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Appendix 6.16 – A HARP Input & Output Files

SECTION ACRONYMS/ABBREVIATIONS

ACRONYM/ ABBREVIATION	DEFINITION
AERMOD	American Meteorological Society - Environmental Protection Agency Regulatory Model
AFC	Application for Certification
ATCM	California Airborne Toxic Control Measures
BACT	Best Available Control Technology
Btu	British Thermal Unit
Btu/scf	British Thermal Unit per Standard Cubic Foot
CAA	Clean Air Act
CARB	California Air Resource Board
CATEF	California Air Toxics Emission Factor
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CO	Carbon Monoxide
CTG	Combustion Gas Turbine
DEM	Digital Elevation Model
EPA	United States Environmental Protection Agency
H&SC	Health and Safety Code
HAP	Hazardous Air Pollutant
HARP	Hotspots Analysis and Reporting Program
HI	Hazard Index
HIA	Acute Health Hazard Index
HIC	Chronic Health Hazard Index
hp	Horsepower
HRA	Health Risk Assessment
ISCST3	Industrial Source Complex – Short Term (Version 3.0)
lb/MMBtu	Pounds per Million British Thermal Units
lb/MMCF	Pounds per Million Cubic Feet
LORS	Laws, Ordinances, Regulations, and Standards
m/s	Meters per Second
MEI	Maximum Exposed Individual
MEIW	MEI for a Worker

ACRONYM/ ABBREVIATION	DEFINITION
mg/kg-day	Milligrams per Kilogram per Day
MMBtus	Million British Thermal Units
MW	Megawatt
NAD83	North American Datum of 1983
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
OEHHA	Office of Environmental Health Hazard Assessment
PAHs	Polycyclic Aromatic Hydrocarbons
PM_{10}	Particulate Matter of 10 microns or Less in Diameter
$PM_{2.5}$	Particulate Matter of 2.5 microns or Less in Diameter
PMI	Point of Maximum Impact
Project	Subject of this AFC Application, Orange Grove Project
Project Site	Approximately 8.5 acre parcel to be leased for the power plant Site (a.k.a. "Site")
Property	Approximately 202-acres owned by SDG&E that encompasses the approximately 8.5 acre Project Site and surrounding lands
REL	Reference Exposure Level
SCR	Selective Catalytic Reduction
SDAPCD	San Diego Air Pollution Control District
SDG&E	San Diego Gas & Electric
Site	Approximately 8.5 acre parcel to be leased for the power plant Site (a.k.a. "Site")
SO_2	Sulfur Dioxide
TAC	Toxic Air Contaminants
T-BACT	Best Available Control Technology for Toxics
UTM	Universal Transverse Mercator
VOCs	Volatile Organic Compounds

6.16 PUBLIC HEALTH

As described in Section 2.0, the proposed Project involves the installation and operation of a 96-megawatt (MW) simple-cycle power station in a rural area of north San Diego County. The Project consists primarily of two GE LM6000PC SPRINT natural gas fired combustion turbine generators (CTGs). A health risk assessment (HRA) was conducted to assess the potential impacts that the proposed Project may have on public health.

This section describes the approach and method, as well as the results of the HRA conducted for the Project. The assessment is limited to evaluating potential public exposure to hazardous air pollutant (HAP) emissions from routine operations. Exposure to criteria pollutants, i.e., nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs),(Particulate Matter of 10 microns or Less in Diameter PM_{10}) and Particulate Matter of 2.5 microns or Less in Diameter ($PM_{2.5}$) is examined in Section 6.2, Air Quality. Since the proposed Project will require hazardous materials for routine operation, most notably aqueous ammonia for nitrogen oxides (NO_x) emission control of the turbines, the associated impacts with the storage and use of ammonia are discussed in Section 6.15, Hazardous Materials Handling. Accordingly, this public health assessment section is arranged as follows:

- Section 6.16.1, Environmental Settings describes the local environment for the Project site. Topographical and meteorological information are provided.
- Section 6.16.2, Sensitive Receptors are identified within 3,000 meters (~ 1.86 miles) of the Project site. There are no schools found within 6,000 meters (3.5 miles) of the Project.
- Section 6.16.3, Health Risk Assessment discusses the HRA approach and methodology. A description of software selection and air dispersion modeling is provided.
- Section 6.16.4, Emission Calculation and Methodology discusses the calculation methodology for non-criteria pollutants and the results of the emission estimates.
- Section 6.16.5, Public Health Impacts provides the results of the HRA, which show that the maximum incremental offsite cancer risk to be below the cancer risk significance threshold of 1 in 100,000 (1E-05). The results also show that the total chronic health hazard index (HIC) and the acute health hazard index (HIA) to be below the significance criteria of 1.0.
- Section 6.16.6, Cumulative Impacts addresses the potential for cumulative impacts associated with other proposed projects.
- Section 6.16.7, Mitigation Measures discusses the mitigation measures proposed for this Project which include clean fuel and emission control technology.
- Section 6.16.8, Laws, Ordinances, Regulations and Standards (LORS) describes applicable LORS and Project compliance.
- Section 6.16.9, Agency Contacts and Permits provides agency contacts for conducting the HRA and identifies permits required for the Project.

Overall, the Project has shown to have no significant impacts on public health. The Project will use one of the cleanest fuels available and implement best available control technologies (BACT) that achieves the lowest achievable emission rate.

6.16.1 Existing Conditions

The Project site comprises 8.5 acres situated on a portion of a 202 acre property owned by San Diego Gas and Electric (SDG&E). The land use within a 3-mile radius of the Project is rural and consists primarily of agricultural land and open space with scattered rural single-family housing.

The Site location is on a gentle slope surrounded by moderately steep hillsides to the north, east and west. Topographic renderings of the area are shown in Figure 6.16-1 – Project Site Topography. The meteorology for the Site location is described in Section 6.2.1.2, Representative Meteorological Data. Based on two years of monitoring data collected in 2002 and 2003 at an adjacent location (the proposed Gregory Canyon Landfill project), the prevailing wind in this area is generally from the west/southwest at an average wind speed over the 2 years of 4.24 knots (2.18 meters per second [m/s]). Wind roses for this data is provided in Appendix 6.2-A.

Even though the meteorological data from Gregory Canyon is ideal for this Project, the HRA is completed with data from the nearest official San Diego Air Pollution Control District (SDAPCD) monitoring station in Escondido (Surface Station No. 72293, Upper Air Station No. 3190). A detailed discussion on the meteorological station is provided in Section 6.16.4.3. The Escondido monitoring station is located approximately 16 miles directly south of Pala. Period and quarterly wind roses for 1998 to 2000 are provided in Appendix 6.2-A. Similarly, the Escondido wind data show that the wind direction is predominantly from the west. Average wind speed over the 3 year period is 1.7 m/s.

The Site will be graded at approximately 420 feet above sea level. The exhaust stack for each of the CTGs will be 80 feet above grade. Due to hills that surround the Site, the regional topography, specifically in the form of digital elevation model (DEM) input files for the region, were utilized for the air dispersion modeling.

6.16.2 Sensitive Receptors

For HRAs, sensitive receptors are defined as groups of individuals (e.g. children, elderly and the chronically ill) that may be more susceptible to health risks from a chemical exposure. Sensitive receptor locations therefore include schools, day care facilities, convalescent homes, parks, and hospitals. Based on a survey of the vicinity, there are no potential sensitive receptors identified within 3,000 meters (1.86 miles) of the Site. The nearest schools are: 1) Vivian Banks Charter School approximately 2.0 miles west of the Site, 2) Vallecitos Elementary approximately 3.6 miles northwest of the Site, 3) Bonsall Union Elementary located approximately 4.5 miles southwest, and 4) Pauma Valley and Pauma Elementary approximately 7.1 miles southeast of the Site.

Figure 6.16-2 identifies some nearby residential and farm houses within close proximity to the Site, as well as non-residential sources, which include the adjacent nursery and the Pala Casino approximately 1.0 mile east of the Project site.

6.16.3 Available Health Studies

Local agencies were contacted to identify the availability of health studies concerning the potentially affected populations within a 6-mile radius of the Project site and related to respiratory illnesses, cancers or related diseases. The San Diego County Health and Human Services Agency, Community Epidemiology Division, the Hazardous Materials Division of the County of San Diego Department of Environmental Health and the SDAPCD were all contacted and none of these Agencies are aware of any studies of these types that have been conducted for this area.

6.16.4 Health Risk Assessment

This section describes the public HRA approach and methodology for this Project. A discussion is provided on the significance criteria for cancer and non-cancer health risks. The conservative assumptions built into the HRA and associated uncertainties are also described.

