7.6 PUBLIC HEALTH

7.6 PUBLIC HEALTH

The assessment of the proposed SGGS's potential impact on public health entailed a human health risk assessment (HRA) based on the project's emissions of toxic air contaminants. This section describes the methodology and results of the HRA for the proposed project. The purpose of the HRA is to evaluate potential public exposure and the potential for adverse health effects due to pollutant emissions from routine project operations. Impacts due to the proposed project's emissions of criteria pollutants, i.e., pollutants for which federal or California ambient air quality standards have been promulgated, are described in Section 7.1, Air Quality. Potential public exposure to accidental releases of hazardous materials on the proposed project site during operation is addressed in Section 7.12, Hazardous Materials Handling.

7.6.1 Affected Environment

The proposed project is located in the City of Rancho Cucamonga in San Bernardino County, California. The land uses within a 3-mile radius of the site are mostly urban (see Section 7.4, Land Use, for a detailed analysis of surrounding land use).

The proposed project's turbine stacks would exhaust combustion gases at a height of 150.5 feet (45.87 meters) above grade elevation. Grade elevation for the major sources of the project is approximately 1,120 feet (342 meters[1]). Topographical features within a 10-mile radius that are of equal or greater elevation than the assumed stack exhaust height are shown in Figure 7.1-1 in Section 7.1, Air Quality. Topographical features above the stack exhaust point from the auxiliary boiler are also shown in Figure 7.1-1.

Certain groups of individuals may be more susceptible to health risks due to chemical exposure, including children, pregnant women, the elderly, and people with chronic illnesses who could have higher sensitivity to toxic pollutants. Consequently, sensitive receptors, such as schools (public and private), day care facilities, convalescent homes, parks, and hospitals receive particular attention in the health risk analysis. The closest residence is located approximately 0.4 mile northeast of the proposed project site on Etiwanda Avenue. All sensitive receptors located within a 3-mile radius of the site are shown on Figure 7.6-1; however, the HRA approach treated all receptors as sensitive receptors.

Several health risk studies have been conducted recently in the neighborhoods surrounding the proposed project site. Studies conducted by D. Cocker at the Center for Environmental Research & Technology at UC Riverside (Cocker, 2002), Peters et al. (1999) at the University of Southern California (USC), and South Coast Air Quality Management District (SCAQMD, 2001) show that the Mira Loma (about 5.5 miles south of the project site) currently has the highest levels of PM (particulate matter) and $PM_{2.5}$ mass concentrations in the U.S. SCAQMD's Mira Loma Specific Air Management Plan also looked at the risks to health posed by the various components of air pollution (dust, agriculture, etc). Approximately 60 percent of PM measured in the Mira Loma area originates in Los Angeles and Orange counties, with the remainder primarily from agricultural areas. The PM pollution is made up of dust, soot, ammonia from dairies, and diesel fuel usage—with diesel being a small portion (12 percent). The greatest risk to health comes from diesel fuel combustion (80 percent of the cancer risk). The USC's Children's Health Study (Peters et al., 1999) noted reduced lung function in Mira Loma children due to the high concentration of PM.

SCAQMD's Multiple Air Toxics Exposure Study (MATES-II) in the South Coast Air Basin (SCAQMD, 2000) consisted of a comprehensive monitoring program, an updated emissions inventory of toxic air contaminants, and a modeling effort to fully characterize the Basin health risk. The South Coast Air Basin carcinogenic risk was estimated to be 1,400 per million, with mobile sources (e.g., cars, trucks, trains, ships, or aircraft) identified as the greatest contributing source category. About 70 percent of all

[1] Modeling for public health based on metric system; however, English units are used for consistency throughout this document.

risk is attributed to diesel particulate emissions; about 20 percent is attributed to other toxics associated with mobile sources (including benzene, butadiene, and formaldehyde); about 10 percent of all risk is attributed to stationary sources, which include industries and other certain businesses such as dry cleaners and chrome plating operations.

MATES-II estimated the current cancer risk in Mira Loma to be 1,265 in 1 million. The MATES-II fixed monitoring sites closest to the proposed project site are the Fontana station and the Rubidoux station (9.1 miles from the proposed project site). The MATES-II microscale monitoring site closest to the project site is Montclair station, which is 8.8 miles from the proposed project site. The average modeled cancer risk in San Bernardino County was 926 per million. Table 7.6-1 shows the modeled and measured cancer risks associated with different individual pollutants in Fontana, Rubidoux, and Montclair stations.

Table 7.6-1
Mates-II Modeled and Measured Cancer Risk in Fontana, Rubidoux, and Montclair Stations (1 in 1 million)

Location	Benzene	1,3 Butadiene	Other	Diesel	Total
Fontana	48	20	121	741	939
Rubidoux	57	26	107	786	987
Montclair	69	39	136	1148	1392

Source: MATES-II, SCAQMD, 2000

7.6.2 Environmental Consequences

This section describes the potential public health risks due to construction and operation of the proposed project, and the methodology and results of the HRA. Significant impacts are defined as a maximum incremental cancer risk greater than 10 in 1 million, a chronic total hazard index (THI) over 1.0, or an acute THI over 1.0. Also, uncertainties in the HRA are discussed and other potential health impacts of the proposed project are described.

7.6.2.1 Public Health Impact Assessment Approach

The potential human health risks posed by the proposed project's emissions were assessed using procedures consistent with the SCAQMD Risk Assessment Procedures for Rules 1401 and 212 (SCAQMD, 2005a), Supplemental Guidelines for Preparing Risk Assessments for the Toxics Hot Spots Information and Assessment Act (AB2588) (SCAQMD, 2005b), and Office of Environmental Health Hazard Assessment (OEHHA) Air Toxics Hot Spots Program Risk Assessment Guidelines (Cal-EPA/OEHHA, 2003). As recommended by the SCAQMD guideline, the California Air Resources Board (CARB) Hotspots Analysis and Reporting Program (HARP) (CARB, 2003) was used to perform a refined SCAQMD Tier 4 and OEHHA Tier 1 health risk assessment for the proposed project. The SCAQMD and OEHHA guidelines were developed to provide risk assessment procedures, as required under the Air Toxics Hot Spots Information and Assessment Act of 1987, Assembly Bill 2588 (Health and Safety Code Sections 44360 et seq.). The Hot Spots law established a statewide program to inventory air toxics emissions from individual facilities, as well as guidance for execution of risk assessments and requirements for public notification of potential health risks.

