5.9 Public Health

This section presents the methodology and results of a human Health Risk Assessment (HRA) performed to assess potential effects and public exposure associated with airborne emissions from the routine operation of the Contra Costa Generating Station (CCGS or project). Section 5.9.1 describes the affected environment. Section 5.9.2 discusses the environmental consequences from the operation of the power facility and associated facilities. Section 5.9.3 discusses cumulative effects. Section 5.9.4 discusses mitigation measures. Section 5.9.5 presents applicable laws, ordinances, regulations, and standards (LORS). Section 5.9.6 lists agency contacts, and Section 5.9.7 provides permit requirements and schedules. Section 5.9.8 contains references cited or consulted in preparing this section.

The Applicant is proposing to construct and operate a nominal 624-megawatt (MW) combined-cycle, combustion-turbine-based electrical generating facility in Contra Costa County, California. The proposed new turbine installation will be constructed on the existing DuPont facility site in Oakley.

Air will be the dominant pathway for public exposure to chemical substances released by the project. Emissions to the air will consist primarily of combustion byproducts from the new combustion turbines and the proposed fire pump engine. Potential health risks from combustion emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways were included in the health risk modeling; however, direct inhalation is considered the most likely exposure pathway. The HRA was conducted in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (OEHHA) and the California Air Resources Board (CARB) (OEHHA/CARB, 2003).

Combustion byproducts with established California Ambient Air Quality Standards (CAAQS) or National Ambient Air Quality Standards (NAAQS), including nitrogen oxides (NO_x), carbon monoxide (CO), and fine particulate matter (PM_{10}/$PM_{2.5}$) are addressed in Section 5.1, Air Quality. However, some discussion of the potential health risks associated with these substances is presented in this section. Human health risks associated with the potential accidental release of stored hazardous materials are discussed in Section 5.5, Hazardous Materials Handling.

5.9.1 Affected Environment

The project site is on 21.95 acres located within the boundary of an existing 210-acre site owned by DuPont. CCGS holds an option to purchase the 21.95-acre site, and DuPont is currently proceeding with a lot line adjustment to separate the site from the larger 210-acre parcel. The site is currently zoned "heavy industrial," with surrounding land uses comprised of industrial, vacant industrial, commercial, and agricultural. The City of Oakley is revising its zoning regulations to match its 2020 General Plan. The site zoning will change from "Heavy Industrial" to "Utility Energy" land use, with the reminder of the DuPont site classified as "Business Park" or "Light Industrial."

The site is bounded to the west by the Pacific Gas and Electric Company's (PG&E) Antioch Terminal, a large natural gas transmission hub; to the north by DuPont property that is industrial and vacant industrial; to the east by DuPont's titanium dioxide landfill area; and

to the south by the Atchison, Topeka, and Santa Fe railroad. Immediately south of the railroad is a large parcel currently in agriculture. A 74.6-acre commercial development, the Rivers Oaks Crossing, has been proposed for this parcel.

The site elevation is approximately 32 feet above mean sea level. Because the site is in the existing DuPont property boundary, the project site and surrounding areas are highly developed, and have been subject to disturbance for many years.

The site Universal Transverse Mercator (UTM) coordinates are 610177 meters easting, 4207415 meters northing, Zone 10 (NAD27).

The site is in census tract 3020.03. Figures 5.1D-1, Sensitive Receptor Map, and 5.1D-2, Census Tracts in the Immediate Impact Area (Appendix 5.1D) show the site, sensitive receptor locations, and surrounding census tracts. The Census Findings table (Appendix 5.1D) presents a summary of data for each identified census tract adjacent to the site.

Sensitive receptors are defined as groups of individuals that may be more susceptible to health risks from chemical exposure. Public and private schools, day care facilities, convalescent homes, and hospitals are of particular concern. Appendix 5.1D presents a detailed listing of near-field sensitive receptors. The nearest sensitive receptors based on receptor type are listed in Table 5.9-1. Appendix 5.1D provides data on the population by census tract.

TABLE 5.9-1
Nearest Sensitive Receptors By Receptor Type

Receptor ID	Receptor Type	UTM Coordinates (E/N), meters
Nearest Residence-1	Residence	611203, 4207655
Nearest Residence-2	Residence	610938, 4207390
Nearest School	School	612604, 4206870
Nearest Hospital	Hospital	604974, 4204348
Nearest Daycare	Daycare Center	N/A
Nearest Convalescent Home	Convalescent Home	N/A
Nearest Worker (offsite)	Offsite Worker	610323, 4207564

N/A = indicates no such receptor type in the near-field radius of 2-3 miles.
Source: All coordinates from Google Earth (center location of each receptor location), converted to NAD27.

