5.9 Public Health

5.9.1 Introduction

The Applicant proposes to develop a solar energy project called the Ivanpah Solar Electric Generating System (Ivanpah SEGS). It will be located in southern California's Mojave Desert, near the Nevada border, to the west of Ivanpah Dry Lake. The project will be located in San Bernardino County, California, on federal land managed by the Bureau of Land Management (BLM). It will be constructed in three phases: two 100-megawatt (MW) phases (known as Ivanpah 1 and 2) and a 200-MW phase (Ivanpah 3). The phasing is planned so that Ivanpah 1 (the southernmost site) will be constructed first, followed by Ivanpah 2 (the middle site), then Ivanpah 3 (the 200-MW plant on the north), though the order of construction may change. Each 100-MW site requires about 850 acres (or 1.3 square miles); the 200-MW site is about 1,660 acres (or about 2.6 square miles). The total area required for all three phases, including the Administration/Operations and Maintenance building and substation, is approximately 3,400 acres. The Applicant has applied for a right-of-way grant for the land from BLM. Although this is a phased project, it is being analyzed as if all phases are operational.

The heliostat (or mirror) fields focus solar energy on the power tower receivers near the center of each of the heliostat arrays (the 100-MW plants have three arrays and the 200-MW plant has four arrays). 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 are started each morning after sunrise and insolation build-up, and shut down in the evening when insolation drops below the level required to keep the turbine online.

Ivanpah 1, 2 and 3 will be interconnected to the Southern California Edison (SCE) grid through upgrades to SCE's 115-kilovolt (kV) line passing through the site on a northeast-southwest right-of-way. These upgrades will include the construction by SCE of a new 220/115-kV breaker-and-a-half substation between the Ivanpah 1 and 2 project sites. This new substation and the 220-kV upgrades will be for the benefit of Ivanpah and other Interconnection Customers in the region. The existing 115-kV transmission line from the El Dorado substation will be replaced with a double-circuit 220-kV overhead line that will be interconnected to the new substation. Power from Ivanpah 1, 2 and 3 will be transmitted at 115 kV to the new substation. SCE plans to add three new 115-kV lines to increase capacity to the existing El Dorado-Baker-Cool Water-Dunn Siding-Mountain Pass 115-kV line heading southwest. The timing of this upgrade depends upon the development of wind projects ahead in the queue, and is not affected by the Ivanpah SEGS project.

Each phase of the project includes a small package natural gas-fired start-up boiler to provide heat for plant start-up and during temporary cloud cover. The project's natural gas system will be connected to the Kern River Gas Transmission Line, which passes less than half a mile to the north of the project site. Raw water will be drawn daily from one of two onsite wells, located east of Ivanpah 2. Each well will have sufficient capacity to supply water for all three phases. Groundwater will go through a treatment system for use as boiler make-up water and to wash the heliostats. To save water in the site's desert environment, each plant will use a dry-cooling condenser. Water consumption is, therefore, minimal

(estimated at no more than 100 acre-feet/year for all three phases). Each phase includes a small onsite wastewater plant located in the power block that treats wastewater from domestic waste streams such as showers and toilets. A larger sewage package treatment plant will also be located at the Administration Building/Operations and Maintenance area, located between Ivanpah 1 and 2. Sewage sludge will be removed from the site by a sanitary service provider. No wastewater will be generated by the system, except for a small stream that will be treated and used for landscape irrigation. If necessary, a small filter/purification system will be used to provide potable water at the Administration Building.

Air will be the dominant pathway for potential public exposure to non-criteria pollutants released by the Ivanpah SEGS. Emissions to the air will consist primarily of combustion by-products produced by the boilers, emergency engines, and emergency fire pump engines. Potential health risks from combustion emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways for dermal absorption, soil ingestion, and mother's milk ingestion were included in the health risk modeling; however, direct inhalation is the dominant exposure pathway. The screening health risk assessment methodology was conducted in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (CA OEHHA) and the California Air Resources Board (CARB, 2005). Ivanpah SEGS will use solar energy to generate electric energy. Natural gas fired boilers will be used to bring the units to operating temperature in the morning, and to keep the units at operating temperatures during transient cloud cover. Emergency diesel fuel-fired engines will be used if the facility's power supply fails, or in case of fire. These engines must be periodically tested to ensure they will operate when needed.

Public health benefits are derived from the generated electric power that is provided to homes, businesses, hospitals, and other societal institutions. However, an analysis of these benefits is beyond the scope of this project.