The HRA was conducted in four steps using the HARP:

1. Hazard identification and emission quantification
2. Exposure assessment

3. Dose-response assessment
4. Risk characterization

First, hazard identification was performed to determine the potential health effects that could be associated with the proposed project emissions. The purpose was to identify whether pollutants emitted from the proposed project during plant operation could be characterized as potential human carcinogens, or associated with other types of adverse health effects. From the SCAQMD and OEHHA guidelines, a list of pollutants with potential cancer and noncancer health effects associated with the emissions from the proposed project are presented in Table 7.6-2.

Table 7.6-2
Toxicity Values Used To Characterize Health Risks

Compound	Sources of Emissions	Inhalation Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Chronic REL ($\mu g/m^3$)	Acute REL ($\mu g/m^3$)
Ammonia	Turbines	--	2.0E+02	3.2E+03
1,3-Butadiene	Turbines	6.0E-01	2.0E+01	--
Acetaldehyde	Turbines and auxiliary boiler	1.0E-02	9.0E+00	--
Acrolein	Turbines and auxiliary boiler	--	6.0E-02	1.9E-01
Benzene	Turbines and auxiliary boiler	1.0E-01	6.0E+01	1.3E+03
Ethylbenzene	Turbines and auxiliary boiler	--	2.0E+03	--
Formaldehyde	Turbines and auxiliary boiler	2.1E-02	3.0E+00	9.4E+01
Hexane	Auxiliary boiler	--	7.0E+03	--
Propylene	Auxiliary boiler	--	3.0E+03	--
Propylene oxide	Turbines	1.3E-02	3.0E+01	3.1E+03
Toluene	Turbines and auxiliary boiler	--	3.0E+02	3.7E+04
Xylenes	Turbines and auxiliary boiler	--	7.0E+02	2.2E+04
Naphthalene	Turbines and auxiliary boiler	1.2E-01	9.0E+00	--
PAHs	Turbines and auxiliary boiler	3.9E-01	--	--

Source: Cal-EPA/OEHHA, 2005

Notes:
-- = not applicable
mg/kg-day = milligrams per kilogram per day
$\mu g/m^3$ = micrograms per cubic meter
REL = reference exposure levels
PAHs = polycyclic aromatic hydrocarbons

Second, an exposure assessment was conducted to estimate the extent of public exposure to the proposed project emissions. Public exposure is dependent on the short- and long-term ground-level concentrations resulting from emissions, the route of exposure, and the duration of exposure to those emissions. Dispersion modeling was performed using the ISCST3 model within HARP to estimate the ground-level concentrations near the proposed project site. The methods used in the dispersion modeling were consistent with the approach described in Section 7.1, Air Quality, and the modeling protocol submitted for the Project (URS, 2007).

Third, a dose-response assessment was performed in HARP to characterize the relationship between pollutant exposure and the incidence of an adverse health effect in exposed populations. The dose-response relationship is expressed in terms of potency factors for cancer risk and reference exposure levels (RELs) for acute and chronic noncancer risks. The OEHHA guidelines provide potency factors and RELs for an extensive list of toxic air contaminants. Potency factors and RELs are constantly being revised by the OEHHA, and the most recent values were applied in this HRA (Cal-EPA/OEHHA, 2005). All exposure pathways were included in this analysis, except the dairy milk and local meat ingestion and drinking water consumption pathways, because the proposed project site is surrounded by urban development. For the calculation of cancer risk, the duration of exposure to project emissions was assumed to be 24 hours per day, 365 days per year, for 70 years, at all receptors. The cancer risk was calculated in HARP using the Derived (Adjusted) Method, and the chronic THI was calculated in HARP using the Derived (OEHHA) Method.

Fourth, risk characterization was performed to integrate the health effects and public exposure information and provide qualitative estimates of health risks from project emissions. Risk modeling was performed using HARP to estimate cancer and noncancer health risks for the project. The HARP model uses OEHHA equations and algorithms to calculate health risks based on input parameters such as emissions, "unit" ground-level concentrations, and toxicological data.

Detailed descriptions of the model input parameters and results of the HRA are given in Section 7.6.2.4.

7.6.2.2 Construction Phase Emissions

Due to the relatively short duration of the proposed project construction (i.e., 22 months), significant long-term public health effects are not expected to occur as a result of project construction emissions. Diesel particulate exhaust is the air pollutant with the largest potential for human health risk emitted during the construction period. Diesel particulate has been classified as a toxic air contaminant and a carcinogen. However, the exposure assessment conducted for carcinogens is typically 70 years; due to the short duration of the construction effort, carcinogenic health risks are not predicted.

To ensure worker safety during actual construction, safe work practices will be followed (see Section 7.7, Worker Safety and Health). A detailed analysis of the potential environmental impacts due to criteria pollutant emissions during construction and control of these emissions is discussed in Section 7.1, Air Quality.

