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APPENDIX [in Volume II]

Appendix L Public Health Data

8.6 PUBLIC HEALTH

The assessment of the proposed project's impact on public health is done by performing a human health risk assessment (HRA). This section contains the methodology and results of the HRA for the project. The purpose of the HRA is to evaluate potential public exposure to pollutant emissions from routine operations. Potential public exposure to accidental releases during operation is addressed in Section 8.12, Hazardous Materials Handling. The details of the Public Health analysis are contained in the following sections:

- Section 8.6.1 describes the local environment surrounding the CGS site. Topographical information is provided.
- Section 8.6.2 discusses the consequences of the CGS project. The assessment approach is described. Emissions of toxic pollutants are discussed and the impacts of these emissions are identified. Under the regulations the significant maximum incremental cancer risk level is defined as 10 in one million. The results of the assessment show that the maximum incremental cancer risk from the project will be well below the significant level, as it is 1.19 in one million. The results of the assessment also show that both the chronic total hazard index (THI) and the acute THI are below the significance criteria of 1, with levels of 0.03055 and 0.4205, respectively.
- Section 8.6.3 addresses the cumulative impacts.
- Section 8.6.4 discusses mitigation measures.
- Section 8.6.5 describes all applicable public health laws, ordinances, regulations, and standards.
- Section 8.6.6 lists the agency contacts used to conduct the public health risk assessment.
- Section 8.6.7 lists the permits required and provides the permit schedule.
- Section 8.6.8 lists the references used to conduct the public health risk assessment.

8.6.1 Affected Environment

The proposed project is located in Colusa County, California. The land uses within a 3-mile radius of the site are predominantly rural (see Section 8.4, Land Use, for a detailed analysis of surrounding land use).

The proposed project's turbine stacks would exhaust combustion gases at an elevation of 175 feet or 53.4 meters above grade elevation. Grade elevation for the major sources of the project is about 180 feet. Topographical features within a 10-mile radius that are of equal or greater elevation than the assumed stack exhaust exit elevation are shown in Figure 8.1-1 (see Section 8.1, Air Quality). Emissions from the auxiliary boiler and non-emergency operation of the diesel generator and the diesel fire pump are also included.

Certain groups of individuals may be more susceptible to health risks due to chemical exposure. These include individuals such as children, pregnant women, the elderly, and people with chronic illnesses that may 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. There is only one of these sensitive receptors within a 3-mile radius of the site, a school located 3 miles from the CGS. Eight homes are located within a 3-mile radius of the plant site. These are scattered homes associated with large-acreage farms. Most are single-family homes clustered

with agriculture-related outbuildings such as barns or silos. The closest home is located approximately 1.7 miles southeast of the plant site. Figure 8.6-1 shows the locations of the sensitive receptors within a 3-mile radius of the CGS. Health studies concerning a population within 6 miles of the project site were researched but not found. The California Environmental Protection Agency (Cal-EPA) Office of Environmental Human Health Assessment (OEHHA) has stated that their exposure factors are conservative and health-protective of sensitive receptors (Cal-EPA and OEHHA, 1999, 2003, and 2005). Even though there is only one sensitive receptor near the project site, every receptor used in the modeling is treated as a sensitive receptor. Therefore, these factors were applied to all receptors in this analysis.

8.6.2 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 one million, a chronic total hazard index over 1, or an acute total hazard index over 1. Also, uncertainties in the HRA are discussed and other potential health impacts are described.

8.6.2.1 Public Health Impact Assessment Approach

The potential human health risks posed by the Project's emissions were assessed using procedures consistent with the OEHHA *Air Toxics Hot Spots Program Risk Assessment Guidelines – The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (Cal-EPA and OEHHA, 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 inventory of air toxics emissions from individual facilities as well as requirements for risk assessment and public notification of potential health risks.

The HRA was conducted in four steps using the Hotspots Analysis and Reporting Program (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 may be associated with project emissions. The purpose was to identify whether emitted pollutants could be characterized as potential human carcinogens or associated with other types of adverse health effects. From the OEHHA guidelines a list of pollutants with potential cancer and noncancer health effects associated with the emissions from the project are presented in Table 8.6-1.

Second, an exposure assessment was conducted to estimate the extent of public exposure to the CGS 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 CGS site. The methods used in the dispersion modeling were consistent with the approach described in Section 8.1, Air Quality, and the modeling protocol submitted for the project (URS, 2006).

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 or unit risk factors (URFs) for cancer risk

and reference exposure levels (RELs) for acute and chronic noncancer risks. The OEHHA guidelines provide a list of pollutants and their associated URFs and RELs. URFs and RELs are constantly being revised by the OEHHA, and the most recent values were applied in this HRA (Cal-EPA and OEHHA 2005). All exposure pathways were included in this analysis except fish and dairy cows. 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 8.6.2.4.