6.16.4.1 Health Risk Assessment Methodology

The HRA conducted for this Project uses procedures consistent with the Office of Environmental Health Hazard Assessment (OEHHA) *Air Toxics Hot Spots Program Risk Assessment Guidelines – The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (OEHHA October 2003). The 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 for the inventorying of air toxics emissions from individual facilities, as well as requirements for risk assessment and public notification of potential health risks.

Following the latest risk assessment guidelines developed by OEHHA, the HRA is conducted using the Hotspots Analysis and Reporting Program (HARP) Version 1.3 software. In addition to the inventorying module, the HARP software consists of an air dispersion module and a risk evaluation module. The HARP dispersion module is based on the United States Environmental Protection Agency (EPA) Industrial Source Complex Short Term Version 3 (ISCST3) air dispersion model.

Although ISCST3 has been used and recommended by EPA since 1995, EPA transitioned its air dispersion modeling software recommendation on November 9, 2005 to AERMOD, a model developed jointly by the American Meteorological Society and EPA. Accordingly, the AERMOD dispersion model is used to evaluate the impacts of criteria pollutants for this Project and presented in Section 6.2, Air Quality.

Recognizing the eventual need, the California Air Resource Board (CARB) recently issued a beta version of a file converter to accept AERMOD results into its HARP risk evaluation module. However, since this file converter has not been finalized and officially issued, and the associated methodology not formalized or recognized by OEHHA, a conservative approach is taken for this HRA by using the most currently approved CARB HARP software which uses ISCST3 instead of AERMOD air dispersion results.

Using the current version of HARP, the HRA is conducted with the following steps:

- Hazard Identification and Emission Quantification
- Exposure Assessment
- Dose-Response Assessment
- Risk Characterization

First, hazard identification was performed to determine the potential health effects that may be associated with Project emissions. The purpose was to identify whether pollutants emitted from the Project could be characterized as potential human carcinogens or associated with other types of adverse health effects. The following table summarizes the list of hazardous air pollutants for this Project and the associated toxicity criteria for these pollutants. With the exception of ethylbenzene, all the toxicity criteria used in HARP are up to date. In January 2008, OEHHA's Cancer Toxicity Criteria Database (http://www.oehha.ca.gov/risk/pdf/TCDB012508cas.pdf) provided an inhalation cancer potency factor for ethylbenzene of 8.7E-03 mg/kg-d-^{1}.

Table 6.16-1 – Toxicity Values Used for Health Risk Assessment

Compound	Sources of Emissions	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Chronic REL (µg/m^3)	Acute REL (µg/m^3)
Diesel particulate (PM_{10})	Diesel fire water pump engine	1.10E+00	5.00E+00	--
Ammonia	Turbine stacks	--	2.00E+02	3.20E+03
1,3-Butadiene	Turbine, black start engine stacks	6.00E-01	2.00E+01	--
Acetaldehyde	Turbine, black start engine stacks	1.00E-02	9.00E+00	--
Acrolein	Turbine, black start engine stacks	--	6.00E-02	1.90E-01
Benzene	Turbine, black start engine stacks	1.00E-01	6.00E+01	1.30E+03
Ethylbenzene	Turbine, black start engine stacks	8.7E-03	2.00E+03	--
Formaldehyde	Turbine, black start engine stacks	2.10E-02	3.00E+00	9.40E+01
Hexane	Turbine stacks	--	7.00E+03	--
Propylene	Turbine, black start engine stacks	--	3.00E+03	--
Propylene oxide	Turbine stacks	1.30E-02	3.00E+01	3.10E+03
Toluene	Turbine, black start engine stacks	--	3.00E+02	3.70E+04
Xylenes	Turbine, black start engine stacks	--	7.00E+02	2.20E+04
Polycyclic Aromatic Hydrocarbons (PAHs):				
Benzo(a)anthracene	Turbine, black start engine stacks	3.90E-01	--	--

Compound	Sources of Emissions	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Chronic REL (μg/m^3)	Acute REL (μg/m^3)
Benzo(a)pyrene	Turbine, black start engine stacks	3.90E+00	--	--
Benzo(b)fluoranthene	Turbine, black start engine stacks	3.90E-01	--	--
Benzo(k)fluoranthene	Turbine, black start engine stacks	3.90E-01	--	--
Chrysene	Turbine, black start engine stacks	3.90E-02	--	--
Dibenz(a,h)anthracene	Turbine, black start engine stacks	4.1E+00	--	--
Indeno(1,2,3-cd)pyrene	Turbine, black start engine stacks	3.90E-01	--	--
Naphthalene	Turbine, black start engine stacks	1.20E-01	9.00E+00	--

Second, an exposure assessment was conducted to estimate the extent of potential public exposure to Project emissions. Public exposure is evaluated in terms of the predicted short and long-term ground-level concentrations resulting from Project emissions, the pathway(s) of exposure, and the duration of exposure to the emissions. As discussed above, dispersion modeling was performed using the ISCST3 module within HARP to estimate the ground-level concentrations near the Project site. The dispersion modeling methodology is further described in the following section.

Third, a dose-response assessment was performed using the HARP risk module 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 (REL) for acute and chronic non-cancer risks. For the purpose of this analysis, the values as provided in HARP (and provided above in Table 6.16-1) were applied in this HRA. The inhalation risk to exposure to ethylbenzene emissions were calculated manually and incorporated into the risk assessment. The receptors evaluated included residential and worker scenarios. All appropriate exposure pathways available in HARP were included in this analysis. For the calculation of cancer risk for the resident receptors, the duration of exposure to Project emissions was assumed to be 24 hours per day, 365 days per year, for 70 years. For the worker receptors the duration of exposure to Project emissions was assumed to be HARP's standard work schedule of 5 days per week for 49 weeks per year for 40 years.

Fourth, risk characterization was performed to integrate the health effects and public exposure information and provide quantitative estimates of health risks from Project emissions. Risk modeling was performed using HARP to estimate cancer and non-cancer health risks for the Project. The HARP model utilizes OEHHA equations and algorithms to calculate health risks based on input parameters such as emissions, "unit" ground-level concentrations, and toxicological data. In order to include the inhalation cancer risk for ethylbenzene in the analyses, detailed HARP reports were generated for the highest cancer risk predicted for an offsite, residential, and worker receptor respectively. These reports provided predicted dosage for each pathway ("DosePath") for each chemical ("ByChem") as denoted in the report standardized file names. The predicted ethylbenzene inhalation dosage (milligrams per kilogram per day [mg/kg-day]) was multiplied by the inhalation cancer potency factor of 8.7E-3 (mg/kg-day)$^{-1}$ to obtain

the additional contribution to the overall cancer risk. These detailed report files, as well as rest of the model input parameters and results of the HRA are provided electronically as Appendix 6.16-A – HARP Input & Output Files.

6.16.4.2 Air Dispersion Modeling Methodology

The HRA was conducted using worst-case emissions (short- and long-term) from all sources at the Project. Cancer and chronic non-cancer health effects were quantified using annual emission estimates for the turbines, the black start engine and the fire water pump. Acute health effects were estimated using the maximum hourly emissions for the two turbines, the black start engine, and the fire water pump, although it is unlikely that all of these sources would ever operate simultaneously. The maximum hourly emissions in pounds per hour and annual emissions in pounds per year were used as inputs to the HARP model.

Dispersion modeling was performed using the ISCST3 module in HARP and methods consistent with the approaches (e.g., building downwash, meteorological and topographic data, etc.) described in Section 6.2, Air Quality and Appendix 6.2-E. The ISCST3 model uses the turbine, black start engine and fire water pump stack parameters to calculate the (Chi over Q) concentration per unit emissions. HARP then uses this information along with the emission rates (provided in the input file as described above) to calculate ground-level concentrations for each chemical species. Risk values were modeled for all sensitive receptors within 3.0 miles (~5 km) of the Project to assess potential health effects at these locations. Figure 6.16-3 depicts the receptor grid points for dispersion modeling. Boundary receptor grid points were set at 20 meters apart. The main grid points are 50 meters apart for an area spanning at least 1 mile or more from the grid origin (Turbine #1). Additional receptor grid points accounted for census blocks within 1.5 miles (~2.4 km) of the facility.

6.16.4.3 Meteorological Data

For HRA using the HARP software, the SDAPCD has recommended and provided meteorological data for direct input to the HARP ISCST3 module from the Escondido monitoring station (Surface Station No. 72293, Upper Air Station No. 3190). Although the Gregory Canyon data is more representative of Site conditions, it is insufficient to meet the 3 years meteorological data requirements specified by OEHHA for risk assessment. Period and quarterly wind roses for 1998 to 2000 are provided in Appendix 6.2-A for Escondido station data. Additional description of the meteorological data is available in Section 6.2.1.2. When compared to the wind roses for Gregory Canyon as presented in Appendix 6.2-A, the prevailing wind direction for the Escondido data is similarly predominately from the west. At an average wind speed of 1.7 m/s (over the three-year period), it is less than the 2.2 m/s monitored for Gregory Canyon.