7.6.2.3 Operational Phase Emissions

Facility operations were evaluated to determine whether particular substances would be used or generated at the proposed site project that could cause adverse health effects upon their release to the air. The primary sources of potential emissions from facility operations would be the two natural gas-fired combustion turbine generators (CTGs) and heat recovery steam generators (HRSG) duct burners, as well as the aqueous ammonia slip stream from the selective catalytic reduction (SCR) control system on each turbine/HRSG train. Natural gas combustion in the auxiliary boiler would also be a source of potential emissions. The substances that would be emitted from facility operations (with potential toxicological impacts) are shown in Table 7.6-2. These potential air toxic species were identified in the list of emission factors published by Ventura County Air Pollution Control District (VCAPCD) (VCAPCD, 2001) and U.S. EPA AP-42 (U.S. EPA, 1995). SCAQMD recommends the use of these factors for purposes of HRAs for combustion sources. In addition, potential emissions from ammonia slip from the turbine/HRSG SCR systems were also included as well as all air toxics associated with the auxiliary boiler.

Worst-case estimates of annual turbine emissions were made by assuming that both turbines would operate simultaneously under full load conditions with a maximum higher heating value (HHV) fuel energy input rate of 2,568 million British thermal units per hour (MMBtu/hr) with duct burning (100 percent load at 25°F annual average), for 4,000 hours per year, and HHV fuel energy input rate of 1,958 MMBtu/hr without duct burning (100 percent load at 25°F annual average), for 3,791 hours per year (3,446 hours of normal operations and 345 hours of startups and shutdowns). The exit temperature and velocity for each turbine stack used in the model represented turbine operations at 100 percent load, with duct firing, at an ambient temperature of 63°F.

For maximum hourly emissions, the peak natural gas consumption rate of about 2,568 MMBtu HHV per combustion turbine (including duct burners) was used, along with the stack parameters corresponding to 100 percent load, with duct firing at 63°F ambient temperature operating mode. The proposed project will have two such combustion turbine trains.

Emission factors for natural gas-fired turbines were obtained from the AP-42 Table 3.1-3 for natural gas-fired stationary turbines (U.S. EPA, 1995), in accordance with the VCAPCD guidelines. The emission factors and estimated maximum hourly and annual turbine emissions are summarized in Table 7.6-3.

Table 7.6-3
Emission Rates From Operation of Natural-Gas-Fired Combustion Turbine Generators/HRSG

Chemical Species	Emission Factor (lb/MMBtu)	Maximum Hourly Emissions per CTG[1] (lb/hr)	Annual Emissions Per CTG[1,2] (lb/yr)
Ammonia	5 ppm[3]	17.32	1.35E+05
1,3-Butadiene	4.30E-07	1.10E-03	7.61E+00
Acetaldehyde	4.00E-05	1.03E-01	7.08E+02
Acrolein	3.62E-06	9.30E-03	6.41E+01
Benzene	3.26E-06	8.37E-03	5.77E+01
Ethylbenzene	3.20E-05	8.22E-02	5.66E+02
Formaldehyde	3.60E-04	9.25E-01	6.37E+03
Propylene oxide	2.90E-05	7.45E-02	5.13E+02
Toluene	1.30E-04	3.34E-01	2.30E+03
Xylenes	6.40E-05	1.64E-01	1.13E+03
Naphthalene	1.30E-06	3.34E-03	2.30E+01
PAH (other than naphthalene)	9.00E-07	2.31E-03	1.59E+01

Notes:

[1] See Appendix P for detailed emission calculations. Emission factors obtained from U.S. EPA AP-42 Table 3.1-3 for uncontrolled natural gas-fired stationary turbines. Formaldehyde, Benzene, and Acrolein emission factors are from the Background document for AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine with a CO catalyst.
[2] Annual emissions calculations are based on maximum fuel flow for 3,791 hours operating without duct burners and 4,000 hours operating with duct burners per year per turbine for the proposed project.
[3] Based on estimated ammonia slip from for the nitrogen oxide (NO_x) control (5 parts per million by volume, dry at 15 percent oxygen).

lb/hr = pounds per hour
lb/yr = pounds per year
lb/MMBtu = pounds per million British thermal units
ppm = parts per million
PAH = polycyclic aromatic hydrocarbons

Emission factors for the natural gas-fired auxiliary boiler were obtained from the VCAPCD (VCAPCD, 2001) AB2588 Combustion Emission Factors. The emission factors were in units of pounds per million cubic feet (lb/MMcf) of natural gas fuel usage, which were divided by the HHV of the natural gas (1,008.6 Btu/standard cubic feet [SCF]) to arrive at an emission factor in units of pounds per MMBtu (lb/MMBtu). The latter factor was in turn multiplied by the Btu equivalent of the gas combusted by the boiler per hour to obtain emissions in pounds per hour. Annual emissions were calculated based on 4,000 operating hours per year. Emission factors and estimated maximum hourly and annual auxiliary boiler emissions are summarized in Table 7.6-4.

Table 7.6-4
Emission Rates From Operation of Natural Gas Auxiliary Boiler

Chemical Species	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Maximum Hourly Emissions[1] (lb/hr)	Annual Emissions[1,2] (lb/yr)
Acetaldehyde	3.07E-06	0.0031	1.72E-04	6.88E-01
Acrolein	2.68E-06	0.0027	1.50E-04	6.00E-01
Benzene	5.75E-06	0.0058	3.22E-04	1.29E+00
Ethylbenzene	6.84E-06	0.0069	3.83E-04	1.53E+00
Formaldehyde	1.22E-05	0.0123	6.83E-04	2.73E+00
Hexane	4.56E-06	0.0046	2.55E-04	1.02E+00
Propylene	5.25E-04	0.5300	2.94E-02	1.18E+02
Toluene	2.63E-05	0.0265	1.47E-03	5.89E+00
Xylenes	1.95E-05	0.0197	1.09E-03	4.38E+00
Naphthalene	2.97E-07	0.0003	1.67E-05	6.66E-02
PAH (other than naphthalene)	9.91E-08	0.0001	5.55E-06	2.22E-02

Notes:
[1] See Appendix P for detailed emission calculations. Emission factors obtained from VCAPCD AB2588 Combustion Emission Factors for Natural Gas-fired External Combustion Equipment (10-100 MMBtu/hr).
[2] Annual emissions calculations based on maximum fuel flow for 4,000 hours of auxiliary boiler operations per year for the proposed project.
lb/hr = pounds per hour
lb/yr = pounds per year
lb/MMBtu = pounds per million British thermal units
lb/MMcf = pounds per million cubic feet
PAH = polycyclic aromatic hydrocarbons

7.6.2.4 Model Input Parameters

The HRA was conducted using worst-case turbine and auxiliary boiler emissions (short and long term). Cancer and chronic noncancer health effects were evaluated using the HARP model with annual turbine/HRSG and auxiliary boiler emission estimates. Acute noncancer health effects were analyzed based on the worst-case maximum hourly emissions for the turbines/HRSGs and the auxiliary boiler.