Air quality and health risk data presented by CARB in the 2008 Almanac of Emissions and Air Quality for the state shows that from 1990 through 2008 the average concentrations for the top 10 toxic air contaminants (TACs) have been substantially reduced, and the associated health risks for the state are showing a steady downward trend. This same trend is expected to have occurred in the San Francisco Bay Area Air Basin (SFBAAB). CARB-estimated emissions inventory values for the top 10 TACs for 2007 to 2008 are presented in Table 5.9-2.

TABLE 5.9-2
Top 10 Toxic Air Contaminants for the SFBAAB

TAC	SFBAAB Year 2008 Emissions (tons/yr)	Annual Average Concentration, 2007	Predicted Cancer Risk, per 10^6, 2007
Acetaldehyde	9103	0.56 ppb	3
Benzene	10794	0.274 ppb	25
1,3 Butadiene	3754	0.06 ppb	23
Carbon tetrachloride	4.04	ND	ND
Chromium 6	0.61	0.053 $\mu g/m^3$	8
Para-Dichlorobenzene	1508	ND	ND
Formaldehyde	20951	1.45 ppb	11
Methylene Chloride	6436	0.13 ppb	<1
Perchloroethylene	4982	0.031 ppb	1
Diesel PM	35884	ND	ND

Source: CARB, 2009a

5.9.2 Environmental Analysis

5.9.2.1 Significance Criteria

5.9.2.1.1 Cancer Risk

Cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are not assumed to have a threshold below which there would be no human health effect. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (that is, a linear, no-threshold model). Under various state and local regulations, an incremental cancer risk greater than 10 in a million from a project is considered to be a significant effect on public health. For example, the 10 in a million risk level is used by the Air Toxics Hot Spots (AB 2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

5.9.2.1.2 Non-Cancer Risk

Non-cancer health effects can be classified as either chronic or acute. In determining the potential health risks of non-cancerous air toxics, it is assumed there is a dose of the chemical of concern below which there would be no effect on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). Non-cancer health risks are measured in terms of a hazard quotient, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for pollutants affecting the same target organ are typically summed with the resulting totals expressed as hazard indices for each organ system. A hazard index of less than 1.0 is considered to be an insignificant health risk. For this HRA, all hazard quotients were summed regardless of target organ. This method leads to a conservative, upper-bound assessment. RELs used in the hazard index calculations were those published in the CARB/OEHHA listings (CARB, 2009b).

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

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

5.9.2.2 Construction Phase Effects

The construction phase is expected to take approximately 33 months. No significant public health effects are expected during the construction phase. Strict construction practices that incorporate safety and compliance with applicable LORS will be followed (see Section 5.9.5). Additionally, mitigation measures to reduce air emissions from construction effects will be implemented as described in Section 5.1, Air Quality.

Temporary emissions from construction-related activities are discussed in Section 5.1, Air Quality. Ambient air modeling for particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), CO, sulfur dioxide (SO_2), and NO_x was performed as described in Section 5.1, Air Quality. Construction-related emissions are temporary and localized, resulting in no long-term effects to the public.

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

5.9.2.3 Operational Phase Effects

Environmental consequences potentially associated with the operation of the project are potential human exposure to chemical substances emitted to the air. The human health risks potentially associated with these chemical substances were evaluated in an HRA. The chemical substances potentially emitted to the air from the project turbine/heat recovery steam generator (HRSG), auxiliary boiler, fire pump engine, and evaporative cooler cells are listed in Table 5.9-3.