The lower averaged wind speed will generally have less dispersion; therefore, it is believed that the Escondido data will have higher predicted concentrations and risk estimates. The predicted impact would therefore be more conservative for this Project.

6.16.4.4 Calculation of Health Effects

Adverse health effects are expressed in terms of cancer or non-cancer health risks. Cancer risk is typically reported as "lifetime cancer risk." Lifetime cancer risk is the maximum estimated increase in risk of contracting cancer caused by long-term exposure to a pollutant suspected of being a carcinogen. Residential cancer risk is calculated by assuming that an individual is exposed continuously to pollutants for 24 hours per day for 70 years. Although the continuous lifetime exposure is unlikely, the goal of the approach is to produce a worst-case estimate of potential cancer risk. Non-cancer risk is typically evaluated based on the hazard index ("HI"). The HI is calculated for each target organ as a fraction based on 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 HI is calculated for short- (acute, HIA) and long-term (chronic, HIC) exposures.

Both cancer and non-cancer risk estimates provided in the HRA represent incremental risks (i.e., risks due to 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 HI posed by Project emissions.

6.16.4.5 Significance Criteria

Various state and local agencies provide different significance criteria for cancer and non-cancer health effects. For carcinogenic health effects, an exposure to a new emission source is considered potentially significant when the predicted incremental lifetime cancer risk of the source exceeds 1 in 100,000 (1E-05). For non-carcinogenic acute and chronic health effects, an exposure that affects each target organ is considered potentially significant when the HI exceeds a value of one (1.0). These thresholds are consistent with the current San Diego County California Environmental Quality Act (CEQA) guidelines and SDAPCD rules and regulations for toxic air contaminants (TAC).

6.16.4.6 Uncertainty with Health Risk Assessment

Sources of uncertainty in HRA include emissions estimates, dispersion modeling, exposure characteristics, and extrapolation of toxicity data in animals to humans. For this reason, assumptions used in HRA are 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.

The turbine emission rates of individual TAC were derived from emission factors published by CARB (1996). In the case of ammonia emissions, the estimate is based on the equipment supplier guarantee for the Selective Catalytic Reduction (SCR) system. Both the short- and long-term turbine emissions were developed assuming all turbines operated at the maximum load for the maximum number of annual operating hours requested for this application. Under actual operating conditions, the turbines may operate less and the average loads will be lower than 100 percent of capacity. Consequently, the emissions used for this HRA are likely to be higher than those that would occur under normal operation of the proposed plant.

The dispersion models used in the HRA contain assumptions that tend to lead toward over-prediction of ground-level contaminant 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 to receptors, none of the material was assumed to be converted or removed 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. Additionally for this Project, the meteorological data applied for modeling is known to have lower average wind velocity than actual Site conditions and would therefore produce higher concentrations and more conservative results.

The exposure characteristics assessed in the HRA included the assumption that residential receptors were exposed to turbine, black start engine, and fire water pump 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 actually be subject to such continued, long-term exposure. The conservative exposure assumption tends to cause risks to be overestimated by the HRA methods used in this analysis.

The toxicity data used in the HRA contain uncertainties resulting from the extrapolation of health effects 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 intraspecies 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 there is sufficient health protection built into the health effects criteria used in assessments such as this one.

The conservatism introduced at each step in the HRA to compensate for all of these sources of uncertainty is compounded in the predicted health risks. Therefore, the actual risks resulting from exposure to emissions from the Project are expected to be well below the values presented in this analysis.

6.16.5 Emission Calculation and Methodology

This section discusses the emission calculation methodology for hazardous air (non-criteria) pollutants and presents the results of the emission estimates.

6.16.5.1 Construction Phase Emissions

Due to the relatively short duration of the Project's construction phase, significant long-term public health effects resulting from construction activities are not expected. While the entire construction schedule is estimated at approximately 6 months, activities, particularly those involving construction vehicles, that would contribute to HAP emission will last no more than 3 months. To ensure local worker safety during actual construction, safe work practices will be followed. A detailed analysis of the potential environmental impacts due to criteria pollutant

emissions during construction and control of these emissions is discussed in Section 6.2, Air Quality.

6.16.5.2 Operational Phase Emissions

Project operations were evaluated to determine whether particular substances will be used or generated that may cause adverse health effects if released to the air. The primary sources of potential emissions from routine operations are the natural-gas-fired CTG and the ammonia slip from the SCR control system used to minimize emissions of NO_x. Secondary sources of potential emissions are the emergency diesel fire water pump engine and natural gas-fired black start engine, both of which will normally be operated only for short periods in test mode to ensure their operability and readiness.

The substances emitted from these sources (with associated toxicological information) are presented in Table 6.16 1 – Toxicity Values Used for Health Risk Assessment. These potential air toxic species were identified in the California Air Toxics Emission Factor (CATEF) Version 1.2 database (CARB 1996), which contains air toxic emission factors calculated from source test data that have been collected for the Air Toxics Hot Spots Program (AB2588). All air toxic species associated with natural gas turbines equipped with SCR and CO catalyst and natural gas internal combustion engines for which cancer potency factors and/or chronic or acute REL have been established are included in Table 6.16-1. In addition, ammonia emissions associated with potential ammonia slip from the turbine SCR system were also included, as well as diesel particulate emissions, which would only result from operation of the diesel internal combustion engine used to drive the plant fire pump.

As with the criteria pollutant impact analysis provided in Section 6.2, annual turbine emissions were estimated by assuming that both turbines would operate simultaneously under full load conditions (100 percent load) for the entire 3,200 hours per year each, including startups, shutdowns and maintenance operations. The Project will accept permit conditions from the SDAPCD limiting the operation of each combustion turbine. Turbine stack parameters (i.e., exit temperature and velocity) for the full load condition were used in the HARP model to assess the hourly and annual ground-level impacts and health risks. Criteria pollutant analyses were also completed for operating scenarios of 75 percent and 50 percent load, but they were determined to not represent the worst-case condition, and were not subsequently reanalyzed with HARP. For both maximum hourly and annual emission rates, the maximum natural gas consumption rate of 472 million British thermal units (MMBtus) per hour per turbine was used. The maximum natural gas consumption rate for the black start engine of 4.0 MMBtu per hour was used. The black start engine is expected to be tested for one half-hour each month (conservatively estimated at 14 times per year). Emergency diesel fire water pump emissions were estimated assuming that this equipment would run at its full rated capacity (373 horsepower [hp]) for half an hour per week for emergency preparedness. Actual emergency use of the black start engine and the emergency diesel fire water pump were not included.

Emission factors for the natural gas-fired turbines (with SCR and CO catalyst emission controls) and the black start internal combustion engine were obtained from the California ARB CATEF

Database (CARB 2000) for PAHs and EPA AP-42 (April 2000) for non-PAH pollutants. The emission factors from CATEF were in units of pounds per million cubic feet (lb/MMCF) of natural gas fuel usage, which were divided by the higher heating value of the natural gas (1024 Btus per standard cubic foot [Btu/SCF]) to arrive at an emission factor in units of pounds per million Btus (lb/MMBTU), which was then multiplied by the Btu equivalent of the gas combusted per hour to obtain emissions in units of pounds per hour. The emission factors and estimated maximum hourly and annual turbine emissions are summarized in Table 6.16 2 – Post-BACT Emission Rates. The emission factors and estimated maximum hourly and annual black start engine emissions are summarized in Table 6.16 4 – Natural Gas Fired Black Start Engine Emission Rates.

The emission factors and estimated maximum hourly and annual emissions from the fire water pump are summarized in Table 6.16 3 – Emergency Diesel-Fired Fire Water Pump Engine Emission Rates.