8.6.2.2 Construction Phase Emissions

Due to the relatively short duration of the construction of the proposed project (i.e., 24 months), significant long-term public health effects are not expected. Diesel particulate exhaust is the air pollutant with the largest potential for human health risk that would be 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 – the duration used in this assessment for operational emissions. The relatively short two-year construction period would not be expected to result in adverse health impacts.

To ensure worker safety during actual construction, safe work practices will be followed (see Section 8.7, 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 8.1.2, Air Quality: Environmental Consequences. To minimize diesel particulate exhaust emissions during construction, a series of mitigation measures have been incorporated into the construction phase of this project (see Section 8.1.5.10.2.3, Construction Equipment Exhaust Emissions).

8.6.2.3 Operational Phase Emissions

Facility operations were evaluated to determine whether particular substances would be used or generated that may cause adverse health effects if released to the air. The primary sources of potential emissions from facility operations are the natural gas–fired combustion turbine generators (CTGs) and the aqueous ammonia slip stream from the selective catalytic reduction (SCR) control system located in the heat recovery steam generators (HRSGs). Natural gas combustion in the auxiliary boiler is also a source of potential emissions as is the diesel fuel combusted in the two emergency engines. The substances emitted from facility operations (with potential toxicological impacts) are shown in Table 8.6-1. These potential air toxic species were identified in the California Air Toxics Emission Factor (CATEF) database (CARB, 2001) and vendor data. All air toxic species associated with Source Classification Code (SCC) 20200203 (natural gas cogeneration turbines with SCR) for which cancer URFs and/or chronic or acute RELs have been established are included in Table 8.6-1. Ammonia emissions associated with potential ammonia slip from the SCR system were also included as well as all air toxics associated with the auxiliary boiler, diesel generator, and the diesel fire water pump. More detailed information on the chemicals stored and used on site, associated potential impacts, and potential accidental chemical releases is included in Section 8.12, Hazardous Materials Handling.

Several very conservative assumptions were made for estimating emissions for this section. These assumptions may not be consistent in all cases with the assumptions made in Section 8.1, Air Quality. However, they result in higher estimated air toxic emissions than the assumptions used in Air Quality would. Worst-case estimates of annual turbine emissions were made by assuming that both turbines would operate simultaneously under full load conditions (100 percent load at 59°F annual average) for 8,760 hours per year with full duct burner firing. The exit temperature and velocity for each turbine stack used in the model represented the 100 percent load, with duct firing, at 59°F ambient temperature operating mode.

For maximum hourly emissions, the maximum natural gas consumption rate of about 2,452 million Btu (mm Btu, higher heating value) per hour per combustion turbine including duct burners was used represented the 100 percent load, with duct firing, at 59°F ambient temperature operating mode. The CGS will have two such combustion turbine trains.

Emission factors for natural gas–fired turbines were obtained from the California ARB CATEF Database (CARB, 2001). 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 (1,024 Btu/scf) to arrive at an emission factor in units of pounds per million British thermal units (lb/mm Btu), 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 8.6-2.

Emission factors for the natural gas–fired auxiliary boiler were obtained from the California Air Resources Board CATEF Database (CARB, 2001). Annual emissions were calculated based on 2,400 hours per year. Emission factors and estimated maximum hourly and annual auxiliary boiler emissions are summarized in Table 8.6-3.

Toxic emissions from the diesel generator and the diesel firewater pump were estimated using the PM_{10} emissions as a surrogate for the toxic compound, diesel exhaust. Emergency diesel generator and emergency diesel firewater pump emissions were estimated assuming each would run at its full rated capacity (1,340 hp and 160 hp, respectively) for one hour per week for emergency preparedness. Actual emergency use of the emergency diesel engines was not included. Emissions are summarized in Table 8.6-4.

8.6.2.4 Model Input Parameters

The HRA was conducted using worst-case turbine, auxiliary boiler, and emergency diesel engine emissions (short and long term). Cancer and chronic noncancer health effects were estimated using the annual turbine and other source emission estimates. Acute noncancer health effects were estimated using the worst-case maximum hourly emissions for the turbines and other sources. The maximum hourly emissions in pounds per hour were used as input to the HARP model.

Dispersion modeling was performed using the ISCST3 model in HARP and methods consistent with the approach (e.g., building down wash, meteorological data, etc.) described in Section 8.1, Air Quality, and the modeling protocol submitted for the project (URS, 2006). The ISCST3 model uses the turbine and other source stack parameters to calculate the Chi over Q concentration. 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. Meteorological data for the years 2001, 2002, 2003, 2004, and 2005 (the same years used in the air quality analysis in Section 8.1) were used in the HRA. Risk values were modeled for all sensitive receptors within 3 miles of the CGS project and all grid, boundary and census receptors within 6 miles of the CGS project. Boundary receptors were placed every 25 meters along the property fence line. Grid receptors were spaced every 100 meters out to 10 kilometers

from the site in every direction. Any risks calculated by the HARP model at onsite receptor locations were ignored. To assess potential health effects at these locations all receptors were treated as sensitive receptors. This ensured that the maximum risk to a receptor was predicted.