Combustion byproducts with established national and California ambient air quality standards (referred to as "criteria pollutants") are addressed in Section 5.1, Air Quality. However, some discussion of the potential health risks associated with these substances is presented in this section.

This section presents the methodology and results of a screening human health risk assessment performed to assess potential impacts and public exposure associated with airborne emissions from the construction and operation of the Ivanpah SEGS.

Section 5.9.1 introduces the subject of public health impact analysis for a power plant proposed in a California Energy Commission (CEC) Application for Certification (AFC). Section 5.9.2 describes the laws, ordinances, regulations, and standards (LORS) relevant to potential public health impacts of such a project. Section 5.9.3 describes the potentially affected public health environment around the proposed project site. Section 5.9.4 discusses the environmental impacts from construction and operation of the power plant and associated facilities. The calculations of non-criteria pollutant emissions and the air dispersion modeling for the screening health risk assessment are presented in Section 5.1, Air Quality and Appendix 5.1E.

Section 5.9.5 discusses the cumulative effects of this and other anticipated projects on public health. Section 5.9.6 discusses mitigation measures that may be needed to reduce potentially significant impacts below a level of significance. Regulatory agencies relevant to public health aspects of the project are identified in Section 5.9.7. Required permits and the schedule for their issuance are listed in Section 5.9.8. Section 5.9.9 contains references cited or consulted in preparing this section.

5.9.2 Laws, Ordinances, Regulations and Standards

An overview of the regulatory process for public health issues is presented in this section. Table 5.9-1 identifies the relevant LORS that affect public health and are applicable to this project. The compliance of Ivanpah SEGS with each of the LORS applicable to public health is also presented in this table.

TABLE 5.9-1
Laws, Ordinances, Regulations, and Standards Applicable to Ivanpah SEGS Public Health

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
Federal			
Clean Air Act	Requires large facilities to provide offsets and demonstrate that new emissions will not cause or contribute to violation of a federal ambient air quality standard	U.S. Environmental Protection Agency (EPA) Region 9, CARB, and Mojave Desert Air Quality Management District (MDAQMD)	Section 5.9.2.1
40 CFR Part 68 (Risk Management Plan)	Requires facilities storing or handling significant amounts of acutely hazardous materials to prepare and submit risk management plans	EPA Region 9 and San Bernardino County Fire Department	Section 5.9.2.1
State			
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Activities resulting in doses or carcinogenic risks above specified thresholds require Proposition 65 exposure warnings.	CA OEHHA	Section 5.9.2.2
Health and Safety Code, Article 2, Chapter 6.95, Sections 25531 to 25541; CCR Title 19 (Public Safety), Division 2 (Office of Emergency Services), Chapter 4.5 (California Accidental Release Prevention Program)	Requires facilities storing or handling significant amounts of acutely hazardous materials to prepare and submit risk management plans	San Bernardino County Fire Department	Section 5.9.2.2
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments.	MDAQMD and CARB	Section 5.9.2.2

TABLE 5.9-1
Laws, Ordinances, Regulations, and Standards Applicable to Ivanpah SEGS Public Health

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
MDAQMD Regulation XIII Rule 1320 - New Source Review for Toxic Air Contaminants	Requires that pre-construction review be conducted for all proposed new or modified sources of toxic air contaminants	MDAQMD	Section 5.9.2.2

5.9.2.1 Federal LORS

5.9.2.1.1 Clean Air Act

The Clean Air Act requires large projects (new or modified sources at major stationary sources) to go through a federal permitting process that ensures that the project will not cause or contribute to a violation of a federal ambient air quality standard. The emissions from Ivanpah SEGS are below the thresholds for applicability of the federal permitting requirements.

5.9.2.1.2 40 CFR Part 68 (Risk Management Plan)

Facilities storing or handling significant amounts of acutely hazardous materials are required to prepare and submit risk management plans. No regulated substance will be present in quantities exceeding the applicability thresholds. A Risk Management Plan (RMP) is not required.

5.9.2.2 State LORS

5.9.2.2.1 Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)

Activities which expose the public to significant levels of chemicals that are carcinogenic or that can cause reproductive harm must provide warnings.

Based on a health risk assessment that follows CARB/CA OEHHA guidelines, non-criteria pollutant emission rates and resulting doses and carcinogenic risks will not exceed thresholds that require Proposition 65 exposure warnings.