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Table 6.16-2 – Post-BACT Emission Rates for Each Turbine

Pollutant	CAS	Emsn Factor (lb/MMBTU)	Emsn Factor (lb/MMCF)	Hourly Emsn (lb/hr)	Annual Emsn (lb/yr)
Ammonia	7664-41-7	5 ppm	5 ppm	3.01	9,635.39
1,3-Butadiene	106-99-0	4.30E-07	4.40E-04	2.0311E-04	6.4994E-01
Acetaldehyde	75-07-0	4.00E-05	4.10E-02	1.8894E-02	6.0460E+01
Acrolein	107-02-8	6.40E-06	6.55E-03	3.0230E-03	9.6735E+00
Benzene	71-43-2	1.20E-05	1.23E-02	5.6681E-03	1.8138E+01
Ethylbenzene	100-41-4	3.20E-05	3.28E-02	1.5115E-02	4.8368E+01
Formaldehyde	50-00-0	7.10E-04	7.27E-01	3.3536E-01	1.0732E+03
Propylene oxide	75-56-9	2.90E-05	2.97E-02	1.3698E-02	4.3833E+01
Toluene	108-88-3	1.30E-04	1.33E-01	6.1404E-02	1.9649E+02
Xylenes	1330-20-7	6.40E-05	6.55E-02	3.0230E-02	9.6735E+01
Polycyclic Aromatic Hydrocarbons (PAH)					
Benzo(a)anthracene	56-55-3	1.31E-07	1.34E-04	6.1877E-05	1.9800E-01
Benzo(a)pyrene	50-32-8	8.95E-08	9.16E-05	4.2274E-05	1.3528E-01
Benzo(b)fluoranthene	205-99-2	6.56E-08	6.72E-05	3.0986E-05	9.9154E-02
Benzo(k)fluoranthene	207-08-9	6.56E-08	6.72E-05	3.0986E-05	9.9154E-02
Chrysene	218-01-9	1.46E-07	1.50E-04	6.8962E-05	2.2068E-01
Dibenz(a,h)anthracene	53-70-3	1.31E-07	1.34E-04	6.1877E-05	1.9800E-01
Indeno(1,2,3-cd)pyrene	193-39-5	1.31E-07	1.34E-04	6.1877E-05	1.9800E-01
Naphthalene	91-20-3	7.70E-06	7.88E-03	3.6370E-03	1.1638E+01
	Total PAH			**4.00E-03**	**1.28E+01**

Notes:
- Exhaust parameters based on 100% load, inlet air chilled, SPRINT on, dry bulb temperature of 86 °F.
- Ammonia emission rate based on BACT NH_3 limit of 5 ppmv @ 15% O_2.
- Non-PAH emission factors source: EPA AP-42, April 2000
- PAH emission factors source: CATEF, 2000 (www.arb.ca.gov/ei/catef/catef.htm)
- Emission factors obtained for natural gas-fired combustion with SCR and CO catalyst.

Table 6.16-3 – Emergency Diesel-Fired Fire Water Pump Engine Emission Rates

Pollutant	CAS	Emsn Factor (lb/MMBTU)	Emsn Factor (lb/Mgal)	Hourly Emsn (lb/hr)	Annual Emsn (lb/yr)
Benzene	71-43-2	9.33E-04	1.29E-01	1.1500E-03	5.9799E-02
Toluene	108-88-3	4.09E-04	5.66E-02	5.0412E-04	2.6214E-02
Xylenes	1330-20-7	2.85E-04	3.95E-02	3.5128E-04	1.8267E-02
Propylene	115-07-1	2.58E-03	3.57E-01	3.1800E-03	1.6536E-01
1,3-Butadiene	106-99-0	3.91E-05	5.41E-03	4.8193E-05	2.5060E-03
Formaldehyde	50-00-0	1.18E-03	1.63E-01	1.4544E-03	7.5630E-02
Acetaldehyde	75-07-0	7.67E-04	1.06E-01	9.4537E-04	4.9159E-02
Acrolein	107-02-8	9.25E-05	1.28E-02	1.1401E-04	5.9286E-03
Polycyclic Aromatic Hydrocarbons (PAH)					
Benzo(a)anthracene	56-55-3	1.68E-06	2.33E-04	2.0707E-06	1.0768E-04
Benzo(a)pyrene	50-32-8	1.88E-07	2.60E-05	2.3172E-07	1.2050E-05
Benzo(b)fluoranthene	205-99-2	9.91E-08	1.37E-05	1.2215E-07	6.3516E-06
Benzo(k)fluoranthene	207-08-9	1.55E-07	2.15E-05	1.9105E-07	9.9344E-06
Chrysene	218-01-9	3.53E-07	4.89E-05	4.3509E-07	2.2625E-05
Dibenz(a,h)anthracene	53-70-3	5.83E-07	8.07E-05	7.1858E-07	3.7366E-05
Indeno(1,2,3-cd)pyrene	193-39-5	3.75E-07	5.19E-05	4.6221E-07	2.4035E-05
Naphthalene	91-20-3	8.48E-05	1.17E-02	1.0452E-04	5.4351E-03

Notes:
- Emission factors source: EPA AP-42, April 2000
- Emission factors for 4-stroke, lean-burn, diesel-fired ICE with no controls

(1) Note that hourly emissions are based on 30 minutes of run time within the one hour time frame.

Table 6.16-4 – Natural Gas Fired Black Start Engine Emission Rates

Pollutant	CAS	Emsn Factor (lb/MMBTU) (3)	Emsn Factor (lb/MMCF)	Hourly Emsn (lb/hr) (4)	Annual Emsn (lb/yr)
1,3-Butadiene	106-99-0	2.67E-04	2.73E-01	2.4262E-04	3.3967E-03
Acetaldehyde	75-07-0	8.36E-03	8.56E+00	7.5967E-03	1.0635E-01
Acrolein	107-02-8	5.14E-03	5.26E+00	4.6707E-03	6.5390E-02
Benzene	71-43-2	4.40E-04	4.51E-01	3.9983E-04	5.5976E-03
Ethylbenzene	100-41-4	3.97E-05	4.07E-02	3.6075E-05	5.0505E-04
Formaldehyde	50-00-0	5.28E-02	5.41E+01	4.7979E-02	6.7171E-01
Methanol	67-56-1	2.50E-03	2.56E+00	2.2717E-03	3.1804E-02
n-Hexane	110-54-3	1.11E-03	1.14E+00	1.0087E-03	1.4121E-02
Phenol	108-95-2	2.40E-05	2.46E-02	2.1809E-05	3.0532E-04
Toluene	108-88-3	4.08E-04	4.18E-01	3.7075E-04	5.1905E-03
Xylenes	1330-20-7	1.84E-04	1.88E-01	1.6720E-04	2.3408E-03
Polycyclic Aromatic Hydrocarbons (PAH) (5)					
Benzo(a)anthracene	56-55-3	9.69E-08	9.92E-05	8.8030E-08	1.2324E-06
Benzo(a)pyrene	50-32-8	3.79E-09	3.88E-06	3.4431E-09	4.8204E-08
Benzo(b)fluoranthene	205-99-2	7.79E-08	7.98E-05	7.0815E-08	9.9140E-07
Benzo(k)fluoranthene	207-08-9	1.18E-08	1.21E-05	1.0738E-08	1.5033E-07
Chrysene	218-01-9	2.20E-08	2.25E-05	1.9967E-08	2.7953E-07
Dibenz(a,h)anthracene	53-70-3	3.79E-09	3.88E-06	3.4431E-09	4.8204E-08
Indeno(1,2,3-cd)pyrene	193-39-5	1.06E-08	1.09E-05	9.6727E-09	1.3542E-07
Naphthalene	91-20-3	3.03E-05	3.10E-02	2.7509E-05	3.8513E-04

Notes:
(1) Fuel consumption based on ½ hour of run time within a one hour time frame
(2) Exhaust parameters based on standby condition.
(3) Emission factors source: EPA AP-42
(4) Emission factors for 4-stroke, lean-burn, > 650 HP natural gas-fired ICE with 80% control applied from the use of 3-way catalytic converter.
(5) Emission factors source: 2000 CATEF (www.arb.ca.gov/ei/catef/catef.htm)

6.16.6 Public Health Impacts

The following section discusses the public health impacts resulting from the above estimated Project emissions, air dispersion modeling and HRA as conducted using CARB HARP 1.3. As discussed above, the significant long-term public health effects resulting from construction activities are not expected due to the short construction duration. For the operational phase of the Project, the carcinogenic and non-carcinogenic risks estimates are provided and described below.

6.16.6.1 Estimated Operational Carcinogenic Risks

The point of maximum impact ("PMI", i.e., incremental cancer risk) resulting from Project emissions is estimated to be 3.65 in 1 million (3.65E-06). The PMI is located just beyond the western Property line at an elevation of 994.7 feet above sea level with Universal Transverse Mercator (UTM) coordinates of 489,046.3 meters easting, 3,690,989.3 meters northing, as shown in Figure 6.16-4 – Incremental Lifetime Cancer Risk to Residential Receptors Isopleths. This is approximately 494 feet above the tip of the CTG stacks. The innermost ring on Figure 6.16-4 shows the limited area which HARP predicted an excess cancer risk of greater than one in a million (inner most ring). This figure and others in this section are presented using North

American Datum of 1983 (NAD83) coordinates to stay consistent with the AERMOD analyses for criteria pollutants in Section 6.2.