Toxicological data, URFs, and RELs are built into the California Air Resource Board's HARP model. The pollutant-specific URFs and RELs used in the HRA are listed in Table 8.6-1. 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.

8.6.2.5 Calculation of Health Effects

Adverse health effects are expressed as 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 assumes 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 conservative worst-case estimate of potential cancer risk.

Noncancer risk is typically reported as a "total hazard index" (THI). The THI 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 THI is calculated for short-term (acute) and long-term (chronic) exposures.

In addition to the analysis above, a brief discussion of potential health effects from acrolein is appropriate. Although acrolein cannot be adequately quantified for CGS, it has been established in the literature that acrolein can be an acute eye irritant at extremely low concentrations. Such health effects are reversible, are not life threatening, and are not considered potentially significant. Other, more invasive and threatening health effects from acrolein exposure occur at much higher concentrations that are not likely to be associated with trace products of incomplete combustion and are only likely to be a consideration in facilities where commercial grade acrolein is manufactured or used. Neither is applicable to CGS. Consequently, potential acute exposure to acrolein is not considered significant.

Both cancer and noncancer risk estimates provided in the HRAs 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 THI posed by proposed project emissions.

8.6.2.6 Health Effects Significance Criteria

Various state and local agencies provide different significance criteria for cancer and noncancer health effects. For the proposed project, the 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 lifetime cancer risk exceeds 10 in one 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.

8.6.2.7 Estimated Lifetime Cancer Risk

The maximum change in cancer risk resulting from the CGS emissions at a non-residential receptor was estimated to be 1.194 in one million, located on the western property boundary at ground level (receptor located at 4,357,710 m north, 562,655 m east), as shown in Figure 8.6-2, Incremental Lifetime Cancer Risk Predicted with HARP. Figure 8.6-2 also shows the one in a million cancer risk isopleth, the area in which HARP predicted an excess cancer risk of greater than one in a million. The land use in this

location is general/agricultural. At the nearest residential receptor (approximately 2.8 km southeast of the property at about 4,356,529 m north, 565,418 m east), the maximum change in cancer risk was estimated to be 0.032 in one million. This residence is shown as ML1 on Figure 8.5-1 in Section 8.5, Noise. Table 8.6-5 presents the detailed cancer results of the HRA for the proposed project operations.

The estimated cancer risks at all locations are well below the significance criteria of 10 in one million. Thus, the proposed project emissions pose no significant health effects relative to the most stringent significance criteria established for carcinogenic health effects. All HARP model files, along with all air quality modeling files, are provided electronically on a DVD that is supplied separately with this Application.

To offer some perspective on the risks estimated for the CGS, it is important to note that background risk of developing cancer in the United States is 0.33 (American Cancer Society, Cancer Statistics 2000). That means that one in three people may potentially develop cancer in the absence of the proposed CGS operating due to a variety of causes. The target risk level of 1×10^{-5} represents the probability that ten additional cancer cases may develop in a population of one million due to emissions from the plant under the prescribed conditions given a series of very unlikely events. By combining the excess cancer risk of 1.194×10^{-6} from the plant and 0.33 from background sources, the maximum total risk for a receptor is 0.330001194 with the vast majority of the risk attributable to lifestyle choices such as diet, smoking, degree of exercise, and alcohol consumption.

8.6.2.8 Estimated Chronic and Acute Total Hazard Indices

The maximum chronic THI resulting from proposed project emissions was estimated to be 0.03055 The maximum chronic THI was located approximately 2.5 km northwest of the CGS site at an elevation of 165 m (the receptor is located 4,359,727 m north, 560,254 m east). The maximum chronic THI resulting from the proposed project emissions at a residence was estimated to be 0.00074. That residence is located approximately 3 kilometers northeast of the CGS site at an elevation of 165 m (the receptor is located 4,360,945 m north, 564,760 m east). This residence is shown as RC1 on Figure 8.5-1 in the Noise section.

The maximum acute THI resulting from proposed project emissions was estimated to be 0.4205. The maximum acute THI was located on the western property boundary (the receptor is located at 4,357,985 m north, 562,655 m east). These locations are general/agricultural settings. The maximum acute THI resulting from the proposed project emissions at a residence was estimated to be 0.039 located approximately 3.8 kilometers northeast of the CGS site (the receptor is located 4,360,945 m north, 564,760 m east). Table 8.6-5 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. Thus, the proposed project emissions would pose no significant health effects relative to the most stringent significance criteria established for noncarcinogenic health effects.