5.9.2.2.2 Health and Safety Code, Article 2, Chapter 6.95, Sections 25531 to 25541; CCR Title 19 (Public Safety), Division 2 (Office of Emergency Services), Chapter 4.5 (California Accidental Release Prevention Program)

Facilities storing or handling significant amounts of acutely hazardous materials are required to prepare and submit risk management plans.

No regulated substance will be present in quantities exceeding the applicability thresholds. A RMP is not required.

5.9.2.2.3 Health and Safety Code Sections 44360 to 44366 (Air Toxics “Hot Spots” Information and Assessment Act—AB 2588)

Under this program, facilities with emissions of toxic air contaminants are prioritized based on emissions. If the facility’s priority score is high enough, the facility is required to prepare

a health risk assessment. High risk facilities may be required to provide notification to neighbors or to develop and implement a risk reduction plan.

Based on the emission estimates described in this report, Ivanpah SEGS is not a high-priority facility.

5.9.2.2.4 MDAQMD Regulation XIII Rule 1320 - New Source Review for Toxic Air Contaminants

Projects that increase the emissions of Toxic Air Contaminants (TACs) above certain levels are required by District regulations to prepare a Health Risk Assessment evaluating cancer and non-cancer risks. If risks are above certain thresholds, the project must use Toxic Best Available Control Technology (TBACT), or may be denied.

Emissions of TACs from Ivanpah SEGS are below the level that requires a health risk assessment. Nevertheless, a screening health risk assessment has been prepared. The health risk assessment confirms that potential health risks are less than Rule 1320 thresholds.

5.9.2.3 Local LORS

There are no local LORS that apply to Public Health.

5.9.3 Affected Environment

Because health risks at the point of maximum impact from operation of Ivanpah SEGS will be below public health significance criteria thresholds, no residential, workplace, or sensitive receptors will be impacted. Sensitive receptors are locations where groups of individuals, including infants, children, the elderly, and chronically ill individuals that may be more susceptible than the general population to health risks from air pollution may be found. Schools, day-care facilities, convalescent homes, and hospitals are of particular concern. In accordance with CEC guidance (Ringer, 1999), a search was conducted for sensitive receptors within six miles of Ivanpah SEGS. No daycare, hospital, park, preschool, or school receptors were found within six miles.

The nearest residence to Ivanpah SEGS is in Primm, Nevada, five miles northeast of the site (See Figure 5.9-1).

Beneficial aspects of Ivanpah SEGS regarding protection of public health include the following:

- Using the sun to generate electricity, and limiting the size and operation of combustion devices at the facility.
- Use of clean-burning natural gas fuel.
- Low-sulfur content of the natural gas, which reduces sulfate fine particulate generation.

There are no ambient monitors measuring toxic air contaminants in San Bernardino County. However, air quality and health risk data presented for the upwind South Coast Air Basin in CARB's *2006 Almanac of Emissions and Air Quality* show that over the period 1990 through 2005, the average concentrations for the top ten TACs have been substantially reduced, and the associated health risks for the air basin are showing a steady downward trend as well.

5.9.4 Environmental Analysis

This public health section is organized to discuss the sources and different kinds of air emissions associated with construction and operation of Ivanpah SEGS (see Section 5.1, Air Quality), the methodology used in the health risk assessment and the results of the assessment of potential health risks from Ivanpah SEGS. Other potential public health risks associated with Ivanpah SEGS are discussed in different sections of the AFC, as follows:

- Potential exposure to wastes generated by Ivanpah SEGS is discussed in Section 5.14, Waste Management.
- Potential safety and health impacts relative to the work environment of project employees are discussed in Section 5.16, Worker Health and Safety.
- Potential exposure to transmission line electric and magnetic fields is discussed in Section 3.3, Transmission Line Safety and Nuisance.

Project emissions to the air will consist of combustion by-products from the natural gas-fired boilers. Another source of combustion pollutants will be the routine testing and maintenance of the diesel-fueled emergency standby generators and emergency fire water pump engines. After dispersion to ground-level, inhalation is the main pathway by which air pollutants can potentially cause public health impacts. Other pathways, including ingestion of soil and mother's milk, and dermal contact, also are evaluated for potential exposure. As discussed below, these health risks are not significant.

Construction emissions are presented in detail in Appendix 5.1F, followed by an air dispersion analysis that demonstrates ambient air quality standards will not be exceeded by Ivanpah SEGS. The dominant emission with potential health risk is diesel particulate matter from combustion of diesel fuel in construction equipment (e.g., cranes, dozers, excavators, graders, front-end loaders, backhoes). A screening-type calculation in Section 5.4 of Appendix 5.1F demonstrates that the potential carcinogenic risk of diesel particulate matter emissions during construction will be less than significant.