Dispersion modeling was performed using the ISCST3 model in HARP and methods consistent with the approach (e.g., building down wash or meteorological data) described in Section 7.1, Air Quality, and the modeling protocol submitted for the proposed project (URS, 2007). The ISCST3 model is used with project source emission rates and stack parameters to calculate the concentration of toxic air contaminants (TACs) per unit emission rate. HARP then uses this information along with the emission rates for specific TAC compounds (provided in the input file as described above) to calculate ground-level concentrations for each chemical species. Meteorological data for the years 1994, 1995, 1997, 1998, and 1999 (the same years used in the air quality modeling analysis described in Section 7.1) were used in the HRA. Risk values were modeled for all sensitive receptors within 3 miles of the proposed project site and all grid, boundary, and census receptors within 6 miles of the project site. Boundary receptors were placed every 82 feet (25 meters) along the property fence line. Grid receptors were spaced every 328 feet (100 meters) out to 6.2 miles (10 kilometers) from the site in every direction. Any risks calculated by the HARP model at onsite receptor locations were ignored. To ensure that the maximum potential risks resulting from proposed project emissions would be addressed, all receptors were treated as sensitive receptors.

Toxicological data, cancer potency factors and RELs for specific chemicals are built into the CARB's HARP model. The pollutant-specific cancer potency factors and RELs used in the HRA are listed in Table 7.6-2. The HARP model uses the toxicological data in conjunction with the other input data described above to perform health risk estimates based on OEHHA equations and algorithms.

7.6.2.5 Calculation of Health Effects

Adverse health effects are expressed in terms of cancer or noncancer health risks. Cancer risk is typically reported as "lifetime cancer risk," which is the estimated maximum increase of risk of developing cancer caused by long-term exposure to a pollutant suspected of being a carcinogen. The calculation of cancer risk conservatively assumes an individual is exposed continuously to the maximum pollutant concentrations 24 hours per day for 70 years. Although such continuous lifetime exposure to maximum TAC levels is unlikely, the goal of the approach is to produce a conservative worst-case estimate of potential cancer risk. When a cancer risk of greater than one in one million is predicted, then cancer burden is calculated. Cancer burden is the estimated increase in the occurrence of cancer cases within the portion of the population subject to a cancer risk greater than or equal to one in one million (1.0×10^{-6}) resulting from exposure to toxic air contaminants.

Noncancer risk is typically reported as a total hazard index (THI). The THI is calculated for each target organ as a fraction of the maximum acceptable exposure level to a pollutant. The acceptable exposure level is generally the level at (or below) which no adverse health effects are expected. The THIs are calculated for both short-term (acute) and long-term (chronic) noncarcinogenic exposures.

Both cancer and noncancer risk estimates produced by the HRA represent incremental risks (i.e., risks due to proposed project sources only) and do not include potential health risks posed by existing background concentrations. The HARP model performs all of the necessary calculations to estimate the potential lifetime cancer risk and the acute and chronic noncancer THIs posed by proposed project emissions.

7.6.2.6 Health Effects Significance Criteria

Various state and local agencies provide different significance criteria for cancer and noncancer health effects. For the proposed project, the SCAQMD and CEC guidelines provide the most stringent significance criteria for potential cancer and noncancer health effects from project-related emissions. For carcinogenic health effects, an exposure is considered potentially significant when the predicted increase in lifetime cancer risk exceeds 10 in 1 million (1.0×10^{-5}). For noncarcinogenic health effects, an exposure that affects each target organ is considered potentially significant when the THI exceeds a value of 1.0.

7.6.2.7 Estimated Lifetime Cancer Risk

The maximum incremental cancer risk resulting from project emissions was estimated to be 2.65 in 1 million, at a location 115 feet (35 meters) north of the northern EGS property boundary (receptor located at 451,300 m east, 3,772,600 m north[2]), as shown on Figure 7.6-2. Figure 7.6-2 also shows a cancer risk isopleth, which defines the area within which HARP predicted an excess cancer risk of greater than one in a million due to project emissions of carcinogenic TACs. The cancer burden (the number of people exposed to a cancer risk of one in a million or greater) predicted in this area was 0.04. At the nearest sensitive receptor, a residence located approximately 0.4 mile (740 meters) northeast of the new Unit 62 (451,620 m east, 3,772,720 m north), the maximum incremental cancer risk was estimated to be 2.50 in 1 million. Table 7.6-5 presents the detailed cancer risk results of the HRA for the proposed project operations.

The estimated cancer risks at all locations are well below the significance criterion of 10 in 1 million. Thus, the proposed project emissions are expected to pose a less-than-significant increase in carcinogenic health risk. All HARP model files and all air quality modeling files are provided electronically on a DVD that is supplied separately with this AFC.

Table 7.6-5
Estimated Cancer Risk and Acute and Chronic Noncancer Total Hazard Indices

Location	Cancer Risk	Chronic Hazard Index	Acute Risk Hazard Index
Point of maximum impact	2.65 excess risk in 1 million	0.019 total hazard index	0.072 total hazard index
Nearest sensitive receptor	2.50 excess risk in 1 million	0.017 total hazard index	0.058 total hazard index

7.6.2.8 Estimated Chronic and Acute Total Hazard Indices

The maximum chronic THI resulting from proposed project's operational emissions was estimated to be 0.019 at a location 115 feet (35 meters) north of the northern EGS property boundary (receptor located at 451,300 m east, 3,772,600 m north). The maximum predicted chronic THI at a sensitive receptor due to TAC emissions of the proposed project was 0.017. This receptor is a residence approximately 0.4 mile (740 meters) northeast of the new Unit 62 (451,620 m east, 3,772,720 m north).