Some general perspective on the relative impacts from projects with low THI values is needed. It should be noted that if, for example, the hazard index of a project is 0.035, this does not imply that acute and chronic effects are 3.5 times more likely to occur in comparison to another project that has a hazard index of 0.01. Medically, there is little or no practical difference between these two values, and both values are well below the threshold of 1. A value of 1 means that a given calculation has demonstrated that under certain conditions, a given series of events has approached the acceptable benchmark. Because multiple safety factors are built into the calculation, no significant health impacts are expected under the worst-case scenario to receptors due to the operation of the CGS.

8.6.2.9 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 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 were derived using vendor data for ammonia slip and from emission factors (CARB, 2001) for the other air toxics. Both the short- and long-term turbine emissions were developed assuming both turbines operated continuously at the same time and at the maximum heat input rate. Under actual operating conditions, the turbines will operate less than 8,760 hours per year and consequently, the emissions used for this HRA are likely to be higher than what would be experienced under normal operation of the turbines.

The models used in dispersion modeling 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 to receptors, none of the material was assumed to be 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.

The exposure characteristics assessed in the HRA included the assumption that residents were 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 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 sufficient health protection is built into the available health effects data.

All of this uncertainty is compounded in the final result. Therefore, the actual risk numbers are expected to be well below the values presented in this analysis.

8.6.2.10 Criteria Pollutants

The dispersion of the criteria pollutants (NO_2, CO, SO_2, and PM) was modeled, and an evaluation of their impacts on air quality is presented in Section 8.1, 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 project would not cause a violation of any state or federal ambient air quality standard and would not significantly contribute to existing violations of state PM_{10} and ozone standards. Therefore, no significant adverse health effects are anticipated from the proposed project's criteria pollutant emissions.

8.6.3 Cumulative Impacts

Risks from the proposed project are evaluated on their own and then compared to the applicable significance criteria. The cumulative effects from sources other than the proposed project are not considered. CEC requirements specify that an analysis must be conducted to determine the cumulative impacts of the project and other projects within a 6-mile radius that have received construction permits but

are not yet operational or that are in the permitting process or can be expected to do so in the near future. Information requests have been made to CCAPCD to obtain data on new projects planned within 6 miles of the proposed site, but CCAPCD indicated that there are none. Studies along traffic corridors elsewhere in California have shown that highways are sometimes areas of localized higher-than-average background health risk, particularly when heavily traveled at low speeds. The highway nearest to this source is I-5, which is located about 4 ½ miles east of the site. This highway is not heavily traveled and is typically not subject to traffic delays in this area. Therefore, highway traffic is not expected to result in a cumulative impact.

The Cumulative Impact Analysis (CIA) included in Section 8.1, Air Quality of this AFC included an analysis of a portion of the criteria air pollutant emissions from the nearby Delevan Compressor Station (DCS) (see Section 8.1.3). A similar cumulative impact analysis for the potential emissions of the toxic air contaminants from the DCS is not necessary because of the following:

1. The AQ CIA demonstrated that contributions from the DCS at the locations of the maximum predicted impacts from CGS were negligible when compared to the difference between the applicable standards and the project impacts.

2. On a relative basis, the results of the health risk assessment for CGS project specific emissions show a wider margin of compliance between the established significance criteria and the estimated impacts than was shown for Air Quality.

3. Therefore, the contributions of toxic air contaminant emissions from the DCS at the locations of the maximum predicted health impacts from the CGS would be an even lower fraction, hence also negligible.

Potential development proposals have been brought to the attention of the Colusa County Planning Department, but no formal applications have been submitted at this time. These proposals consist of the potential development of an 18-unit subdivision near Maxwell, located about 5 miles southeast of the project site. No further information is available on these potential projects, nor is there any available information on their schedules or likelihood of an Applicant submitting an application. The Colusa County Planning Department is not aware of any planned development projects in closer proximity to the project site. Thus, based on the information that no development applications have been submitted in conjunction with the distance of possible future planned development, potential cumulative impacts to public health would be less than significant.

8.6.4 Mitigation Measures

The criteria pollutant emissions from the project will be mitigated by the use of BACT and through emissions offsets. A complete discussion of these measures is included in Section 8.1, Air Quality. The toxic pollutant emissions from the CGS will also be mitigated by the exclusive use of natural gas fuel. In addition, pollution control technologies employed to control criteria pollutants, specifically, the CO oxidation catalyst on the CTG/HRSG, will also have the effect of significantly reducing organic TACs, such as those listed in Table 8.6-1, Toxicity Values Used to Characterize Health Risks Associated With The CGS Project. Emissions of toxic pollutants from the diesel engines will be minimized by using Tier 2 and CARB Certified engines and through usage limits.

The HRA presented in the foregoing subsections shows that the health effects impacts of the project as proposed will be well below the significance thresholds identified in Section 8.6.2.6, Health Effects Significance Criteria. Therefore, no further mitigation of emissions from the Project is required to protect public health.

8.6.5 Laws, Ordinances, Regulations, and Standards

The applicable laws, ordinances, regulations, and standards (LORS) related to public health impacts from the proposed project are identified below. The relevant LORS that have been established to protect public health are identified in Table 8.6-6, Summary of Compliance with Public Health LORS. 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.