The highest predicted cancer risk for a residential location (maximum exposed individual – MEI) is located on the hill immediately north east of the plant (490,106.5 meters easting, 3,691,865.7 meters northing); the maximum incremental cancer risk at this location is estimated to be 1.78E-07 (this includes the calculated ethylbenzene cancer risk for this receptor of 3.8E-10). For non-residential exposure, the MEI for a worker (MEIW) is 8.93E-10(this includes the calculated ethylbenzene cancer risk for this receptor of 3.8E-12). This occurs at the outermost boundary of the Pala Casino (491,624.8 meters easting, 3,691,554.0 meters northing), as shown in Figure 6.16-5. The following table summarizes the results.

Table 6.16-5 – HARP Estimated Carcinogenic Risk

RECEPTOR TYPE	CARCINOGENIC RISK	LOCATION (UTM METERS)
Point of Maximum Impact (PMI)	3.65E-06	489,046.3 E : 3,690989.3 N
Maximum Exposed Individual – Residential (MEI)	1.78E-07	490,106.5 E : 3,691,865.7 N
Maximum Exposed Individual – Worker (MEIW)	8.93E-10	491,624.8 E : 3,691,554.0 N

As shown above, the estimated cancer risk at all locations is well below the significance criteria of 1 in 100,000 (1E-05). The Project emissions will therefore not pose a significant carcinogenic health risk to any sources potentially exposed to these emissions.

6.16.6.2 Estimated Operational Non-Carcinogenic Risks

For long-term chronic non-carcinogenic incremental risks, the HIC at the PMI resulting from Project emissions is estimated to be 0.0413 in an unpopulated area near the center western boundary of the property (489,046.3 E : 3,690,989.3 N). The highest HIC affecting a residence is 0.00204 which is a residence near-by on the hill northeast of the facility (490,106.5 E : 3,691,865.7 N). The highest HIC affecting a non-residential location is 0.000104. These values are all well below the health threshold value of 1.0. Chronic Hazard Index Isopleths are provided in Figure 6.16-6.

Table 6.16-6 – HARP Estimated Non-Carcinogenic Risks

RECEPTOR TYPE	HIC (CHRONIC)	LOCATION (UTM METERS)	HIA (ACUTE)	LOCATION (UTM METERS)
Point of Maximum Impact (PMI)	0.0413	489,046.3 E 3,690,989.3 N	1.54	489,596.3 E 3,691,439.3 N
Maximum Exposed Individual –Residential (MEI)	0.00204	490,l06.5 E 3,691,865.7 N	0.538	490,271.2 E 3,691,646.5 N
Maximum Exposed Individual –Worker (MEIW)	0.000104	491,624.8 E 3691,554.0 N	0.495	489,899.8 E 3,691,020.0 N

The maximum off-property HIA resulting from Project emissions is estimated to be 1.54 at a location just beyond the north boundary of the Property (UTM coordinates 489,596.3 meters easting, 3,691,439.3 meters northing). The highest residential exposure is 0.538 at a residence located northeast of the facility. The highest non-residential exposure occurs across Pala Road at an HIA of 0.495.

Figure 6.16-7 shows that the estimated acute HI are well below the significance criterion of 1.0 for residential and non-residential locations. It is thus concluded the Project's emissions will not pose a significant health risk to any populations potentially exposed to these emissions.

6.16.7 Cumulative Impacts

To account for potential cumulative impacts from projects and/or emission sources near the Project site, the SDAPCD provided a list of applications for authority to construct that were submitted since January 2006 by facilities that are within 6 miles of the Project Site. The only applications resulting from the query are a portable thermal oxidizer used for soil remediation in Escondido and a dust collector for a spent abrasive handling and recycling system in the City of Vista.

Since there appears to be no other sources of potential HAP emissions, no additional or cumulative health risk is expected for this project.

6.16.8 Mitigation Measures

Both the criteria and non-criteria pollutant emissions from the Project will be mitigated by the exclusive use of CARB specified natural gas and the implementation of T-BACT. For this Project, the BACT employed for controlling criteria pollutants, specifically, the CO oxidation catalysts, will also control the organic group of the air contaminants listed in Table 6.16 1 – Toxicity Values Used for Health Risk Assessment.

The HRA conducted for this section shows that the health impacts from the proposed Project will be well below the significance thresholds presented in section 6.16.4.5, Significance Criteria. Therefore, no further mitigation of emissions from the Project is required for public health protection.

6.16.9 Laws, Ordinances, Regulations and Standards

The relevant LORS that have been established to protect public health are identified in Table 6.16 7 – Summary of Compliance with Public Health LORS. This table 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.

Table 6.16-7 – Summary of Compliance with Public Health LORS

JURIS-DICTION	AUTHORITY	AGENCY[1]	REQUIREMENTS	COMPLIANCE	AFC SECTIONS AND PAGES
Federal	Clean Air Act (CAA)	EPA, CARB, SDAPCD	Protect public from unhealthful exposure from air pollutants.	Based on the results of the risk assessment, hazardous air emissions are within acceptable levels.	6.16 Pages 6.16-1 to 6.16-17
State	California Public Resource Code § 25523(a); 20 CCR § 1752.5, 2300-2309, and Division 2 Chapter 5, Article 1, Appendix B, Part(1)	California Energy Commission (CEC)	Assure protection of environmental quality, requires quantitative HRA.	The HRA in Section 6.16, Public Health of this Application for Certification (AFC) satisfies this requirement.	6.16 Pages 6.16-1 to 6.16-17
	Health & Safety Code (H&SC) § 25500-25542; 10 CR § 2720-2734	SDAPCD with CARB oversight	Requires quantification of TAC emissions, use of BACT, and preparation of a HRA	The Project will not cause unsafe exposure to TAC based on results of HRA, and has performed a BACT assessment.	6.16 Pages 6.16-1 to 6.16-17 App. 6.2-D
	H&SC, Part 6, § 44300 et seq. (Air Toxics "Hot Spots")	SDAPCD with CARB/OEHHA oversight	Regulates a business plan and public exposure to air toxics. Requires inventory of TAC and HRA.	The HRA presented in this section satisfies this requirement.	6.16 Pages 6.16-1 to 6.16-17
	H&SC § 41700	SDAPCD with CARB oversight	Prohibits emissions in quantities that adversely affect public health, other businesses or property.	Section 6.2, Air Quality, and the HRA (Section 6.16, Public Health) presented in this AFC satisfy this requirement.	6.2 6.16 Pages 6.2-1 to 6.2-45, 6.16-1 to 6.16-17

[1] Pursuant to 20 CCR Chapter 5 Appendix B Section (i)(1)(B): Each agency with jurisdiction to issue applicable permits and approvals or to enforce identified LORS and adopted local, regional and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the CEC to certify sites and related facilities.

JURIS-DICTION	AUTHORITY	AGENCY[1]	REQUIREMENTS	COMPLIANCE	AFC SECTIONS AND PAGES
Local	SDAPCD Rule 51	SDAPCD	No source shall cause injury, detriment, nuisance or annoyance to the public, which could endanger their comfort, repose, health and safety, or property.	Section 6.2, Air Quality, and the HRA (Section 6.16, Public Health) presented in this AFC satisfy this requirement.	6.2 6.16 Pages 6.2-1 to 6.2-45, 6.16-1 to 6.16-17
	SDAPCD Rule 1200	SDAPCD	Requires use of Best Available Control Technology for Toxics (T-BACT) for major sources.	This is not a major source, thus T-BACT will not be required.	NA
	SDAPCD Rule 1210	SDAPCD	California Airborne Toxic Control Measures (ATCM).	Section 6.16, Public Health of this AFC satisfies this requirement. No public notice is required.	6.16 Pages 6.16-1 to 6.16-17
Industry	None applicable	None applicable	None applicable	None applicable	

6.16.10 Permits and Agency Contacts

The Authority to Construct and Permit to Operate to be issued by the SDAPCD and the CEC final decision on this AFC will serve as the principal approvals required to ensure that the Project's impacts to public health will be within acceptable levels. A consolidated permit schedule is provided in Section 2.15. Agency contacts are identical to those in Section 6.2 (Air Quality).

6.16.11 References

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

OEHHA (2003). Air Toxics Hot Spots Program Risk Assessment Guidelines – The Air Toxics Hot Spots Program Guidance Manual for EPA Preparation of Health Risk Assessments.

OEHHA (2003). Air Toxics Hot Spots Risk Assessment Guidelines, Part II: Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels.