To evaluate potential health risks, the measures of these risks are first described in terms of the types of public health effects and the significance criteria and thresholds for those effects. Project impacts are then discussed and compared with the significance criteria.

5.9.4.1 Significance Criteria

Significance criteria exist for both carcinogenic and non-carcinogenic risks, and are discussed separately.

5.9.4.1.1 Carcinogenic Risk

Carcinogenic or cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are assumed to have no threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (i.e., a linear, no-threshold model). Under state and MDAQMD regulations, an incremental cancer risk less than 10-in-one million due to a project is considered to be an insignificant impact on public health. The 10-in-one-million risk level is

also used by the Air Toxics "Hot Spots" (AB 2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

5.9.4.1.2 Non-Carcinogenic Risk

Non-carcinogenic or non-cancer health effects can be either long-term (chronic) or short-term (acute). In determining potential non-carcinogenic health risks from air toxics, it is assumed there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). Non-carcinogenic health risks are measured in terms of a hazard quotient, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for pollutants affecting the same target organ are typically summed, with the resulting totals expressed as hazard indices for each organ system. A hazard index of less than 1.0 is considered to be an insignificant health risk. For this health risk assessment, all hazard quotients were summed regardless of target organ.

This method leads to a conservative (upper bound) assessment. RELs used in the hazard index calculations were those published in the CARB/CA OEHHA listings dated April 25, 2005 (see Appendix 5.1E).

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure, caused by chemicals accumulating in the body. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no-effect chronic exposure level for a non-carcinogenic air toxic is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic hazard index was calculated using the hazard quotients calculated with annual concentrations.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure of no more than 24 hours. For most chemicals, the air concentration required to produce acute effects is higher than the level required to produce chronic effects because the duration of exposure is shorter. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all hazard quotients are typically summed to calculate the acute hazard index. One-hour average concentrations are divided by acute RELs to obtain a hazard index for health effects caused by relatively high, short-term exposure to air toxics.

5.9.4.2 Construction Impacts

The project is composed of three plants: Ivanpah 1 (100 MW), Ivanpah 2 (100 MW), and Ivanpah 3 (200 MW). Ivanpah 1 and 2 are identical plants, and Ivanpah 3 is a scaled up version of the others. The phasing is planned so that Ivanpah 1 (the southernmost sitE) will be constructed first, followed by Ivanpah 2 (the middle site), then Ivanpah 3 (the 200-MW plant on the north), though the order of construction may change.

Each plant has a 24-month construction schedule. This analysis is based on the assumption that the last 12 months of construction of Ivanpah 1 will overlap with the first 12 months of construction of Ivanpah 2, and that the last 12 months of construction of Ivanpah 2 will overlap with the first twelve months of construction of Ivanpah 3.

No significant public health effects are expected during construction. Strict construction practices that incorporate safety and compliance with applicable LORS will be followed. In addition, measures to reduce impacts from construction air emissions will be implemented as described in Section 5.1.6.6.

Temporary air emissions from construction-related activities are discussed in Section 5.1.6.3.4, and a detailed emission inventory is presented in Appendix 5.1F. Ambient air modeling for particulate matter less than 10 microns in equivalent diameter (PM_{10}), carbon monoxide (CO), sulfur dioxide (SO_2), and oxides of nitrogen (NO_X) was performed as described in Section 5.1.6.6 and Appendix 5.1F. Construction-related emissions are temporary and localized, resulting in no long-term significant impacts to the public.

Small quantities of hazardous waste may be generated during the construction phase of the project. Hazardous waste management plans will be in place so the potential for public exposure is minimal. Refer to Section 5.14 (Waste Management) for more information. No acutely hazardous materials will be used or stored on site during construction (see Section 5.5, Hazardous Materials Handling). To assure worker safety during construction, safe work practices will be followed (see Section 5.16, Worker Health and Safety).

5.9.4.3 Operations Impacts

Potential human health impacts associated with Ivanpah SEGS stem from exposure to air emissions from operation of boilers and routine testing of the emergency engines and fire water pump engines. The non-criteria pollutants emitted from Ivanpah SEGS include certain volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) from the combustion of natural gas and diesel exhaust particulate matter (DPM) from combustion of diesel fuel in the emergency engines. These pollutants are listed in Table 5.9-2, and their emission rates are presented in Appendix 5.1E.