TABLE 5.9-3
Chemical Substances Potentially Emitted to the Air from the Project

Criteria Pollutants	
Particulate Matter	
Carbon Monoxide	
Sulfur Oxides	
Nitrogen Oxides	
Volatile Organic Compounds	
Lead	
Noncriteria Pollutants (Toxic Pollutants)	
Ammonia	Xylene
Polycyclic Aromatic Hydrocarbons (PAHs)	Arsenic
Acetaldehyde	Aluminum
Acrolein	Cadmium
Benzene	Chromium VI
1-3 Butadiene	Copper
Ethylbenzene	Iron
Formaldehyde	Mercury
Hexane (n-Hexane)	Manganese
Naphthalene	Nickel
Propylene	Silver
Propylene Oxide	Zinc
Toluene	Diesel PM

Emissions of criteria pollutants will adhere to NAAQS and CAAQS as discussed in Section 5.1, Air Quality. The project also will include emission control technologies necessary to meet the required emission standards specified for criteria pollutants under Bay Area Air Quality Management District (BAAQMD) rules. Offsets will be required because the project will be a new major source. Finally, air dispersion modeling results (presented in Section 5.1, Air Quality) show that emissions will not result in concentrations of criteria pollutants in air that would cause exceedances of ambient air quality standards (either NAAQS or CAAQS) or applicable significance thresholds. These standards are intended to protect the general public with a wide margin of safety. Therefore, the project is not anticipated to have a significant effect on public health from emissions of criteria pollutants.

Potential effects associated with emissions of toxic pollutants to the air from the project were addressed in an HRA, presented in Appendix 5.1D. The HRA was prepared using guidelines developed by OEHHA and CARB, as implemented in the latest version of the Hotspots Analysis and Reporting Program (HARP) model (Version 1.4a)(HARP, 2003). As an input into HARP, the HARP On-Ramp preprocessor (as compiled by CARB on February 3, 2009) was used to convert the AERMOD model output into a suitable format for HARP (HARP, 2004).

5.9.2.4 Public Health Effect Study Methods

Emissions of toxic pollutants potentially associated with the project were estimated using emission factors approved by CARB and the U.S. Environmental Protection Agency (EPA). Concentrations of these pollutants in air potentially associated with project emissions were estimated using the HARP dispersion modeling module. Modeling allows the estimation of short- and long-term average concentrations in air for use in an HRA, accounting for site-specific terrain and meteorological conditions. Health risks potentially associated with the estimated concentrations of pollutants in the air were characterized in terms of excess lifetime cancer risks (for carcinogenic substances), or comparison with reference exposure levels for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the maximum impact receptor (MIR). The hypothetical MEI is an individual assumed to be at the MIR location, which is a residential receptor where the highest concentrations of air pollutants associated with project emissions are predicted to occur, based on the air dispersion modeling. Human health risks associated with emissions from the project are unlikely to be higher at any other location than at the location of the MIR. If there is no significant effect associated with concentrations in air at the MIR location, it is unlikely that there would be significant effects in any location in the vicinity of the project. The highest concentration location represents the MIR.

Health risks potentially associated with concentrations of carcinogenic air pollutants were calculated as estimated excess lifetime cancer risks. The excess lifetime cancer risk for a pollutant is estimated as the product of the concentration in air and a unit risk value. The unit risk value is defined as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 microgram per cubic meter ($\mu g/m^3$) over a 70-year lifetime. In other words, it represents the increased cancer risk associated with continuous exposure to a concentration in the air over a 70-year lifetime. Evaluation of potential non-cancer health effects from exposure to short- and long-term concentrations in the air was performed by comparing modeled concentrations in air with the RELs. An REL is a concentration in the air at or below which no adverse health effects are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential non-cancer effects were evaluated by calculating a ratio of the modeled concentration in the air and the REL. This ratio is referred to as a hazard quotient. The unit risk values and RELs used to characterize health risks associated with modeled concentrations in the air were obtained from the Consolidated Table of OEHHA/CARB Approved Risk Assessment Health Values (CARB, 2009b), and are presented in Table 5.9-4.

There were no identified or available health studies through the local public health department concerning the potentially affected population(s) within a 6-mile radius of the proposed power plant site related to respiratory illnesses, cancers, or related diseases.

Emissions of the various toxic and/or hazardous air pollutants are detailed in Appendix 5.1A.