8.6.6 Involved Agencies and Agency Contacts

Agency contacts regarding public health assessment of the proposed project are shown.

Agency	Contact/Title	Telephone
California Energy Commission	Keith Golden and Joe Loyer Air Quality Specialists 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
Colusa County Environmental Health Department	Mr. Jaime Favila Director 251 E. Webster Street Colusa, CA 95932	(530) 458-0590
Colusa County Air Pollution Control District	Charles Price Deputy Air Pollution Control Officer Colusa County APCD 100 Sunrise Blvd. #F Colusa, CA 95932-3246	(530) 458-0590

8.6.7 Permits Required and Permit Schedule

This section lists the required permit related to public health for the proposed project. The permit is summarized in the following table.

Responsible Agency	Permit/Approval	Schedule
Colusa County Air Pollution Control District	Authority to Construct/Permit to Operate	Application to be filed concurrent with AFC. 180-day application review period.

The Final Determination of Compliance to be issued by the Colusa County Air Pollution Control District and the Commission Decision to be issued by the CEC will serve as the approvals required for assessing impacts to public health. These should be completed within approximately 6 months after submittal of complete applications to these two agencies.

8.6.8 References

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

Cal-EPA (California Environmental Protection Agency) and OEHHA (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). 2001. California Air Toxics Emission Factor II (CATEF II) Database, http://www.arb.ca.gov/emisinv/catef/catef.htm.

OEHHA (Office of Environmental Health Hazard Assessment). 2006. Website at http://www.oehha.org/home.html.

URS Corporation. 2006. Modeling Protocol for the Colusa Generating Station Project, Colusa County. Prepared by URS for Colusa County Air Pollution Control District, U.S.EPA and California Energy Commission. July.

Table 8.6-1
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 ($\mu g/m^3$)
Diesel particulate (PM_{10})	two diesel engines	1.1E+00	5.0E+00	--
Ammonia	gas turbine stacks	--	2.0E+02	3.2E+03
1,3-Butadiene	gas turbine stacks	6.0E-01	2.0E+01	--
Acetaldehyde	gas turbine stacks/aux boiler	1.0E-02	9.0E+00	--
Acrolein	gas turbine stacks	--	6.0E-02	1.9E-01
Benzene	gas turbine stacks/aux boiler	1.0E-01	6.0E+01	1.3E+03
Ethylbenzene	gas turbine stacks/	--	2.0E+03	--
Formaldehyde	gas turbine stacks/aux boiler	2.1E-02	3.0E+00	9.4E+01
Hexane	gas turbine stacks	--	7.0E+03	--
Propylene	gas turbine stacks	--	3.0E+03	--
Propylene oxide	gas turbine stacks	1.3E-02	3.0E+01	3.1E+03
Toluene	gas turbine stacks	--	3.0E+02	3.7E+04
Xylenes	gas turbine stacks	--	7.0E+02	2.2E+04
Polycyclic Aromatic Hydrocarbons				
Benzo(a)anthracene	gas turbine stacks	3.9E-01	--	--
Benzo(a)pyrene	gas turbine stacks	3.9E+00	--	--
Benzo(b)fluoranthene	gas turbine stacks	3.9E-01	--	--
Benzo(k)fluoranthene	gas turbine stacks	3.9E-01	--	--
Chrysene	gas turbine stacks	3.9E-02	--	--
Dibenz(a,h)anthracene	gas turbine stacks	3.9E-01	--	--
Indeno(1,2,3-cd)pyrene	gas turbine stacks	3.9E-01	--	--
Naphthalene	gas turbine stacks	1.2E-01	9.0E+00	--

Source: Cal-EPA/OEHHA, 2005

Notes:
-- = not applicable
mg/kg-day = milligrams per kilogram per day
PM_{10} = particulate matter less than 10 micrometers in diameter
$\mu g/m^3$ = micrograms per cubic meter
REL = reference exposure levels

Table 8.6-2
Emission Rates From Operation of GCS CTG/HRSG fired With Natural Gas With Carbon Monoxide Oxidation Catalyst and SCR