Emissions of criteria pollutants will not cause or contribute significantly to existing violations of the National Ambient Air Quality Standards or California Ambient Air Quality Standards as discussed in Section 5.1 (Air Quality).

TABLE 5.9-2
Pollutants Potentially Emitted to the Air from Ivanpah SEGS

Criteria Pollutants	**Non-criteria (Toxic) Pollutants**
Carbon monoxide	Benzene
Oxides of nitrogen	Formaldehyde
Particulate matter	Hexane
Oxides of sulfur	Naphthalene
Volatile organic compounds	Toluene
	PAHs
	Diesel Exhaust Particulate

Finally, air dispersion modeling results (see Section 5.1.6) show that emissions will not result in ambient concentrations of criteria pollutants that exceed, or contribute significantly to existing exceedances of ambient air quality standards. These standards are intended to

protect the general public with a wide margin of safety. Therefore, Ivanpah SEGS will not have a significant impact on public health from emissions of criteria pollutants.

The screening health risk assessment containing potential impacts associated with emissions of non-criteria pollutants to the air from Ivanpah SEGS is presented in Appendix 5.1E. The risk assessment was prepared using guidelines developed by CA OEHHA and CARB, and implemented in the latest version (1.3) of the HARP model.

5.9.4.4 Public Health Impact Study Methods

Emissions of non-criteria pollutants from Ivanpah SEGS were estimated using emission factors developed by the EPA. Air dispersion modeling combines the emissions with site-specific terrain and meteorological conditions to estimate short-term and long-term arithmetic mean concentrations in air for use in the health risk assessment carried out with HARP Version 1.3. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of potential lifetime cancer risk (for carcinogenic substances), or comparison with RELs for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the Maximum Impact Receptor (MIR). This is also called the Maximum Incremental Cancer Risk (MICR). The hypothetical MEI is an individual assumed to be located at the MIR point (i.e., residential receptor) where the highest concentrations of air pollutants associated with facility emissions are predicted to occur, based on air dispersion modeling. Human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is assumed to be unlikely that there would be significant impacts in any other location. Health risks potentially associated with concentrations of carcinogenic pollutants in air were calculated as estimated excess lifetime cancer risks.

The inhalation excess cancer risk associated with Ivanpah SEGS is calculated by the HARP model from the ground-level concentration and inhalation cancer potency slope as follows:

$$ECR_{ij} = CONC_{ij} * ICPF_i * BR$$

where: ECR_{ij} = excess cancer risk from carcinogenic substance i at location j

$CONC_{ij}$ = ground-level concentration (in $\mu g/m^3$) of carcinogenic substance i at location j

$ICPF_i$ = inhalation cancer potency factor for carcinogenic substance i (in kg-day/mg)

BR = breathing rate (in L/kg-day)

The total carcinogenic risk at location j is found by summing the contributions from each carcinogenic substance i. The resulting ECR_j can be plotted over all calculated locations.

Evaluation of potential non-carcinogenic health effects from exposure to short-term and long-term concentrations in air was performed by comparing modeled concentrations in air with the RELs. An REL is a concentration in air at or below which no adverse health effects

are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential non-carcinogenic effects were evaluated by calculating a ratio of the modeled concentration in air and the REL. This ratio is referred to as a hazard quotient. The unit risk values and RELs used to characterize health risks associated with modeled concentrations in air were obtained from the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (CARB, 2005), and are presented in Table 5.9-3.

TABLE 5.9-3
Toxicity Values Used to Characterize Health Risks

Compound	Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Chronic Reference Exposure Level ($\mu g/m^3$)	Acute Reference Exposure Level ($\mu g/m^3$)
Benzene	0.10	60	1,300
Diesel PM	1.1	5.0	—
Ethylbenzene	—	2,000	—
Formaldehyde	0.021	3.0	94
Hexane	—	7,000	—
Naphthalene	0.12	9.0	—
PAHs (as BaP for HRA)	3.9	—	—
Toluene	—	300	37,000

Source: CARB, 2005.

5.9.4.5 Characterization of Risks from Toxic Air Pollutants

The estimated potential maximum carcinogenic risk associated with concentrations in air estimated for the MIR location is shown in Table 5.9-4. The maximum carcinogenic risk is well below the 10×10^{-6} threshold of significance.