TABLE 5.9-4
Toxicity Values Used to Characterize Health Risks (Inhalation)

Compound	Unit Risk Factor $(\mu g/m^3)^{-1}$	Chronic Reference Exposure Level $(\mu g/m^3)$	Acute Reference Exposure Level $(\mu g/m^3)$
Ammonia	—	200	3,200
Acetaldehyde	0.0000027	140	470
Acrolein	—	0.35	2.5
Benzene	0.000029	60	1,300
1-3 Butadiene	0.00017	20	—
Ethylbenzene	0.0000025	2,000	—
Formaldehyde	0.000006	9	55
Hexane	—	7,000	—
Naphthalene	0.000034	9	—
PAHs (as BaP)	0.0011	—	—
Propylene	—	3,000	—
Propylene Oxide	.0000037	30	3,100
Toluene	—	300	37,000
Xylene	—	700	22,000
Arsenic	0.0033	0.015	0.20
Aluminum	—	—	—
Cadmium	0.0042	0.02	—
Chromium VI	0.15	0.2	—
Copper	—	—	100
Iron	—	—	—
Lead	0.000012	—	—
Mercury	—	0.03	0.6
Manganese	—	0.09	—
Nickel	0.00026	0.05	6
Silver	—	—	—
Zinc	—	—	—
Diesel PM	0.0003	5	—

Source: CARB, 2009b.

5.9.2.5 Characterization of Risks from Toxic Air Pollutants

Based on 8,449 hours of operation, the excess lifetime cancer risk associated with concentrations in air estimated for the project MIR location is estimated to be 2.14×10^{-6}. Excess lifetime cancer risks less than 1×10^{-6} are unlikely to represent significant public health effects that require additional controls of facility emissions. Risks higher than 1×10^{-6} may or may not be of concern, depending upon several factors. These include the conservatism of assumptions used in risk estimation, size of the potentially exposed population, and toxicity of the risk-driving chemicals. Health effects risk thresholds are listed in Table 5.9-5. Risks associated with pollutants potentially emitted from the Project are

presented in Table 5.9-6. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 5.1D. As described previously, human health risks associated with emissions from the project are unlikely to be higher at any other location than at the location of the MIR. If there is no significant effect associated with concentrations in air at the MIR location, it is unlikely that there would be significant effects in any other location in the project vicinity.

TABLE 5.9-5
Health Effects Significant Threshold Levels for BAAQMD

Risk Category	Risk Threshold
Cancer Risk	1 per million without T-BACT 10 per million with T-BACT
Acute Hazard Index	<= 1.0
Chronic Hazard Index	<= 1.0
Cancer Burden	N/A

N/A = not applicable to the BAAQMD
T-BACT = Toxic Best Available Control Technology

Source: BAAQMD Regulation 2, Rule 5.

Cancer risks potentially associated with facility emissions also were assessed in terms of cancer burden. Cancer burden is a hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the project. Cancer burden is calculated as the worst-case product of excess lifetime cancer risk and the number of individuals at that risk level. A worst-case estimate of cancer burden was calculated based on the following assumptions.

TABLE 5.9-6
Project HRA Summary

	Turbines/HRSGs, Auxiliary Boiler, Fire Pump, and Evaporative Cooler	
Risk Category	**Project Values**	**Applicable Significance Threshold**
Cancer Risk	2.14×10^{-6}	10.0×10^{-6} with T-BACT
Chronic Hazard Index	0.0604	1.0
Acute Hazard Index*	0.344	1.0
Cancer Burden	0.02	N/A

Notes:
MIR effect area lies in Tract 3020.03, with a total population of ~10231.
*at the maximum acute impact receptor.

N/A = not applicable in the BAAQMD
T-BACT = Toxic Best Available Control Technology

Source: Radback Energy CCGS Team, 2009.

A detailed listing and map of affected census tracts and year 2000 population estimates are provided in Appendix 5.1D, Public Health.

As described previously, human health risks associated with project emissions are unlikely to be higher at any other location than at the MIR. Therefore, the risks for all of these individuals would be lower (and in most cases, substantially lower) than 2.14×10^{-6}. The estimated cancer burden was ~0.02, indicating that emissions from the project would not be associated with any increase in cancer cases in the previously defined population. Additionally, the cancer burden is less than the California threshold value. The methods used in this calculation considerably overstate the potential cancer burden, further suggesting that project emissions are unlikely to represent a significant public health effect in terms of cancer risk. Risk results for all of the identified nearfield sensitive receptors were well below the MIR values noted above.

The acute non-cancer hazard quotient associated with concentrations in air is shown in Table 5.9-6. The acute non-cancer hazard quotients for all target organs fall below 1.0. A hazard quotient less than 1.0 is unlikely to represent significant effect to public health. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 5.1D. Human health risks associated with project emissions are unlikely to be higher at any other location than at the MIR. If there is no significant effect associated with concentrations in the air at the MIR location, it is unlikely that there would be significant effects in any other location in the project vicinity.