The maximum acute THI resulting from proposed project emissions was estimated to be 0.072 at a location on the northern property boundary (the receptor UTM coordinates are 451,015 m east, 3,772,548 m north). The maximum acute THI at a sensitive receptor was estimated to be 0.058 at the Firow Family Daycare, which is approximately 1.7 miles (2.7 kilometers) northwest of the proposed project site (449,877 m east, 3,775,245 m north). Table 7.6-5 presents the detailed noncancer results of the HRA for the proposed project operations.

The estimated chronic and acute THIs are well below the significance criterion of 1.0. Thus, the proposed project emissions of noncarcinogenic TACs would not be expected to pose a significant risk.

7.6.2.9 Uncertainty in the Public Health Impact Assessment

Sources of uncertainty in the results of HRAs include emissions estimates, dispersion modeling, exposure characteristics, and extrapolation of toxicity data in animals to humans. For this reason, assumptions used in HRAs are typically designed to provide sufficient health protection to avoid underestimation of risk to the public. Some sources of uncertainty applicable to this HRA are discussed below.

[2] Coordinates are provided in accordance with the Universal Transverse Mercator and North American Datum, 1983, Zone 11.

The turbine/HRSG emission rates were derived using vendor data for ammonia slip and from emission factors (VCAPCD, 2001) and AP-42 (U.S. EPA, 1995) for the other air toxics. Both the short- and long-term turbine emissions estimates were developed assuming both turbines would operate continuously at the same time and at the maximum heat input rate with supplemental duct firing. Under actual operating conditions, the turbines would operate less hours per year and at a lower load. Consequently, the emissions used for this HRA are likely to be higher than what would be experienced under normal plant operation. In addition, the VCAPCD emission factors were derived form source tests conducted on uncontrolled emissions units and do not reflect the emission reductions for organic TACs that would occur due to use of a carbon monoxide (CO) oxidation catalyst system on the proposed combined cycle units.

Dispersion models approved for regulatory applications contain assumptions that tend to overpredict ground-level concentrations. For example, the modeling performed in the HRA assumed a conservation of mass (i.e., all of the pollutants emitted from the sources remained in the atmosphere while being transported downwind). During the transport of pollutants from sources toward receptors, none of the emitted material was assumed to be removed from the source plumes through chemical reaction or lost at the ground surface through reaction, gravitational settling, or turbulent impaction. In reality, these mechanisms work to reduce the level of pollutants remaining in the atmosphere during plume travel.

The exposure characteristics assessed in the HRA included the assumption that residents would be exposed to turbine emissions continuously at the same location for 24 hours per day, 365 days per year, for 70 years. It is extremely unlikely that any resident would meet this condition. The conservative exposure assumption tends to overpredict risk estimates in the HRA process.

The toxicity data used in the HRA contain uncertainties due to the extrapolation of data from animals to humans. Typically, safety factors are applied when doing the extrapolation. Furthermore, the human population is much more diverse, both genetically and culturally, than bred experimental animals. The interspecies variability among humans is expected to be much greater than in laboratory animals. With all of the uncertainty in the assumptions used to extrapolate toxicity data, significant measures are taken to ensure that sufficient health protection is built into the available health effects data.

Conservative measures to compensate for all of these uncertainties and ensure that potential health risks are not underestimated are compounded in the final HRA predictions. Therefore, the actual risk numbers are expected to be well below the values presented in this analysis.

7.6.2.10 Criteria Pollutants

The dispersion of the criteria pollutants (nitrogen dioxide, CO, sulfur dioxide, and PM_{10}) was modeled, and an evaluation of their impacts on air quality is presented in Section 7.1, Air Quality. The federal and state ambient air quality standards (AAQS) set limits on the allowable level of air pollutants in the ambient air necessary to protect public health. The results show that the proposed project would not cause a violation of any state or federal AAQS and would not significantly contribute to existing violations of federal and state PM_{10} and ozone standards. Therefore, no significant adverse health effects are anticipated from the proposed project's criteria pollutant emissions.

7.6.3 Cumulative Impacts

A cumulative HRA was performed to evaluate the combined impacts of the project emissions with those of the existing EGS Units 3 and 4. Units 3 and 4 are utility boilers firing natural gas that have been retrofitted with SCR to reduce NO_x emissions and will remain in service after the proposed combined cycle units commence operation. Each unit has a power generation potential of about 320 megawatts (MW). The cumulative HRA modeling was performed according to the methodology described in previous sections to predict the cancer and noncancer health risks due to the proposed project plus existing EGS boilers.

The maximum natural gas fuel usage for either Unit 3 or 4 from the past 2 years (2005/2006) was used to estimate the air toxic emission rates (1,400 MMBtu/hr HHV) from both units. Emission rates were calculated from the VCAPCD emission factors recommended by SCAQMD for combustion sources. Ammonia slip emissions were determined to be at 10 parts per million from the mitigated negative declaration prepared by SCAQMD for addition of SCR to Units 3 and 4. Worst-case estimates of annual emissions were made by assuming that both boilers would operate under full load conditions with a maximum HHV fuel rate of 1,400 MMBtu/hr, for 5,756 hours per year. The exit temperature and exhaust flow rate for each boiler stack used in the model represented the 100 percent load operating mode.

The assumed emission rates from Units 3 and 4 are presented in Table 7.6-6. Data used in calculating Units 3 and 4 emission rates are provided in Appendix P.