TABLE 5.9-4
Summary of Potential Health Risks

Receptor	Carcinogenic Risk (per million)	Cancer Burden	Acute Health Hazard Index	Chronic Health Hazard Index
MICR Location	0.08	0	0.013	0.00001
Significance Level	10	1.0	1.0	1.0

Cancer risks potentially associated with facility emissions also were assessed in terms of cancer burden. Cancer burden is a hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the facility. Cancer burden is calculated as the worst-case product of any potential carcinogenic risk greater than 1 in one million and the number of individuals at that risk level. Because the MICR is only 0.08 in one million, the potential cancer burden is zero. If the MICR had exceeded 1 in

one million, then the worst-case estimate of cancer burden would have been calculated based upon the following assumptions:

- The MIR concentration would have been applied to all affected portions of identified census tracts within the radius area defined by the distance to the 1st high (MIR) concentration;
- A detailed listing and map of affected census tracts and year 2000 population estimates would then have been provided in Appendix 5.1E; and
- Figures would then have been presented in Appendix 5.1E to show the 1-, 2-, and 3-mile radius plots in relationship to the census tract locations and site.

This procedure, if it had been needed, would have resulted in a conservatively high estimate of cancer burden.

By definition, human health risks associated with emissions from Ivanpah SEGS cannot be higher elsewhere than at the location of the MIR. Therefore, the potential carcinogenic risk elsewhere also would be lower than the maximum listed in Table 5.9-4. Because the potential cancer burden listed in Table 5.9-4 is less than one, the emissions from Ivanpah SEGS would not be associated with any increase in cancer cases in the previously defined population. In addition, the cancer burden is less than the Rule 1320 threshold value of 0.5. The methods that would have been used in this calculation considerably overstate the potential cancer burden, further supporting the conclusion that project emissions would not cause a significant public health impact in terms of cancer risk.

The maximum potential acute non-carcinogenic hazard index associated with concentrations in air is shown in Table 5.9-4. The acute non-carcinogenic hazard index for all target organs falls below 1.0, the threshold of significance. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 5.1E.

Similarly, the maximum potential chronic non-carcinogenic hazard index associated with concentrations in air is shown in Table 5.9-4. The chronic non-carcinogenic hazard index falls below 1.0, the threshold of significance.

The estimates of carcinogenic and non-carcinogenic risks associated with chronic or acute exposures fall below thresholds used for regulating emissions of toxic pollutants to the air. Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. In other words, there is no threshold for carcinogenicity. Because risks at low levels of exposure cannot be quantified directly by either animal or epidemiological studies, mathematical models have estimated such risks by extrapolation from high to low doses. This modeling procedure is designed to provide a highly conservative estimate of carcinogenic risks based on the most sensitive species of laboratory animal for extrapolation to humans (i.e., the assumption being that humans are as sensitive as the most sensitive animal species). Therefore, the true risk is not likely to be higher than risks estimated using inhalation cancer potency factors and is most likely lower, and could even be zero (EPA, 1986; EPA, 1996).

The analysis of potential cancer risk described in this section employs methods and assumptions generally applied by regulatory agencies for this purpose. Given the

importance of assuring public health, these methods and assumptions are highly conservative. Conservative methodology and assumptions are summarized below.

- The analysis includes representative weather data over a period of two years to assure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included.
- The power plant is assumed to operate at hourly, daily, and annual emission conditions that produce the highest ground-level concentrations.
- The location of the highest ground-level concentration of power plant emissions is identified and the analysis then assumes that a sensitive individual is at this location constantly over the entire 70-year period.

Taken together, these methods and assumptions create a scenario that cannot exist in the real world. For example, if the worst case weather conditions occur on a winter evening, but the worst case emission rates occur on a summer afternoon, the analysis nonetheless assumes that these events occur at the same time. The point of using these unrealistic assumptions is to consciously overstate the potential impacts. No one will experience exposures as great as those assumed for this analysis. By determining that even this highly overstated exposure will not be significant, the analysis enables a high degree of confidence that the much lower exposures that actual persons will experience will not result in any significant increase in cancer risk. In short, the analysis ensures that there will not be any significant public health impacts at any location, under any weather condition, under any operating condition.

5.9.4.6 Hazardous Materials

Hazardous materials will be used and stored at the facility. The hazardous materials stored in significant quantities on-site and descriptions of their uses are presented in Section 5.5. Use of chemicals at the proposed facility will be in accordance with standard practices for storage and management of hazardous materials. Normal use of hazardous materials, therefore, will not pose significant impacts to public health. While mitigation measures will be in place to prevent releases, if an accidental release migrated offsite, potential impacts to the public could result.