Detailed risk and hazard values are provided in the HARP output presented in Appendix 5.1D.

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

An excess lifetime cancer risk of 1×10^{-6} is typically used as a screening threshold of significance for potential exposure to carcinogenic substances in air. The excess cancer risk level of 1×10^{-6}, which has historically been judged to be an acceptable risk, originates from efforts by the Food and Drug Administration to use quantitative HRA for regulating carcinogens in food additives in light of the zero tolerance provision of the Delany Amendment (Hutt, 1985). The associated dose, known as a "virtually safe dose," has become a standard used by many policy makers and the lay public for evaluating cancer risks. However, a study of regulatory actions pertaining to carcinogens found that an acceptable risk level can often be determined on a case-by-case basis. This analysis of 132 regulatory decisions, found that regulatory action was not taken to control estimated risks below 1×10^{-6} (one in a million), which are called de minimis risks. De minimis risks are historically considered risks of no regulatory concern. Chemical exposures with risks above 4×10^{-3}, called de manifestis risks, were consistently regulated. De manifestis risks are

typically risks of regulatory concern. The risks falling between these two extremes were regulated in some cases, but not in others (Travis et al., 1987).

The estimated lifetime cancer risks to the maximally exposed individual located at the project MIR are well below the 10×10^{-6} significance level, and the aggregated cancer burden associated this risk level is less than 1.0 excess cancer case. Additionally, the cancer burden is less than the California threshold value. These risk estimates were calculated using assumptions that are highly health conservative. Evaluation of the risks associated with project emissions should consider that the conservatism in the assumptions and methods used in risk estimation considerably overstates the risks. Based on the results of this HRA, there are no significant public health effects anticipated from emissions of toxic pollutant to the air from the project.

5.9.2.6 Hazardous Materials

Hazardous materials will be used and stored at the project site. The hazardous materials stored in significant quantities onsite and descriptions of their uses are presented in Section 5.5, Hazardous Materials Handling. Use of chemicals at the project site will be in accordance with standard practices for storage and management of hazardous materials. Normal use of hazardous materials, therefore, will not pose significant effects to public health. While mitigation measures will be in place to prevent releases, accidental releases that migrate off-site could result in potential effects to the public.

The California Accidental Release Program (CalARP) regulations and Code of Federal Regulations (CFR) Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for specific hazardous materials. These regulations require preparation of a Risk Management Plan (RMP), which is a comprehensive program to identify hazards and predict the areas that may be affected by a release of a program listed hazardous material. Any RMP-listed materials proposed to be used at the project are discussed in Section 5.5, Hazardous Materials Handling.

5.9.2.7 Operation Odors

The project is not expected to emit or cause to be emitted any substances that could cause odors.

5.9.2.8 Electromagnetic Field Exposure

Electromagnetic fields (EMFs) occur independently of one another as electric and magnetic fields at the 60- Hertz frequency used in transmission lines, and both are created by electric charges. Electric fields exist when these charges are not moving. Magnetic fields are created when the electric charges are moving. The magnitude of both electric and magnetic fields falls off rapidly as the distance from the source increases (proportional to the inverse of the square of distance).

Because the electric transmission line does not travel through residential areas, and based on recent findings of the National Institute of Environmental Health Sciences (NIEHS, 1999), EMF exposures are not expected to result in a significant effect on public health. The NIEHS report to the U.S. Congress found that "the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory

support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm" (NIEHS, 1999).

California does not have a regulatory level for magnetic fields. However, the values estimated for the project are well below those established by states that do have limits. Other states have established regulations for magnetic field strengths that have limits ranging from 150 milligauss to 250 milligauss at the edge of the right-of-way, depending on voltage. The California Energy Commission does not specify limits on magnetic fields for 230-kilovolt transmission lines.

5.9.2.9 Legionella

In addition to being a source of potential toxic air contaminants, the possibility exists for bacterial growth to occur in the evaporative cooler cells, including *Legionella*. *Legionella* is a bacterium that is ubiquitous in natural aquatic environments and is also widely distributed in human-made water systems. It is the principal cause of legionellosis, otherwise known as Legionnaires' disease, which is similar to pneumonia. Transmission to people results mainly from inhalation or aspiration of aerosolized contaminated water. Untreated or inadequately treated cooling systems, such as industrial evaporative cooler cells and building heating, ventilating, and air conditioning systems, have been correlated with outbreaks of legionellosis.