Chemical Species	Emission Factor (lb/mm Btu)	Emission Factor (lb/MMcf)	Maximum Hourly Emissions per CTG[1] (lb/hr)	Annual Emissions Per CTG[1,2] (lb/yr)
Ammonia	5 ppm[3]	5 ppm[3]	18.2	1.59E+05
1,3-Butadiene	1.24E-07	1.27E-04	3.04E-04	2.66E+00
Acetaldehyde	1.34E-04	1.37E-01	3.28E-01	2.87E+03
Acrolein	1.85E-05	1.89E-02	4.53E-02	3.96E+02
Benzene	1.30E-05	1.33E-02	3.18E-02	2.79E+02
Ethylbenzene	1.75E-05	1.79E-02	4.29E-02	3.75E+02
Formaldehyde	8.96E-04	9.17E-01	2.20E+00	1.92E+04
Hexane	2.53E-04	2.59E-01	6.20E-01	5.43E+03
Propylene	7.53E-04	7.71E-01	1.85E+00	1.62E+04
Propylene oxide	4.67E-05	4.78E-02	1.14E-01	1.00E+03
Toluene	6.93E-05	7.10E-02	1.70E-01	1.49E+03
Xylenes	2.55E-05	2.61E-02	6.25E-02	5.47E+02
Polycyclic Aromatic Hydrocarbons				
Benzo(a)anthracene	2.21E-08	2.26E-05	5.41E-05	4.74E-01
Benzo(a)pyrene	1.36E-08	1.39E-05	3.98E-05	1.32E-01
Benzo(b)fluoranthene	1.10E-08	1.13E-05	2.71E-05	2.37E-01
Benzo(k)fluoranthene	1.07E-08	1.10E-05	2.63E-05	2.31E-01
Chrysene	2.46E-08	2.52E-05	6.03E-05	5.29E-01
Dibenz(a,h)anthracene	2.29E-08	2.35E-05	5.63E-05	4.93E-01
Indeno(1,2,3-cd)pyrene	2.29E-08	2.35E-05	5.63E-05	4.93E-01
Naphthalene	1.62E-06	1.66E-03	3.97E-03	3.48E+01

Notes:

[1] See Appendix L, Public Health Data, for detailed emission calculations. Natural gas fuel heat rate assumed at 1,024 Btu/scf.
[2] Annual emissions calculations based on maximum fuel flow for 8,760 operating hours per year for the CGS.
[3] Based on estimated ammonia slip from NO_x control (5 ppmvd at 15% oxygen).
CO = carbon monoxide
lb/hr = pounds per hour
lb/yr = pounds per year
lb/mm Btu = pounds per million British thermal units
lb/MMcf = pounds per million cubic feet
ppm = parts per million
SCR = selective catalytic reduction

Table 8.6-3
Emission Rates from Operation of Auxiliary Boiler

Chemical Species	Emission Factor (lb/mm Btu)	Emission Factor[a] (lb/MMcf)	Maximum Hourly Emissions (lb/hr)	Annual Emissions[b] (lb/yr)
Acetaldehyde	8.66E-06	8.87E-03	3.81E-04	9.15E-01
Benzene	4.21E-06	4.31E-03	1.85E-04	4.44E-01
Formaldehyde	2.16E-04	2.21E-01	9.50E-03	2.28E+01

Notes:

[a] Emission factors obtained from the CATEF database for natural gas boilers with no controls.
[b] Annual emissions based in 2,400 full load hours per year. See Appendix L for detailed emission calculations.
g/s = grams per second
lb/hr = pounds per hour
lb/mm Btu = pounds per million British Thermal Units
lb/MMcf = pounds per million cubic feet
lb/yr = pounds per year

Table 6.8-4
Emission Rates From Operation Of The Emergency Diesel Fire Pump and Generator

Source	Chemical Species	Emission Factor (g/hp-hr) [1]	Maximum Hourly Emissions (lb/hr)	Annual Emissions[2] (lb/yr)
Emergency Fire Water Pump	Diesel particulate (PM_{10})	0.13	4.58E-02	2.29E+00
Emergency Generator	Diesel particulate (PM_{10})	0.13	3.84E-01	1.92E+01

Notes:

[1] Emission factor from vendor guarantee.
[2] Annual emissions based on 50 hours of operation annually. See Appendix L for detailed emission calculations.
g/hp-hr = grams per horsepower hour
lb/hr = pounds per hour
lb/yr = pounds per year
PM_{10} = particulate matter less than 10 micrometers in diameter

Table 8.6-5
Estimated Cancer Risk and Acute and Chronic Total Hazard Indices

Cancer Risk at Maximum Point of Impact	Chronic Risk at Maximum Point of Impact	Acute Risk at Maximum Point of Impact
1.194 Excess risk in one million	0.03055 Total hazard index	0.4205 Total hazard index