The California Accidental Release Program (CalARP) regulations and Code of Federal Regulations (CFR) Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for acutely hazardous materials. These regulations require preparation of an RMP, which is a comprehensive program to identify hazards and predict the areas that may be affected by a release of a program-listed hazardous material.

An RMP is not required for this facility. No regulated substance will be present in quantities exceeding the applicability thresholds. See Section 5.5 for a more detailed discussion of management of hazardous substances at Ivanpah SEGS.

5.9.4.7 Operation Odors

The fuels used at the Ivanpah facility include natural gas and very low sulfur diesel fuel. Combustion contaminants are not present at concentrations that could produce a significant odor.

5.9.4.8 Electromagnetic Field Exposure

The existing electric transmission lines are not part of Ivanpah SEGS. Ivanpah SEGS will include additional electric power handling transformers and associated equipment in a relocated substation as described in Section 2.0, and in more detail in Section 5.0. Ivanpah SEGS electric power handling equipment does not travel through residential areas, and, based on recent findings of the National Institute of Environmental Health Sciences (NIEHS, 1999), electromagnetic field exposures would not result in a significant impact on public health. The NIEHS report to the U.S. Congress found that "the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm" (NIEHS, 1999).

5.9.4.9 Summary of Impacts

Results from the screening health risk assessment based on emissions modeling indicate that there will be no significant incremental public health risks from construction or operation of the proposed project. Results from criteria pollutant modeling for routine operations indicate that potential ambient concentrations of NO_2, CO, SO_2, and PM_{10} would not exceed or will not contribute significantly to existing exceedances of ambient air quality standards, which protect public health with a margin of safety for the most sensitive subpopulations (Section 5.1.6.5).

5.9.5 Cumulative Effects

An analysis of potential cumulative air quality impacts that may result from the proposed Ivanpah and other reasonably foreseeable projects is required by the CEC. A protocol for performing the cumulative effects analysis is presented in Appendix 5.1H. The analysis will be submitted upon receipt of the necessary data from the MDAQMD. The cumulative impact analysis determines if the total set of proposed Ivanpah SEGS project and foreseeable projects will cause a combined air quality impact that exceeds significance thresholds. In contrast with the approach used to estimate impacts for criteria pollutants, the significance thresholds developed for toxic air contaminants are set sufficiently stringently so as to preclude the potential for any significant cumulative impacts. Thus, a separate cumulative impacts analysis for toxic air contaminants was not prepared.

5.9.6 Mitigation Measures

No mitigation measures are needed for Ivanpah SEGS air emissions because the potential air quality and public health impacts are less than significant.

5.9.7 Involved Agencies and Agency Contacts

Table 5.9-5 provides contact information for agencies involved with public health.

TABLE 5.9-5
Summary of Agency Contacts for Ivanpah SEGS Public Health

Public Health Concern	Primary Regulatory Agency	Regulatory Contact
Public exposure to air pollutants	EPA Region 9	Gerardo Rios EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (916) 972-3974
	CARB	Mike Tollstrup Project Assessment Branch California Air Resources Board 1001 I Street Sacramento, CA 95812 (916) 323-8473
	Mojave Desert Air Quality Management District	Eldon Heaston, Executive Director Mojave Desert Air Quality Management District 14306 Park Avenue Victorville, CA 92392
Public exposure to chemicals known to cause cancer or reproductive toxicity	Cal-EPA, Office of Environmental Health and Hazard Assessment	Cynthia Oshita or Susan Long Office of Environmental Health Hazard Assessment 1001 I Street, Sacramento, CA 95814 (916) 445-6900
Public exposure to accidental releases of hazardous materials	EPA Region 9	Deborah Jordan EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (916) 947-4157
	California Office of Emergency Services	Moustafa Abou-Taleb Governor's Office of Emergency Services 3650 Schriever Avenue Mather, CA 95655 (916) 845-8741
	San Bernardino County Fire Department	Doug Snyder San Bernardino County Fire Department Hazardous Materials Division 620 South "E" Street San Bernardino, CA 92415-0153 (909) 386-8401

5.9.8 Permit Requirements and Permit Schedule

Agency-required permits related to public health include a Risk Management Plan for hazardous materials, and the MDAQMD Determination of Compliance (DOC). Upon approval of the project by the CEC, the DOC serves as the District Authority to Construct. A Permit to Operate will be issued by the MDAQMD after construction and commencement of operation. These requirements are discussed in detail in Sections 5.1 (Air Quality) and 5.5 (Hazardous Materials Handling).