Legionella can grow symbiotically with other bacteria and can infect protozoan hosts. This provides *Legionella* with protection from adverse environmental conditions, including making it more resistant to water treatment with chlorine, biocides, and other disinfectants. Thus, if not properly maintained, cooling water systems and their components can amplify and disseminate aerosols containing *Legionella*.

The State of California regulates recycled water for use in cooling tower cells in Title 22, Section 60303, California Code of Regulations. This section requires that evaporative cooler chlorine or another biocide must be used to treat the cooling system water to minimize the growth of *Legionella* and other microorganisms to protect workers and the public who may come into contact with cooling tower mists. The EPA published an extensive review of *Legionella* in a human health criteria document (EPA, 1999). The EPA noted that *Legionella* may propagate in biofilms (collections of microorganisms surrounded by slime they secrete, attached to either inert or living surfaces) and that aerosol-generating systems, such as evaporative cooler cells, can aid in the transmission of *Legionella* from water to air. The EPA has inadequate quantitative data on the infectivity of *Legionella* in humans to prepare a dose-response evaluation. Therefore, sufficient information is not available to support a quantitative characterization of the threshold infective dose of *Legionella*. Thus, the presence of even small numbers of *Legionella* bacteria presents a risk, however small, of disease in humans.

In 2000, the Cooling Tower Institute (CTI) issued its own report and guidelines for the best practices for control of *Legionella* (CTI, 2000). The CTI found that 40 to 60 percent of industrial evaporative cooler cells tested were found to contain *Legionella*. The CTI noted that consensus recommendations included minimization of water stagnation, minimization of process leads into the cooling system that provide nutrients for bacteria, maintenance of overall system cleanliness, the application of scale and corrosion inhibitors as appropriate,

the use of high-efficiency mist eliminators on cooling tower cells, and the overall general control of microbiological populations. Good preventive maintenance is important for the efficient operation of cooling tower cells and other evaporative equipment (ASHRAE, 1998). Preventive maintenance includes having effective drift eliminators, periodically cleaning the system if appropriate, maintaining mechanical components in working order, and maintaining an effective water treatment program with appropriate biocide concentrations. The efficacy of any biocide in ensuring that bacteria, and in particular *Legionella* growth, is kept to a minimum is contingent on several factors, including proper dosage amounts, appropriate application procedures, and effective monitoring.

To ensure that *Legionella* growth is kept to a minimum, thereby protecting nearby workers and the public, an appropriate biocide program and anti-biofilm agent monitoring program would be prepared and implemented for the entire evaporative cooler. These programs would ensure that proper levels of biocide and other agents are maintained within the evaporative cooler water at all times, that periodic measurements of Legionella levels are conducted, and that periodic cleaning is conducted to remove bio-film buildup. The mitigation measure presented in Section 5.9.4 would reduce to insignificant the chances of *Legionella* growing and dispersing (Risk Science Associates, 2008).

5.9.2.10 Summary of Effects

Results from the air toxics HRA based on emissions modeling indicate that there will be no significant incremental public health risks from construction or operation of the project. Results from criteria pollutant modeling for routine operations indicate that potential ambient concentrations of NO_2, CO, SO_2, and PM_{10} will not significantly affect air quality (Section 5.1, Air Quality). Potential concentrations are below the federal and California standards established to protect public health, including the more sensitive members of the population.

5.9.3 Cumulative Effects

The HRA for the project indicates that the maximum cancer risk will be approximately 2.14×10^{-6}, versus a significance threshold of 10.0 in 1 million with T-BACT at the point of maximum exposure to air toxics from power facility emissions. This risk level is considered to be insignificant. Non-cancer chronic and acute effects also will be less than significant. Therefore, the risk of effects from the project combining with effects from other past, present, and reasonably foreseeable future projects to make a significant effect are also very low. A cumulative health risk effect analysis is not proposed at this time because of the low emissions and low risks from the project.

5.9.4 Mitigation Measures

5.9.4.1 Criteria Pollutants

Emissions of criteria pollutants will be minimized by applying Best Available Control Technology (BACT) to the project. BACT for the turbines/HRSGs, auxiliary boiler, fire pump, and new evaporative condenser cells is discussed in Appendix 5.1F.

The project location is in an area that is designated by the federal air agencies as non-attainment for ozone and particulate matter. Pursuant to BAAQMD New Source Review

Rule, offsets are required for the project. Therefore, further mitigation of emissions is not required to protect public health.