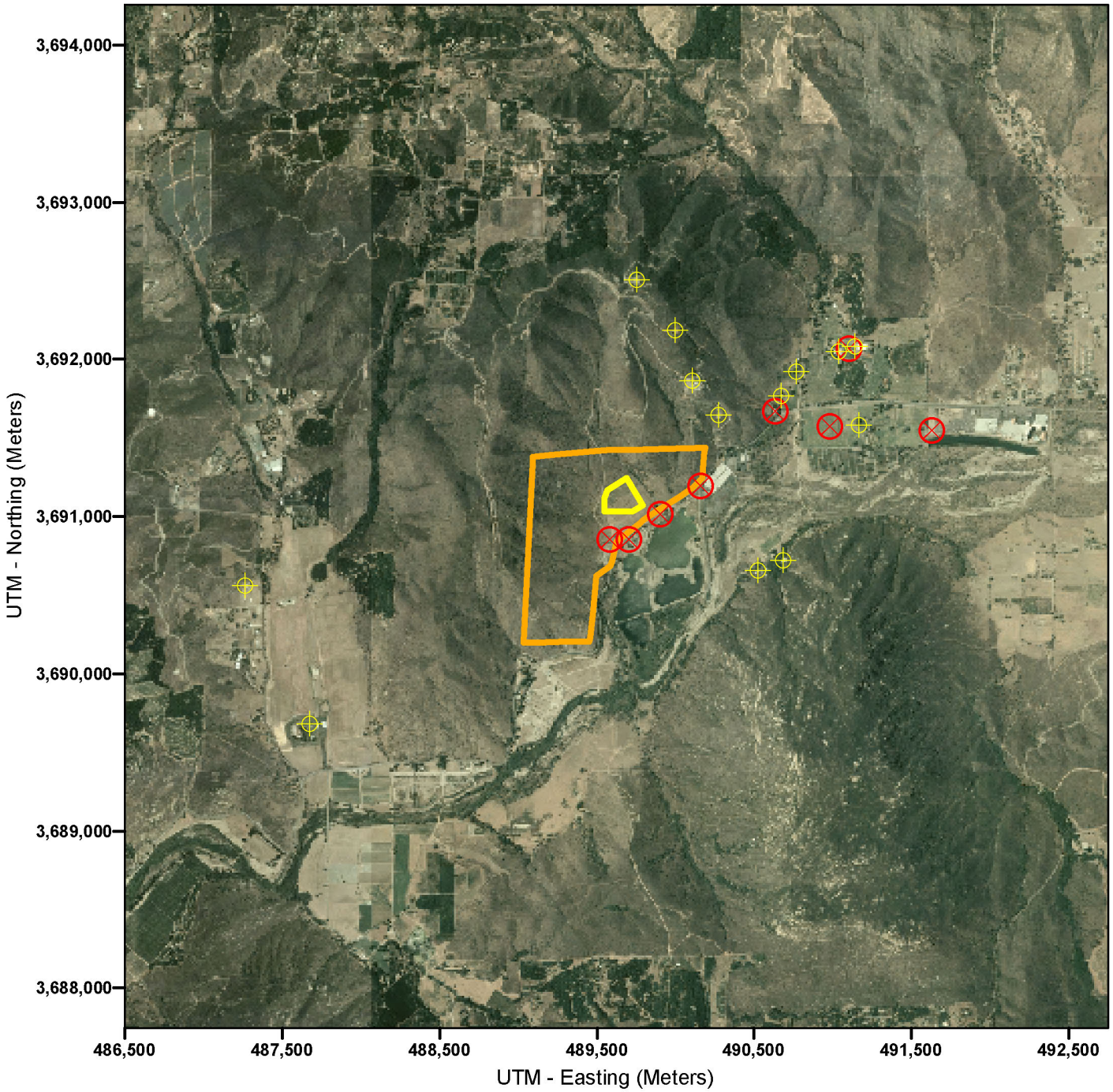
OEHHA (2005). Air Toxics Hot Spots Risk Assessment Guidelines, Part II: Technical Support Document for Describing Available Cancer Potency Factors.

California Air Resources Board (2000). California Air Toxics Emission Factor Database, Version 1.2.

Figure 6.16-1 – Project Site Topography (North & South-West Views)

TRC	Project: **Orange Grove Project**
	Map Source: Google Earth

Figure 6.16-2 - Residential and Non-Residential (Commerical) Receptors



Note: There are no sensitive receptors (school, daycare facility, convalescent homes, and hospitals) within the boundaries of this map.

N

Residential or Farm Houses

Commerical Establishments

Site

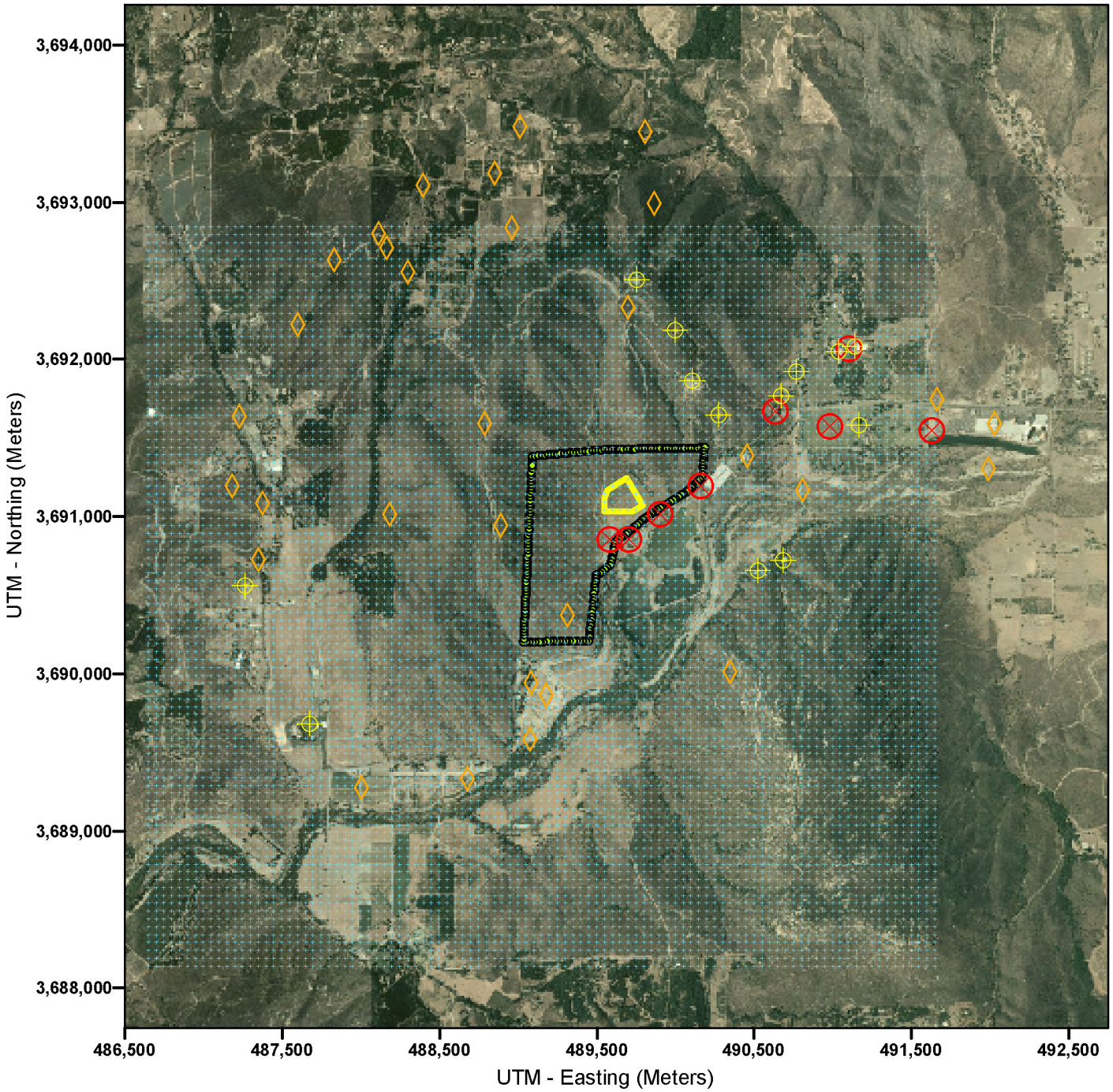
Property Boundary

TRC

Project: Orange Grove Project - AFC Application

Map Source: USDA National Agriculture Imagery Program 2004 - Coordinates UTM Zone 11 NAD83