Table 7.6-6
Emission Rates From Operation of Units 3 and 4 Natural-Gas-Fired Boilers

Chemical Species	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Maximum Hourly Emissions per Unit1 (lb/hr)	Annual Emissions Per Unit[1,2] (lb/yr)
Ammonia	10 ppm[3]	10 ppm[3]	13.2	7.60E+04
Acetaldehyde	8.79E-07	0.0009	1.23E-03	7.08E+00
Acrolein	7.81E-07	0.0008	1.09E-03	6.30E+00
Benzene	1.66E-06	0.0017	2.32E-03	1.34E+01
Ethylbenzene	1.95E-06	0.0020	2.73E-03	1.57E+01
Formaldehyde	3.52E-06	0.0036	4.92E-03	2.83E+01
Hexane	1.27E-06	0.0013	1.78E-03	1.02E+01
Propylene	1.52E-05	0.0155	2.12E-02	1.22E+02
Toluene	7.62E-06	0.0078	1.07E-02	6.14E+01
Xylenes	5.66E-06	0.0058	7.93E-03	4.56E+01
Naphthalene	2.93E-07	0.0003	4.10E-04	2.36E+00
PAH (other than naphthalene)	9.77E-08	0.0001	1.37E-04	7.87E-01

Notes:
[1] See Appendix __, for detailed emission calculations. Emission factors obtained from the VCAPCD AB2588 Combustion Emission Factors for Natural Gas-Fired External Combustion Equipment > 100 MMBtu/hr (2001).
[2] Annual emissions calculations based on maximum natural gas fuel consumption for 5,756 hours per year per boiler.
[3] Based on estimated ammonia slip from NO_x control (10 ppmvd at 3 percent oxygen).
lb/hr = pounds per hour
lb/yr = pounds per year
lb/MMBtu = pounds per million British thermal units
ppm = parts per million
PAH = Polycyclic Aromatic Hydrocarbons

Cumulative health risks predicted from the HARP model are summarized in Table 7.6-7. As shown in this table, the maximum cancer risk approximately 328.08 feet (100 meters) north of the property boundary was predicted to be 2.91 in 1 million (receptor located at 451,500 m east, 3,772,700 m north). The cancer burden (the number of people exposed to a cancer risk of 1 in a million or greater) was predicted to be 0.058. The estimated cancer risk at all locations is below the significance criteria of 10 in

1 million. Therefore, the proposed project's emissions along with the EGS Unit 3 and 4 emissions would not pose a significant cancer risk to any populations potentially exposed to these emissions.

Table 7.6-7
HRA Estimated Cancer Risk Acute and Chronic Noncancer Total Hazard Indices[1]

Cancer Risk at Point of Maximum Impact	Chronic Risk at Point of Maximum Impact	Acute Risk at Point of Maximum Impact
2.91 excess risk in 1 million	0.033 total hazard index	0.199 total hazard index

Notes:
[1] Estimated risks due to proposed project plus existing EGS Units 3 and 4.
HRA = Health Risk Assessment

The maximum chronic noncancer THI from cumulative sources located approximately 328.08 feet (100 meters) north of the EGS property boundary was predicted to be 0.033 (receptor located at 451,521 m east, 3,772,681 m north). The maximum acute noncancer THI from cumulative sources was predicted to be 0.199 on the northern property boundary (receptor located at 451,040 m east, 3,772,549 m north).

The estimated chronic and acute THIs are both well below the THI significance criterion of 1.0. Therefore, the proposed project's combined with EGS Units 3 and 4 emissions would not pose a significant noncancer health risk to any populations that would potentially be exposed to these emissions. By definition, the proposed project would not therefore contribute to a cumulatively significant impact, and cumulative impacts of the proposed project would be less than significant.

7.6.4 Mitigation Measures

The criteria pollutant emissions from the proposed project will be mitigated by the use of Best Available Control Technology (BACT) and through emissions offsets; these measures are presented in Section 7.1, Air Quality. The toxic pollutant emissions from the proposed project will also be mitigated by the exclusive use of natural gas fuel. In addition, pollution control technologies employed to control criteria pollutants (specifically, the oxidation catalyst on the CTG/HRSG) will also significantly reduce organic TACs, such as those listed in Table 7.6-2. These measures satisfy the SCAQMD requirements for toxics (T-BACT) for natural gas-fired generation units.

The HRA presented in the foregoing subsections shows that the health effects impacts of the project as proposed would be well below the significance thresholds identified in Section 7.6.2.6. Therefore, no further mitigation of emissions from the proposed project is required to protect public health.

7.6.5 Laws, Ordinances, Regulations, and Standards

The proposed project will be constructed and operated in accordance with all laws, ordinances, regulations, and standards (LORS) applicable to protecting public health. The applicable (LORS) related to public health impacts from the proposed project are identified in Table 7.6-8. This table also summarizes the agencies that are principally responsible for public health, as well as the general category(ies) of public health concerns regulated by each of these agencies. The conformity of the project to each of the LORS applicable to public health is also presented in this table, as well as references to the locations in this document where each of these issues is addressed.

Table 7.6-8
Applicable Public Health Laws, Ordinances, Regulations, and Standards