5.9.4.2 Toxic Pollutants

Emissions of toxic pollutants to the air will be minimized through the use of BACT/T-BACT.

5.9.4.2.1 Legionella Mitigation Measure

The Applicant will develop and implement a Cooling Water Management Plan to ensure that the potential for bacterial growth in cooling water is kept to a minimum. The plan will be consistent with the CTI's "Best Practices for Control of *Legionella*" guidelines and will include sampling and testing for the presence of *Legionella* bacteria at appropriate intervals (Risk Science Associates, 2008).

5.9.4.3 Hazardous Materials

Mitigation measures for hazardous materials are presented below and discussed in more detail in Section 5.5, Hazardous Materials Handling. Potential public health effects from the use of hazardous materials are only expected to occur as a result of an accidental release. The facility has many safety features designed to prevent and minimize effects from the use and accidental release of hazardous materials. The project site will include the design features listed below.

- Curbs, berms, and/or secondary containment structures will be provided where accidental release of chemicals may occur.
- A fire-protection system will be included to detect, alarm, and suppress a fire in accordance with applicable LORS.
- Construction of all storage systems will be in accordance with applicable construction standards and LORS.

If required, a RMP for the facility will be prepared prior to commencement of operations. The RMP will estimate the risk presented by handling affected materials at the site. The RMP will include a hazard analysis, offsite consequence analysis, seismic assessment, emergency response plan, and training procedures. The RMP process will accurately identify and propose adequate mitigation measures to reduce the risk to the lowest possible level.

A safety program will be implemented and will include safety training programs for contractors and operations personnel, including instructions on the proper use of personal protective equipment, safety operating procedures, fire safety, and emergency response actions. The safety program also will include programs on safely operating and maintaining systems that use hazardous materials. Emergency procedures for personnel include power facility evacuation, hazardous material spill cleanup, fire prevention, and emergency response.

Areas subject to potential leaks of hazardous materials will be paved and bermed. Incompatible materials will be stored in separate containment areas. Containment areas will

be drained to either a collection sump or to holding or neutralization tanks. Also, piping and tanks exposed to potential traffic hazards will be additionally protected by traffic barriers.

5.9.5 Laws, Ordinances, Regulations, and Standards

An overview of the regulatory process for public health issues is presented in this section. The relevant LORS that affect public health and are applicable to the project are identified in Table 5.9-7. The conformity of the project with each of the LORS applicable to public health is also presented in this table, with references to the sections in this report where each of these issues is addressed. Table 5.9-7 also lists the primary agencies responsible for public health and the general category of the public health concern regulated by each.

TABLE 5.9-7
Summary of LORS – Public Health

LORS	Applicability	Primary Regulatory Agency	Project Conformance	Conformance (AFC Section)
Federal Clean Air Act Title III	Public exposure to air pollutants	EPA Region 9 CARB BAAQMD	Based on results of HRA as per CARB/OEHHA guidelines, toxic contaminants do not exceed acceptable levels. Emissions of criteria pollutants will be minimized by applying BACT to the Project.	Section 5.9, and Appendix 5.1D
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986— Proposition 65)	Public exposure to chemicals known to cause cancer or reproductive toxicity	OEHHA	Based on results of HRA as per CARB/OEHHA guidelines, toxic contaminants do not exceed thresholds that require exposure warnings.	Section 5.9, and Appendix 5.1D
40 CFR Part 68 (Risk Management Plan) and CalARP Program Title 19	Public exposure to specific hazardous materials	EPA Region 9 Contra Costa County Department of Health Services	A vulnerability analysis will be performed to assess potential risks from a spill or rupture from any affected storage tank. An RMP (if required) will be prepared prior to commencement of Project operations.	Section 5.9, and Appendix 5.1D, Section 5.5
Health and Safety Code Sections 25531 to 25541	Public exposure to specifichazardous materials	Contra Costa County Department of Health Services CARB BAAQMD	A vulnerability analysis will be performed to assess potential risks from a spill or rupture from any affected storage tank.	Section 5.5
California Health and Safety Code 25500-25542	Hazmat Inventory	State Office of Emergency Services and Contra Costa County Department of Environmental Health	Prepare all required hazardous material plans and inventories, distribute to affected agencies	Section 5.5