5.9.9 References

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California Office of Environmental Health Hazard Assessment (CA OEHHA). 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, Guideline, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. CalEPA. August.

National Institute of Environmental Health Sciences. 1999. Environmental Health Institute report concludes evidence is 'weak' that EMFs cause cancer. Press release. National Institute of Environmental Health Sciences, National Institutes of Health.

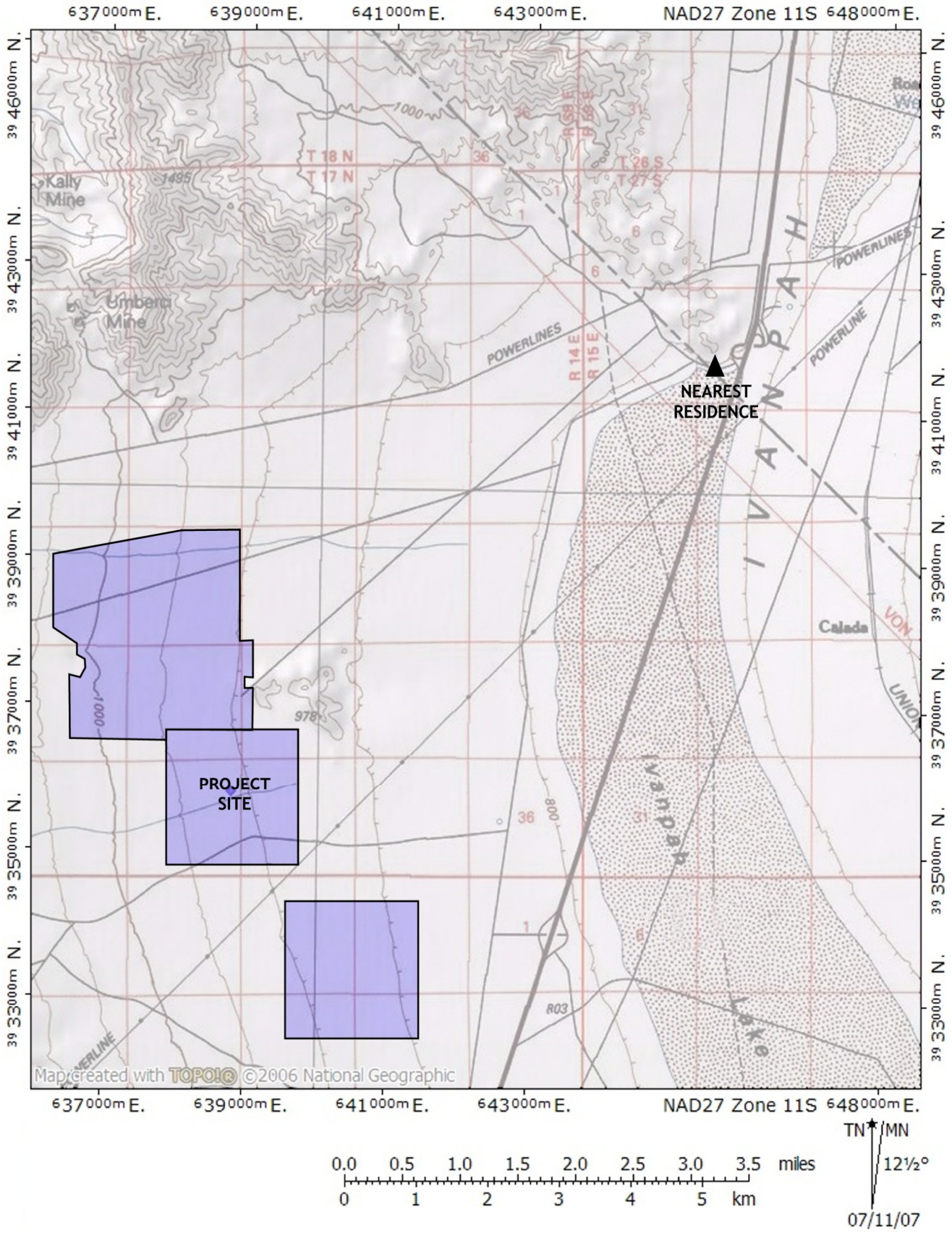

FIGURE 5.9-1
NEAREST RESIDENTIAL RECEPTOR
IVANPAH SOLAR ELECTRIC GENERATING SYSTEM

Source: Sierra Research