Figure 6.16-3 - HARP Receptor Points



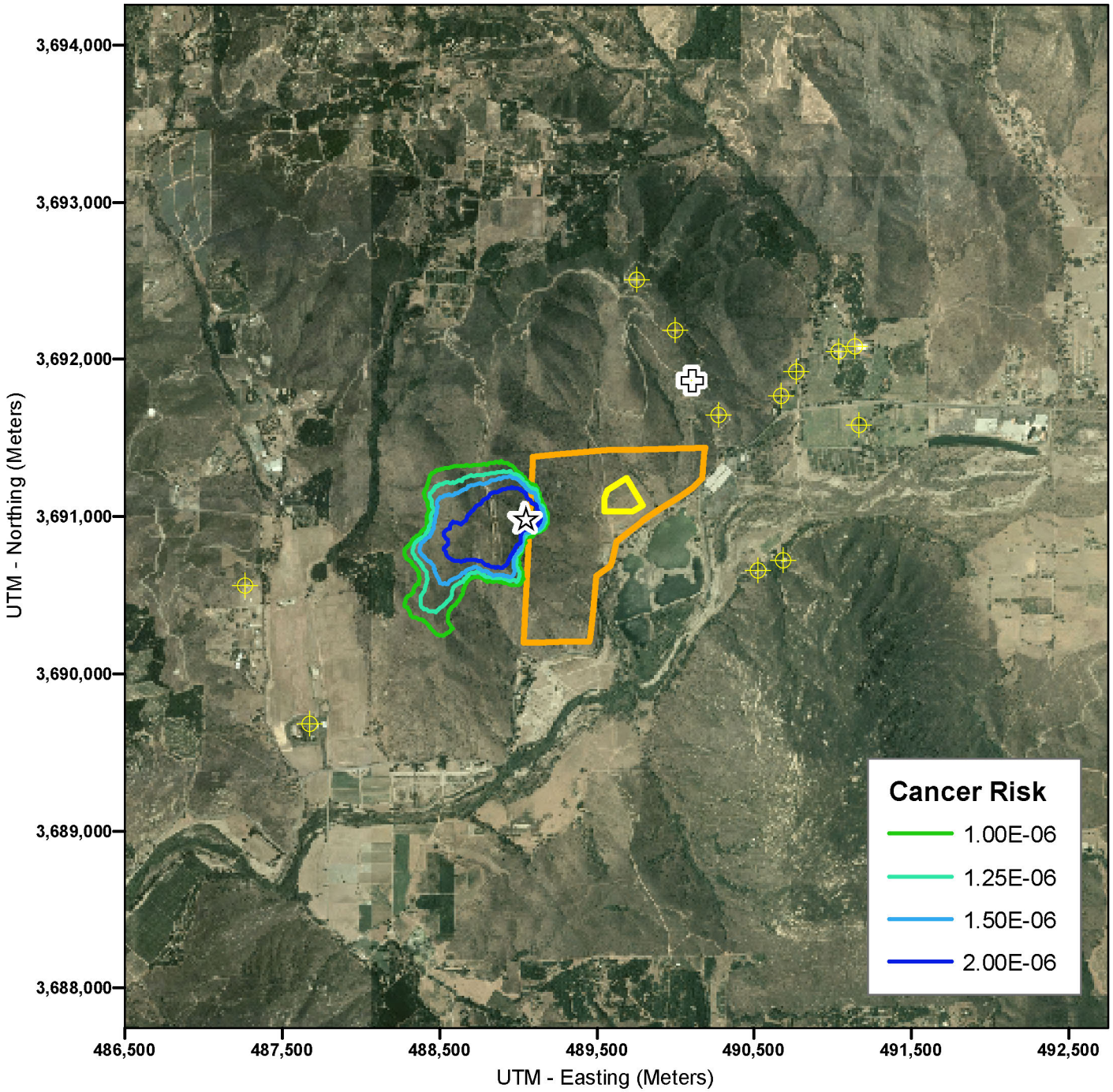
Census Block Receptors
Receptor Grid
Boundary Receptors
Residential or Farm Houses
Commerical Establishments
Site
Property Boundary

TRC

Project: Orange Grove Project - AFC Application

Map Source: USDA National Agriculture Imagery Program 2004 - Coordinates UTM Zone 11 NAD83

Figure 6.16-4 - Incremental Lifetime Cancer Risk to Residential Receptors Isopleths



Note: Isopleths show HARP's directly calculated Cancer Risk prior to adjustment for Ethyl Benzene Inhalation Cancer Risk

N

☆ Point of Maximum Impact (PMI)

✚ Maximum Exposed Individual - Residential (MEIR)

⊕ Residential or Farm Houses

Site

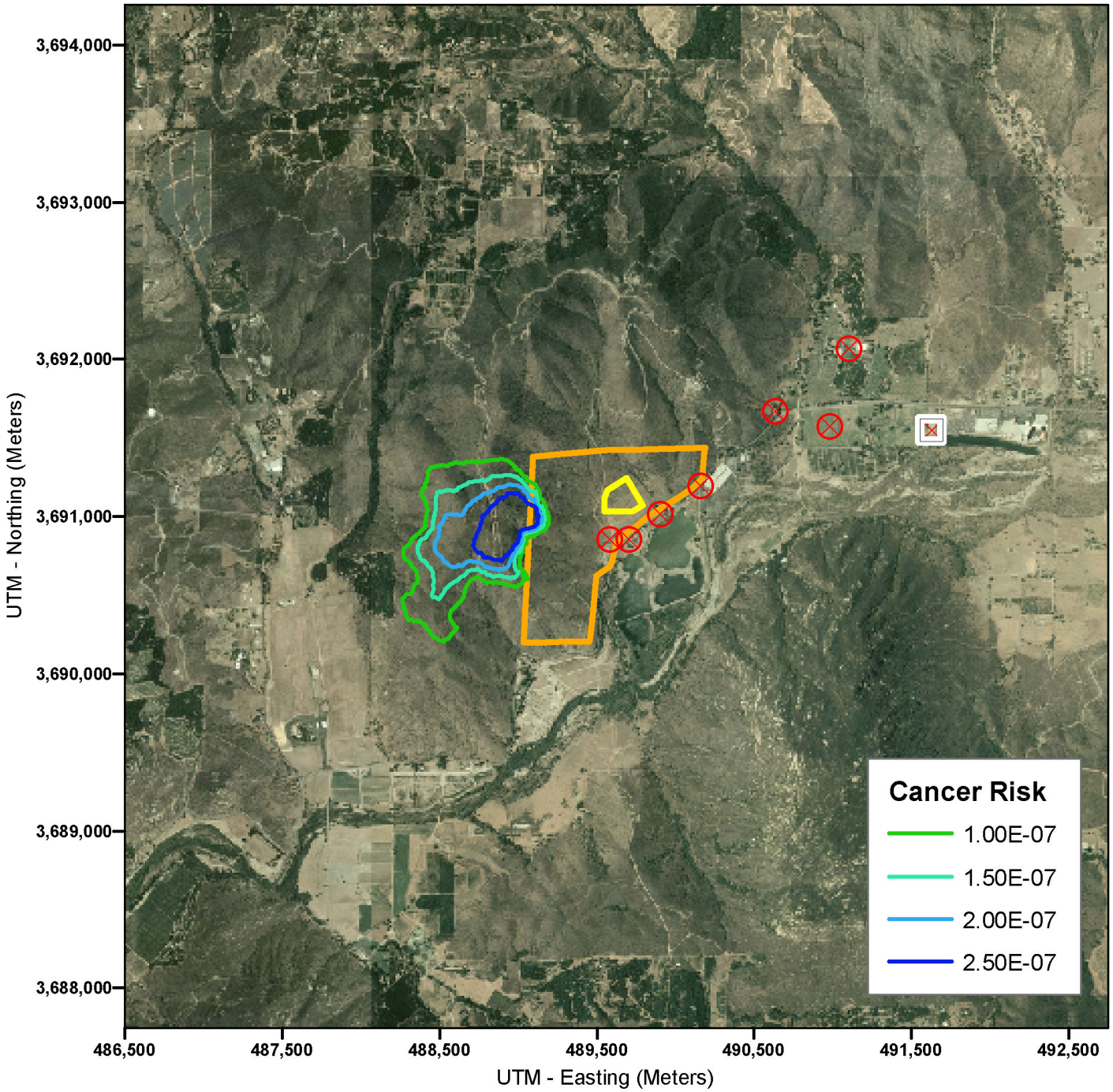
Property Boundary

TRC

Project: Orange Grove Project - AFC Application

Map Source: USDA National Agriculture Imagery Program 2004 - Coordinates UTM Zone 11 NAD83