Authority	Administering Agency	Requirement	Project Compliance
Federal			
Clean Air Act (CAA)	U.S. EPA CARB SCAQMD	Protect public from unhealthful exposure to air pollutants.	Based on the results of the risk assessment, health risks due to proposed project emissions of air toxics would not exceed acceptable levels (Section 7.6, Public Health). Emissions of criteria pollutants will be minimized by applying BACT to the facility. Increases in emissions of criteria pollutants will be fully offset (Section 7.1 Air Quality).
State			
California Public Resource Code § 25523(a); 20 CCR § 1752.5, 2300-2309, and Division 2 Chapter 5, Article 1, Appendix B, Part (1)	CEC	Assure protection of environmental quality; requires quantitative HRA.	The HRA in Section 7.6, Public Health, of this AFC satisfies this requirement.
California Clean Air Act, TAC Program, H&SC § 39650, et seq.	SCAQMD with CARB oversight	Requires quantification of TAC emissions, use of BACT, and preparation of an HRA.	The proposed project would not cause unsafe exposure to TACs based on results of HRA (Section 7.6, Public Health), and has performed a BACT assessment (Section 7.1, Air Quality).
H&SC, Part 6, § 44300 et seq. (Air Toxics “Hot Spots”)	SCAQMD with CARB/ OEHHA oversight	Requires inventorying of TACs and HRA, as well as public notification of predicted health risks.	The HRA presented in Section 7.6, Public Health, of this AFC satisfies this requirement.
H&SC § 41700	SCAQMD with CARB oversight	Prohibits emissions in quantities that adversely affect public health, other businesses or property.	Section 7.1, Air Quality, and the HRA (Section 7.6, Public Health) presented in this AFC satisfy this requirement.

Table 7.6-8
Applicable Public Health Laws, Ordinances, Regulations, and Standards

Authority	Administering Agency	Requirement	Project Compliance
Local			
SCAQMD Rule 1401	SCAQMD	Requires use of T-BACT for major sources and an HRA to predict health risks.	T-BACT will be applied. The HRA presented in Section 7.6, Public Health, of this AFC has been conducted in accordance with requirements of this rule.
SCAQMD Rule 301	SCAQMD	Requires annual fees for toxic air contaminants or ozone depleting compounds.	The HRA presented in Section 7.6, Public Health, of this AFC and the payment of fees to SCAQMD will satisfy these requirements.
SCAQMD Rule 212	SCAQMD	Requires an HRA to estimate the maximum cancer risk for purpose of approving the permit to operate and issuing public notice if necessary.	The HRA presented in Section 7.6, Public Health, of this AFC satisfies this requirement.

Notes:
BACT = Best Available Control Technology
CARB = California Air Resources Board
CCR = California Code of Regulations
CEC = California Energy Commission
CUPA = Certified Unified Program Agency
H&SC = Health and Safety Code
HRA = Health Risk Assessment
SCAQMD = South Coast Air Quality Management District
LORS = Laws, Ordinances, Regulations, and Standards
OEHHA = Office of Environmental Health Hazard Assessment
OES = Office of Emergency Services
RMP = Risk Management Plan
AFC = Application for Certification
TAC = toxic air contaminant
T-BACT = Toxic Best Available Control Technology
U.S. EPA = United States Environmental Protection Agency

7.6.6 Involved Agencies and Agency Contacts

Agency	Contact/Title	Telephone
California Energy Commission	Keith Golden Air Quality Specialist 1516 Ninth Street Sacramento, CA 95814	(916) 654-4287
	Mike Ringer Public Health Specialist 1516 Ninth Street Sacramento, CA 95814	(916) 654-4287
California Air Resources Board	Mike Tollstrup 1001 I Street Sacramento, CA 95814	(916) 322-6026

Agency	Contact/Title	Telephone
South Coast Air Quality Management District	Tom Chico SCAQMD 21865 Copley Dr, Diamond Bar, CA 91765	(909) 396-3149

7.6.7 Permits Required and Permit Schedule

The Permit to Construct (PTC) permitting process that would otherwise apply is superseded in the case of CEC licensing projects by the Determination of Compliance (DOC) process which is its functional equivalent. The CEC's final decision on this AFC application will serve as the principal approval required to ensure that the project's impacts to public health would be within acceptable levels. However, a Permit to Operate (PTO) would be awarded following SCAQMD confirmation that the project has been constructed to operate as described in the permit applications.

7.6.8 References

Cal-EPA/OEHHA (California Environmental Protection Agency and Office of Environmental Health Hazard Assessment), 1999. Air Toxics Hot Spots Risk Assessment Guidelines, Part I. Technical Support Document for the Determination of Acute Reference Exposure Levels for Airborne Toxicants.

Cal-EPA/OEHHA (California Environmental Protection Agency and Office of Environmental Health Hazard Assessment), 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines – The Air Toxics Hot Spots Program Guidance Manual for EPA Preparation of Health Risk Assessments; Air Toxics Hot Spots Risk Assessment Guidelines, Part II: Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels.

Cal-EPA/OEHHA (California Environmental Protection Agency and Office of Environmental Health Hazard Assessment), 2005. Air Toxics Hot Spots Risk Assessment Guidelines, Part II: Technical Support Document for Describing Available Cancer Potency Factors.

CARB (California Air Resources Board), 2003. HARP User Guide – Software for Emission Inventory Database Management, Air Dispersion Modeling Analyses, and Health Risk Assessment version 1.3, Air Resources, Board, California Environmental Protection Agency. December 2003.

Cocker, D., 2002. Mira Loma Air Quality Study; The Center for Environmental Research & Technology at UC Riverside (CE-CERT).

Peters, M., E. Avol, W. Navidi, S.J. London, W. Gauderman, W.F. Lurmann, W.S. Linn, H. Margolis, E. Rappaport, H. Gong Jr., D.C. Thomas, 1999. A study of twelve Southern California communities with differing levels and types of air pollution. Volume 159, Number 3, March 1999, pp. 760-767. *American Journal of Respiratory and Critical Care Medicine* I. Prevalence of respiratory morbidity and II. Effects on pulmonary function. University of Southern California.

SCAQMD (South Coast Air Quality Management), 2005a. Risk Assessment Procedure for Rules 1401 and 212, Version 7, July.

SCAQMD (South Coast Air Quality Management), 2005b. Supplemental Guidelines for Preparing Risk Assessments for the Toxics "Hot Spots" Information and Assessment Act (AB2588), July.

SCAQMD (South Coast Air Quality Management), 2000. Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES-II).

SCAQMD (South Coast Air Quality Management), 2001. Monitoring and Analysis – Mira Loma PM_{10} Monitoring.

U.S. EPA (U.S. Environmental Protection Agency), 1995. AP-42 Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition.