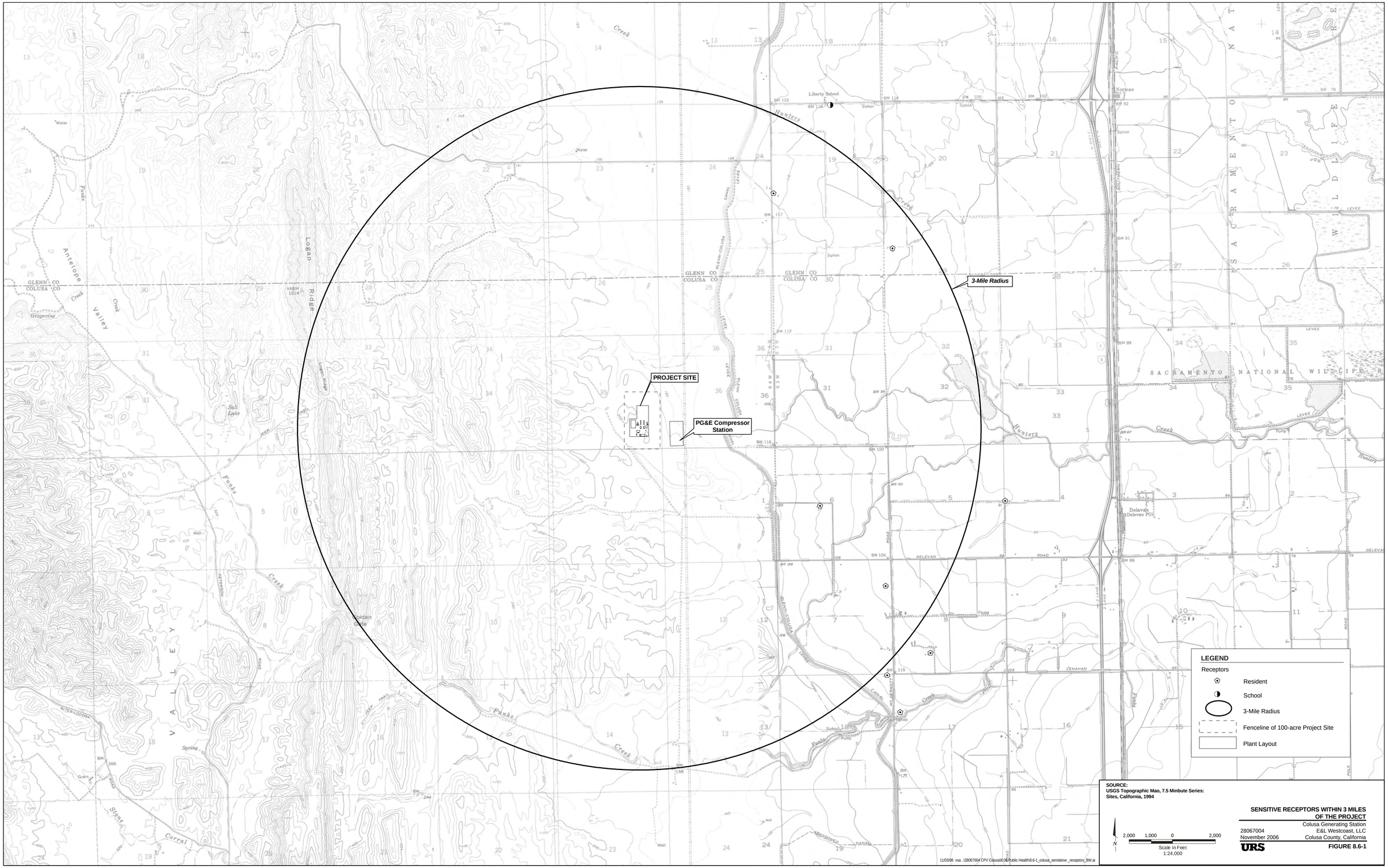
Table 8.6-6 Summary of Compliance with Public Health Laws, Ordinances, Regulations, And Standards			
Authority	**Administering Agency**	**Requirement**	**Colusa Generating Station Project Compliance**
Federal			
Clean Air Act (CAA)	USEPA CARB CCAPCD	Protect public from unhealthful exposure from air pollutants.	Based on the results of the risk assessment, air toxics do not exceed acceptable levels (Section 8.6, 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 8.1 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	Ensure protection of environmental quality, requires quantitative HRA.	The HRA in Section 8.6, Public Health, of this AFC satisfies this requirement.
H&SC § 25500-25542; 10 CR § 2720-2734	Colusa County CUPA, Colusa County Environmental Health Department	Requires a business plan and RMP where acutely hazardous materials are stored.	The project will update the RMP for aqueous per CUPA guidance.
California Clean Air Act, TAC Program, H&SC § 39650, et seq.	CCAPCD with CARB oversight	Requires quantification of TAC emissions, use of BACT, and preparation of an HRA.	The project will not cause unsafe exposure to TACs based on results of HRA (Section 8.6, Public Health), and has performed a BACT assessment (Section 8.1, Air Quality).
H&SC, Part 6, § 44300 et seq. (Air Toxics “Hot Spots”)	CCAPCD with CARB/OEHHA oversight	Regulates a business plan and public exposure to air toxics. Requires inventory of TACs and HRA.	The HRA presented in Section 8.6, Public Health, of this AFC satisfies this requirement.