Figure 6.16-5 - Incremental Lifetime Cancer Risk to Workers Isopleths



Note: Isopleths show HARP's directly calculated Cancer Risk prior to adjustment for Ethyl Benzene Inhalation Cancer Risk

N

Maximum Exposed Individual - Worker (MEIW)

Commerical Establishments

Site

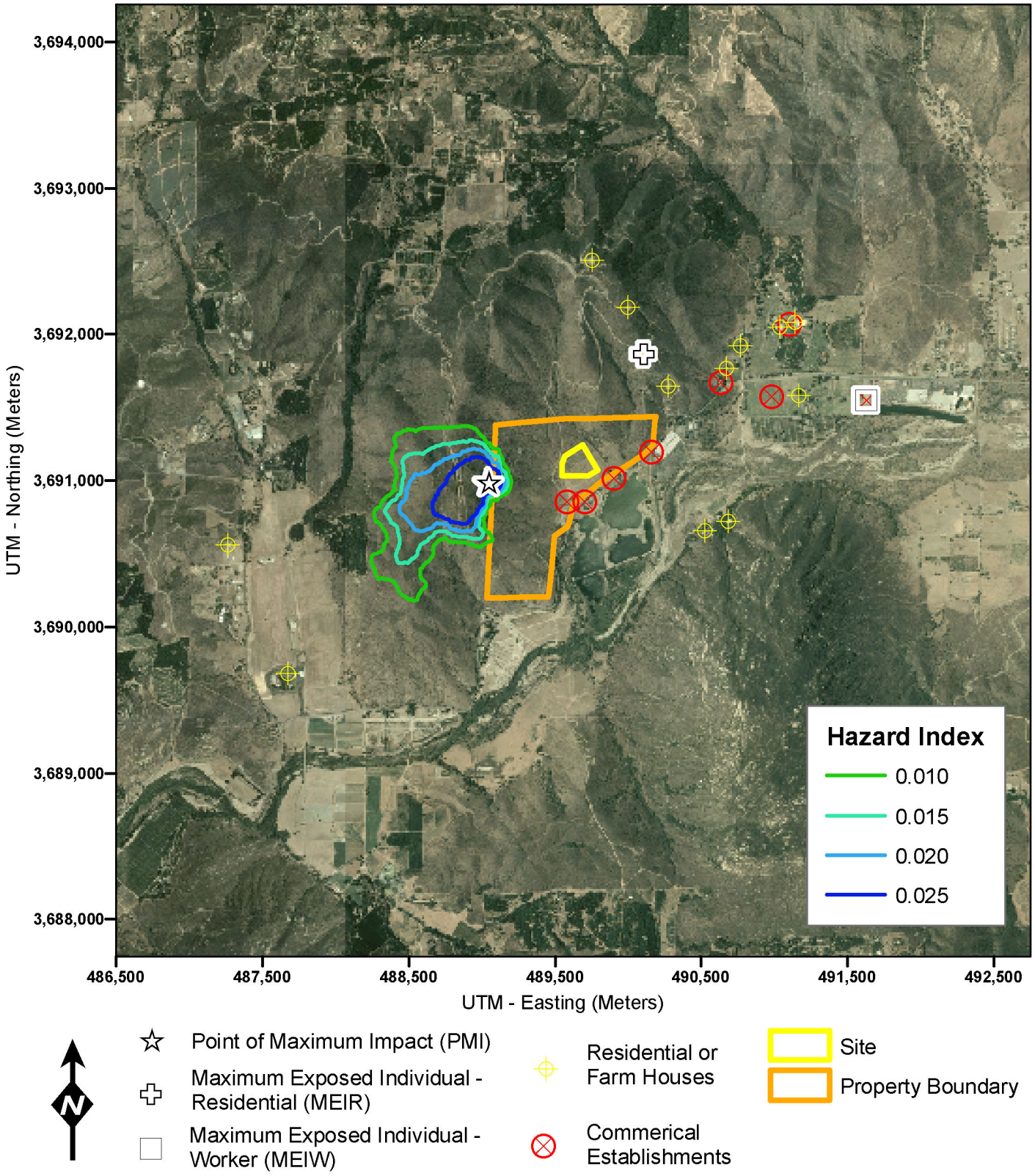
Property Boundary

TRC

Project: Orange Grove Project - AFC Application

Map Source: USDA National Agriculture Imagery Program 2004 - Coordinates UTM Zone 11 NAD83

Figure 6.16-6: Chronic Hazard Index Isopleths

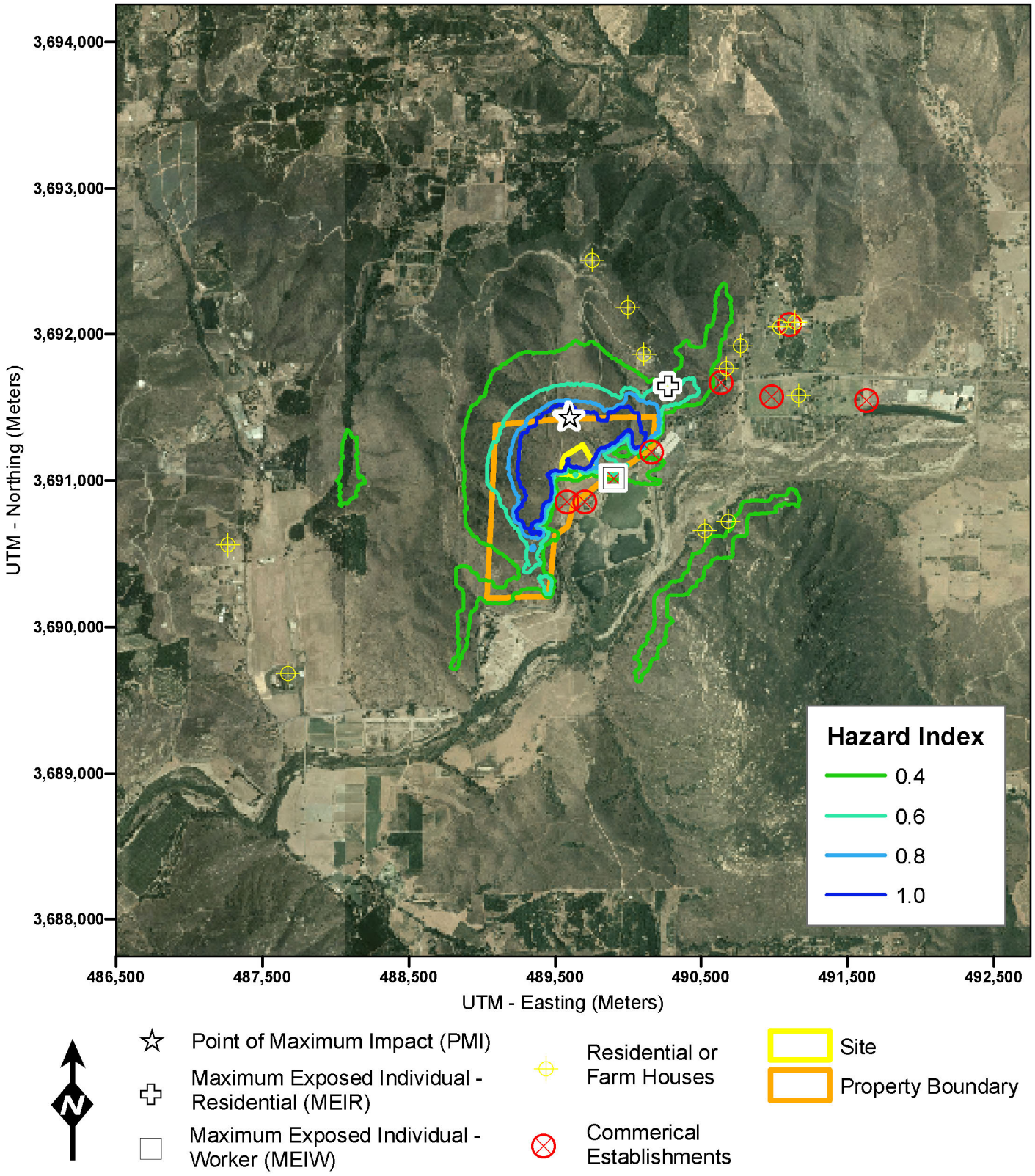


TRC

Project: Orange Grove Project - AFC Application

Map Source: USDA National Agriculture Imagery Program 2004 - Coordinates UTM Zone 11 NAD83

Figure 6.16-7: Acute Hazard Index Isopleths



TRC

Project: Orange Grove Project - AFC Application

Map Source: USDA National Agriculture Imagery Program 2004 - Coordinates UTM Zone 11 NAD83