URS Corporation, 2007. Modeling Protocol for the Etiwanda Power Project, San Bernardino County. Prepared by URS for South Coast Air Quality Management District, U.S. EPA, and California Energy Commission.

VCAPCD (Ventura County Air Pollution Control District), 2001. Ventura County Air Pollution Control District AB2588 Combustion Emission Factors.

Feet
0 1000 2000 3000 4000

SCALE: 1" = 2,000' (1:24,000)

SOURCE:
USGS TOPO! (Quads: Corona North 1981, Cucamonga Peak 1988, Devore 1988, Fontana 1980, Glendora 1972, Guasti 1981, Mount Baldy 1988, Ontario 1981, Prado Dam 1981, Riverside East 1980, Riverside West 1980, San Bernardino North 1988, San Bernardino South 1980, San Dimas 1981, Yorba Linda 1981).

SENSITIVE RECEPTORS WITHIN 3 MILES OF THE PROJECT SITE

San Gabriel Generating Station
San Gabriel Power Generation, LLC
Rancho Cucamonga, California

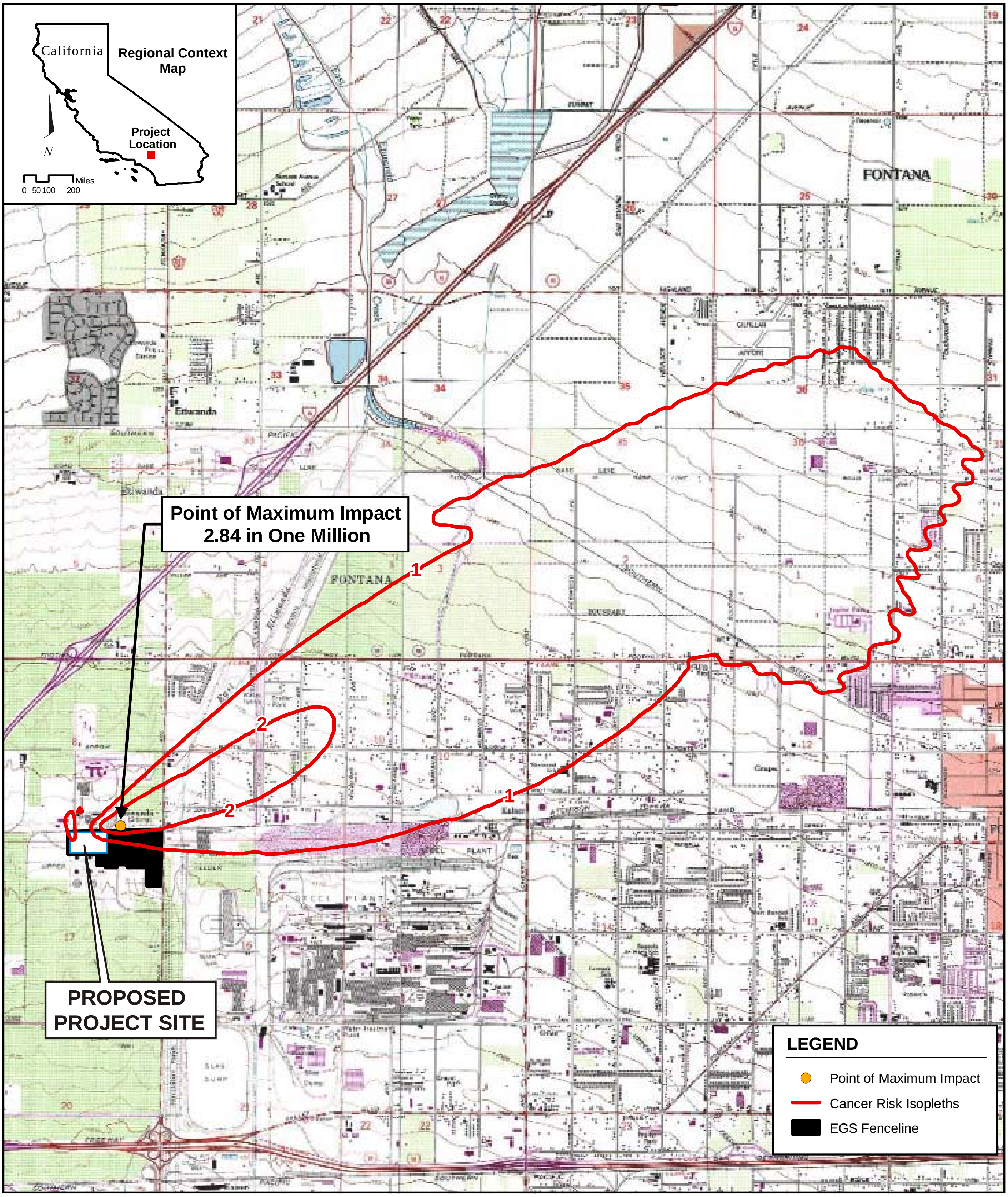
April 2007
28067169

URS

FIGURE 7.6-1

Path: G:\gis\projects\1577\28067169\mxd\public_health_sensitive_receptors.mxd, 03/20/07, Jamie_Nyholt

4/09/07 vsa ..\Reliant Etiwanda\Graphics\7.06 Public Health\7.6-1_sensitive_receptors_OVERSIZE_GRAY.ai



Path: G:\gis\projects\1577\28067169\mxd\public_health_cancer_risk.mxd, 03/20/07, Jamie_Nyholt

0 2000 4000 6000 Feet
SCALE: 1" = 4,000' (1:48,000)

N

SOURCE:
USGS TOPO!
(Guasti Quad 1981).

INCREMENTAL LIFETIME CANCER RISK PREDICTED WITH HARP

April 2007
28067169

San Gabriel Generating Station
San Gabriel Power Generation, LLC
Rancho Cucamonga, California

URS

FIGURE 7.6-2