than 40 miles to the north, or San Bernardino County in California. Since any non-local construction workers would not likely relocate family members for the relatively short duration of construction and very few, if any, new permanent employees would be hired by SCE for operation of the project, impacts to schools, public services, and recreational facilities would be less than significant.

SOIL AND WATER RESOURCES

Construction activities would not occur within the watercourses; therefore, impacts to water quality for construction and operation of the transmission lines would be less than significant. Implementation of SWPPP and recommended mitigation, such as temporary erosion control measures, and best management practices or similar mitigation would ensure less than significant impacts to soils and water resources. The SCE project would cross three grazing allotments located along the transmission line corridor in California and Nevada, however, with the implementation of mitigation, neither construction nor operation of the transmission line would cause a significant impact to agricultural resources.

TRAFFIC AND TRANSPORTATION

Since the majority of construction activities would take place in largely rural areas, it is projected that the activities would have minimal impact on the traffic level of service for the roadways in the vicinity of the activities. In addition, the movement of heavy machinery on local roads would occur intermittently, but infrequently throughout the project area over the construction period. However, on Fridays from approximately 12 p.m. to 10 p.m., northbound I-15 experiences an hourly average of approximately 2,000 trips per lane and operates at LOS F. Regardless, the number of vehicles added to northbound I-15 on Friday afternoons as a result of the project would be minor compared to the number of vehicles traveling on northbound I-15 during the same time. Based on the temporary nature of the construction activities and the generally undeveloped nature of the area, coupled with implementation of traffic mitigation measures similar to conditions of certification in the ISEGS Staff Assessment, such as scheduling during non-peak hours, would ensure that any potential traffic and transportation impacts would be less than significant.

TRANSMISSION LINE SAFETY AND NUISANCE

Since the upgraded 220 kV line would be operated at a higher voltage than the existing 115 kV line, the magnitude of the electric field along the line route would increase. The magnetic field may also change, because its intensity depends directly on current levels, however, phasing with other existing lines can actually reduce magnetic fields in some instances. SCE would prepare an EMF Field Management Plan as part of its project application to the CPUC that would include changes in EMF levels associated with the upgrades. The upgraded 220 kV transmission line would be designed, built and operated (largely within the existing ROW) according to SCE's requirements, reflecting compliance with the health and safety (non-EMF) LORS of concern to Energy Commission staff. Therefore, Energy Commission staff would not expect its operation to pose a significant health and safety hazard to individuals in the area.

TRANSMISSION SYSTEM ENGINEERING

To mitigate potential safety and reliability impacts, the LORS, CPUC and NESC regulations and SCE scheduling protocols would be used. SCE would need to assure conformance with the safety and reliability requirements. All of SCE's electrical and telecommunication upgrades would result in local system benefits, in that they would provide considerably greater flexibility in routing power in the regional transmission, subtransmission and telecommunication networks, even if the ISEGS is not built. The project would ensure that the ISEGS could generate at its rated capacity as it would mitigate overloads on the existing Eldorado–Baker–Coolwater-Dunn Siding-Mountain Pass 115 kV transmission line between Eldorado and Ivanpah Substations.

VISUAL RESOURCES

Construction of the SCE upgrades project would require temporary disturbance during construction (i.e., heavy equipment, tensioning, and pull sites). After rehabilitation of temporary construction yards and pulling sites, as required by the suggested mitigation, the transmission line would appear largely as it does now, except for the construction of new and permanent spur and access roads, which would permanently scar the fragile desert landscape.

The SCE system upgrades would result in the construction of new industrial equipment in the viewsheds across the project area. Construction of the 220 kV line would be largely within a widened, but existing ROW across undeveloped BLM lands, and would parallel a large existing utility corridor with up to five existing lines for its length. Because the existing transmission line and towers are an established part of the setting and the project would include removal of the existing 115 kV line and poles, the adverse visual impacts that would occur due to installation of the new line and any incremental changes in tower height or design would likely not be significant. This conclusion assumes that the new wires and towers would incorporate typical recommended measures to mitigate potentially significant adverse visual impacts.

WASTE MANAGEMENT

Construction would generate waste largely in the form of soil from structure excavation, concrete from existing foundations, utility line cable, and scrap metal/wood from the removal/replacement of existing structures, which would be disposed of at an offsite

location. Due to the number and capacity of landfills serving the project area, capacity for materials generated from construction of the upgrades would be available. Recycling activities would greatly reduce the quantity of construction-related materials transported to local landfills. To help ensure and facilitate ongoing project compliance with LORS, Energy Commission staff recommends mitigation similar to the conditions of certification included in the **Waste Management** section of this Staff Assessment. Energy Commission staff also recommends that SCE should be required to recycle construction waste where feasible.

WORKER SAFETY AND FIRE PROTECTION

Workers at the project would be exposed to loud noises, moving equipment, trenches, and confined space entry and egress. Workers may sustain falls, trips, burns, lacerations, and other injuries. During construction and operation of the upgrades there is also the potential for both small fires and major structural fires. Energy Commission staff recommends mitigation similar to the Conditions of Certification in the **Worker Safety and Fire Protection** section of this Staff Assessment that would require SCE to provide a project construction safety and health program and a project operations and maintenance safety and health program. These measures would ensure adequate levels of industrial safety and would comply with applicable LORS. Energy Commission staff also concludes that the project would not have significant impacts on local fire protection services.