TABLE 5.9-7
Summary of LORS – Public Health

LORS	Applicability	Primary Regulatory Agency	Project Conformance	Conformance (AFC Section)
California Health and Safety Code 44300 et seq.	AB2588 Air Toxics Program	BAAQMD	Participate in the AB2588 inventory and reporting program at the District level.	Section 5.9, and Appendix 5.1D
BAAQMD Regulation 2, Rule 5	Toxics New Source Review	BAAQMD	Application of BACT and T-BACT, preparation of HRA	Section 5.9, and Appendix 5.1D
California Health and Safety Code 25249.5	Proposition 65	OEHHA	Comply with all signage and notification requirements.	Section 5.5
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Public exposure to toxic air contaminants	CARB BAAQMD	Based on results of HRA as per CARB/OEHHA guidelines, toxic contaminants do not exceed acceptable levels.	Section 5.9, and Appendix 5.1D

5.9.6 Agencies and Agency Contacts

Table 5.9-8 provides contact information for agencies involved with public health.

TABLE 5.9-8
Summary of Agency Contacts for Public Health

Public Health Concern	Primary Regulatory Agency	Regulatory Contact
Public exposure to air pollutants	EPA Region 9	Gerardo Rios Chief, Permits Section EPA-Region 9 75 Hawthorne St. San Francisco, CA 94105 (415) 947-3974
	CARB	Mike Tollstrup 1001 1 Street, 19th Floor Sacramento, CA 95814 (916) 322-6026
	BAAQMD	Brian Bateman Director, Engineering Division 939 Ellis St. San Francisco, Ca. 94109 415-771-4653
Public exposure to chemicals known to cause cancer or reproductive toxicity	OEHHA	Cynthia Oshita or Susan Long P.O. Box 4010 Sacramento, CA 95812-4010 (916) 445-6900

TABLE 5.9-8
Summary of Agency Contacts for Public Health

Public Health Concern	Primary Regulatory Agency	Regulatory Contact
Public exposure to acutely hazardous materials	EPA Region 9	Gerardo Rios Chief, Permits Section EPA-Region 9 75 Hawthorne St. San Francisco, CA 94105 (415) 947-3974
	Contra Costa County Health Services, Hazardous Materials Division	Randy Sawyer Director, Haz Mat Programs 4333 Pacheco Blvd. Martinez, Ca. 94553 (925) 646-2286

Source: Radback Energy CCGS Team, 2009.

5.9.7 Permits and Permit Schedule

Agency-required permits related to public health include an RMP and BAAQMD Permit to Construct/Permit to Operate. These requirements are discussed in Section 5.5, Hazardous Materials Handling, and Section 5.1, Air Quality, respectively.

5.9.8 References

California Air Resources Board (CARB). 2009a. California Almanac of Emissions and Air Quality – 2009 Edition. Planning and Technical Support Division.

California Air Resources Board (CARB). 2009b. Consolidated table of OEHHA/ARB approved risk assessment health values. (http://arbis.arb.ca.gov/toxics/healthval/contable.pdf)

Hotspots Analysis and Reporting Program (HARP). 2003. User Guide, Version 1.4a. CalEPA-Air Resources Board. December.

Hotspots Analysis and Reporting Program (HARP). 2004. Express User Manual. Dillingham Software Engineering, Inc., Version 2.07, September.

Hutt, P.B. 1985. Use of quantitative risk assessment in regulatory decision making under federal health and safety statutes, in Risk Quantitation and Regulatory Policy. Eds. D.G. Hoel, R.A. Merrill and F.P. Perera. Banbury Report 19, Cold Springs Harbor Laboratory.

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

OEHHA/CARB (Office of Environmental Health Hazard Assessment/California Air Resources Board). 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, CalEPA, August 2003. HARP Model, Version 1.4a, Updated July 2008.

Radback Energy – Contra Costa Generating Station, Project Research Team, 2009.

Risk Science Associates, Inc. 2008. Liberty Energy XXIII-Renewable Energy Power Plant Project, Draft EIR, Public Health Section D.11, Aspen Environmental Group, June.

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

Travis, C.C., E.A.C. Crouch, R. Wilson and E.D. Klema. 1987. Cancer risk management: A review of 132 federal regulatory cases. Environ. Sci. Technol. 21:415-420.

U.S. Environmental Protection Agency. 1999. *Legionella*: Human Health Criteria Document. EPA -822-R-99-001. November.