Table 8.6-6
Summary of Compliance with Public Health Laws, Ordinances, Regulations, And Standards

Authority	Administering Agency	Requirement	Colusa Generating Station Project Compliance
H&SC § 41700	CCAPCD with CARB oversight	Prohibits emissions in quantities that adversely affect public health, other businesses or property.	Section 8.1, Air Quality, and the HRA (Section 8.6, Public Health) presented in this AFC satisfy this requirement.
Local			
CCAPCD Rule 3.18	CCAPCD	Requires use of TBACT for major sources.	TBACT will be applied.
CCAPCD Rule 4.10	CCAPCD	Requires annual fees for the Air Toxic "Hot Spots" (AB2588)	The HRA presented in Section 8.6, Public Health, of this AFC and the payment of fees to CCAPCD satisfy these requirements.

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	CCAPCD	= Colusa County Air Pollution Control 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
TBACT	= Toxic Best Available Control Technology	USEPA	= United States Environmental Protection Agency



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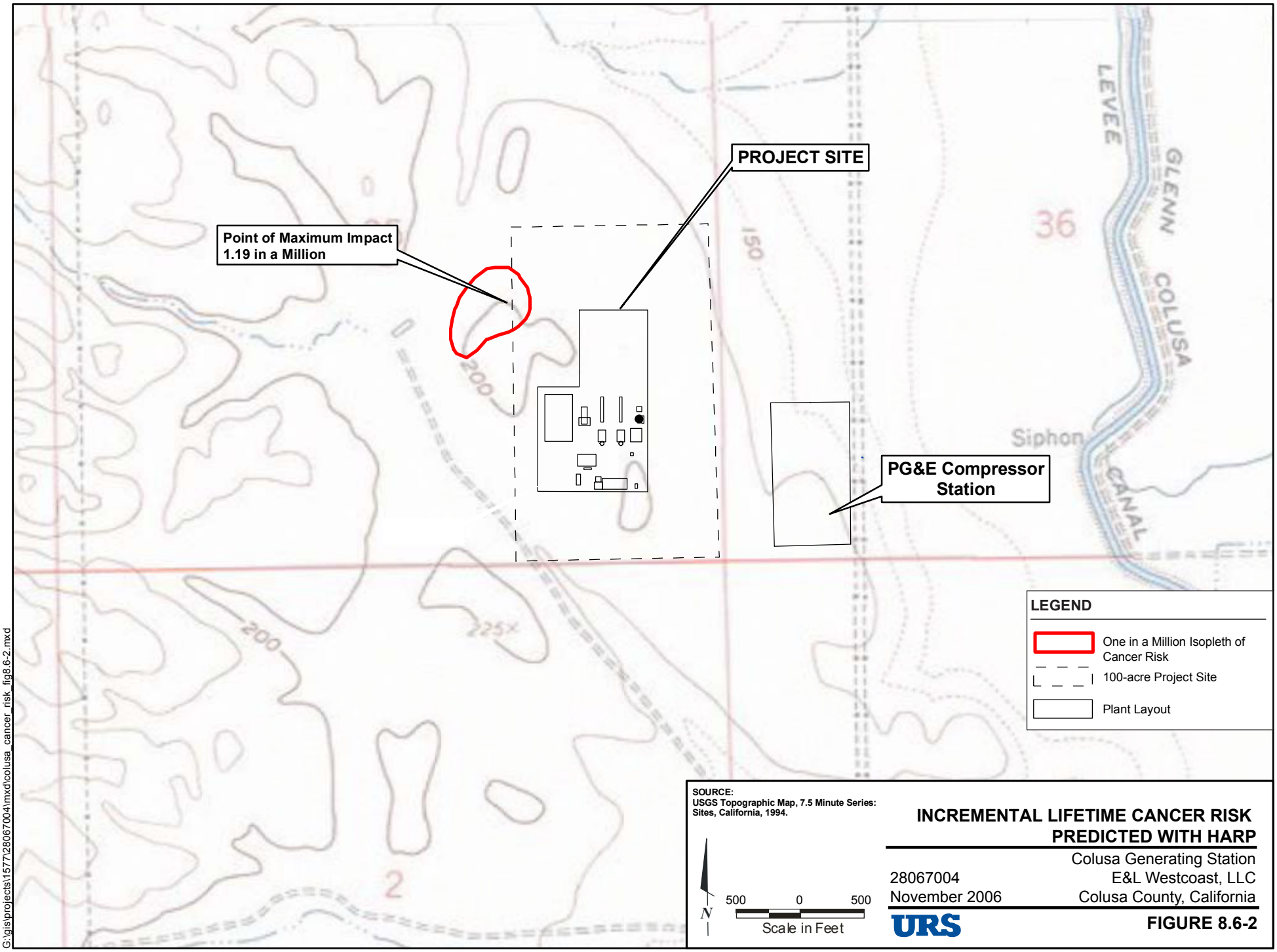

INCREMENTAL LIFETIME CANCER RISK PREDICTED WITH HARP

Colusa Generating Station
E&L Westcoast, LLC
Colusa County, California

28067004
November 2006

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FIGURE 8.6-2

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