REFERENCES

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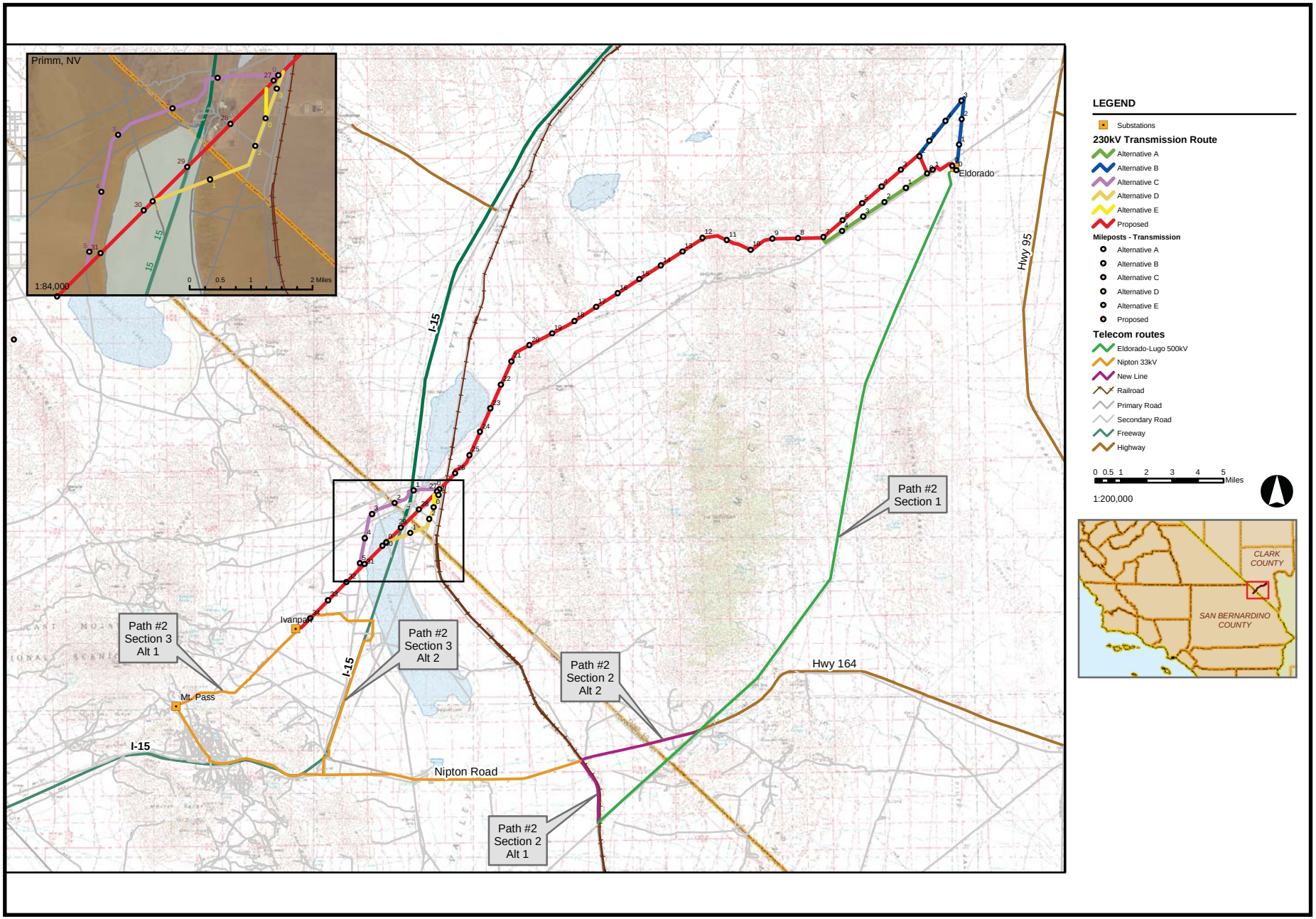
APPENDIX A - FIGURE 1

Ivanpah-El Dorado Transmission Line Project



SOURCE: Ivanpah-Eldorado TL Analysis rev 111008, Figure 1

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Introduction ..... Che McFarin

Project Description ..... Che McFarin

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Biological Resources ..... Susan Sanders

Cultural Resources ..... Michael McGuirt

Hazardous Materials Management ..... Geoff Lesh and Rick Tyler

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Noise and Vibration ..... Steve Baker

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Cumulative Impacts ..... Susan Lee

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BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA

APPLICATION FOR CERTIFICATION FOR THE *IVANPAH SOLAR ELECTRIC GENERATING SYSTEM*	DOCKET NO. 07-AFC-5 PROOF OF SERVICE (Revised 7/14/08)

INSTRUCTIONS: All parties shall 1) send an original signed document plus 12 copies OR 2) mail one original signed copy AND e-mail the document to the web address below, AND 3) all parties shall also send a printed OR electronic copy of the documents that shall include a proof of service declaration to each of the individuals on the proof of service:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 07-AFC-5
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DECLARATION OF SERVICE

I, Hilarie Anderson, declare that on December 09, 2008, I deposited copies of the attached Preliminary Staff Assessment in the United States mail at Sacramento, CA with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

OR

Transmission via electronic mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury that the foregoing is true and correct.

__Original Signature in Dockets___
Hilarie Anderson