5.9 Public Health

This section presents the methodology and results of a human health risk assessment performed to assess potential impacts and public exposure associated with airborne emissions from the construction and operation of the Almond 2 Power Plant (A2PP). TID has performed a screening health risk assessment in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (OEHHA),[1] the California Air Resources Board (CARB),[2] and the San Joaquin Valley Air Pollution Control District (SJVAPCD).[3] The results of this risk assessment demonstrate that the potential impacts of the project will be below public health-related thresholds of significance. Beneficial aspects of the A2PP regarding protection of public health include the following:

- Use of clean-burning natural gas fuel
- Low-sulfur content of the natural gas, which reduces sulfate fine particulate and sulfur dioxide (SO_2) generation
- Advanced SPRINT combustion gas turbine technology to minimize the amount of fuel and associated combustion emissions needed to produce electricity
- Water injection and selective catalytic reduction (SCR) technology to control nitrogen oxides (NO_x) emissions
- Oxidation catalyst technology to control carbon monoxide (CO) emissions, and to reduce emissions of various toxic air contaminants (TAC)
- Optimized stack height to reduce ground-level concentrations of exhaust pollutants below public health-related significance thresholds

These project features will ensure that the public health impacts of the A2PP will be minimized.

Section 5.9.1 introduces the subject of public health impact analysis for a power plant proposed in a California Energy Commission (CEC) Application for Certification (AFC). Section 5.9.2 describes the potentially affected public health environment around the proposed project site. Section 5.9.3 discusses the environmental impacts from construction and operation of the power plant and associated facilities. Section 5.9.4 discusses potential cumulative public health impacts of the combined TAC[4] emissions from the A2PP project, the existing TID Almond Power Plant units, and other projects, if any, in the process of obtaining Authority to Construct permits or reasonably known by SJVAPCD to be entering the permitting process. Section 5.9.5 discusses mitigation measures that may be needed to reduce potentially significant impacts below a level of significance. Section 5.9.6 describes the laws, ordinances, regulations and standards (LORS) relevant to potential public health impacts of such a project. Section 5.9.7 provides the agencies involved in public health

[1] OEHHA. Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, April 2005.

[2] CARB. Consolidated Table of OEHHA/CARB-Approved Risk Assessment Health Values, February 2009, at http://www.arb.ca.gov/toxics/healthval/healthval.htm.

[3] SJVAPCD. Guidance for Air Dispersion Modeling, January 2007.

[4] Also called non-criteria pollutants.

aspects of permitting and the California Environmental Quality Act (CEQA) analysis for the proposed project, along with agency contact information. Section 5.9.8 describes public health-related permits for the A2PP, and the schedule for obtaining those permits. Section 5.9.9 provides the references cited or consulted in preparing this section.

5.9.1 Introduction

Inhalation will be the dominant pathway for potential public exposure to non-criteria pollutants released by the A2PP. Emissions to the air will consist primarily of combustion by-products produced by the gas turbines. The health risk modeling presented in this section examines potential health risks from various potential pathways including direct inhalation, dermal absorption, soil ingestion, home-grown vegetable consumption,[5] and mother's milk ingestion.

A2PP will use efficient, natural gas-fired technology to minimize emissions of pollutants per unit of electric energy generated, and will use an optimized stack height to reduce ground-level concentrations of the emissions, thus reducing potential effects on public health.

Combustion byproducts with established national and California ambient air quality standards (referred to as "criteria pollutants") are addressed in Section 5.1, Air Quality. Discussion of the potential health risks associated with these criteria pollutants is presented in Section 5.1. Human health risks potentially associated with accidental releases of stored hazardous materials at A2PP (such as anhydrous ammonia) are discussed in Section 5.5, Hazardous Materials Handling.

5.9.2 Affected Environment

The proposed approximately 4.6-acre A2PP project site is located in Ceres, California, approximately 2 miles southwest of the Ceres city center. The A2PP site is located immediately north of the existing Almond Power Plant. The project site is nearly level, at an elevation of approximately 80 feet above sea level. Essentially flat terrain extends for many miles on all sides of the project site. The project site is located in the SJVAPCD.

The WinCo distribution warehouse is west of the A2PP site, a farm supply facility is to the north, and the lands to the east include various industrial facilities including a modular building distributor and drilling equipment storage laydown area. A railroad line owned by Union Pacific Railroad is aligned along the eastern boundary of the project site.

Lands within a 1-mile radius of the A2PP site are within the City of Ceres and Stanislaus County. These lands are primarily agricultural fields and almond orchards (west, south, and east of the project site), single-family residences (northeast of the project site), and a community agricultural center (northwest of the project site). The City of Ceres Wastewater Treatment Plant is located approximately 0.5 mile east of the project site. See Figure 5.6-1 for existing land uses within 1 mile of project site.

[5] This non-standard pathway was included at the request of the SJVAPCD staff.

The nearest residences are approximately 0.3 mile northeast of the A2PP site. Additional residences within 1 mile of the project site are located to the west, on Crows Landing Road; to the south, on Grayson Road; and to the southeast, on Morgan Road.

Sensitive receptors are locations where groups of individuals—including infants, children, the elderly and chronically ill—who may be more susceptible than the general population to health risks from air pollution may be found. Schools, day-care facilities, convalescent homes and hospitals are of particular concern. In accordance with guidance from the CEC,[6] a search was conducted for sensitive receptors within 3 miles of the A2PP site. Daycare, preschool, and school receptors found within 3 miles are listed in Appendix 5.9A, Tables 5.9A-1 and 5.9A-2, with their Universal Transverse Mercator coordinates, and are shown in Appendix 5.9A and Figures 5.9-2a through 5.9-2c.[7] The combined set of all sensitive receptors is shown on Figure 5.9-1, and in more detail on the scale of 1:24,000 in Appendix 5.9A and Figures 5.9-4a and 5.9-4b. The figure shows no public health impacts because indices of cancer risk and non-cancer chronic and acute health hazards are less than significant at and beyond the project boundary (see Section 5.9.4).

Air quality and health risk data presented by CARB in the 2008 Almanac of Emissions and Air Quality for the San Joaquin Valley Air Basin show that over the period 1990 through 2005, the average concentrations for the top ten TACs have been substantially reduced, and the associated health risks for the San Joaquin Valley Air Basin are showing a steady downward trend as well. CARB-estimated emissions inventory values for the top ten TACs for 2006 and ambient levels and associated potential risks are presented in Table 5.9-1 for the air basin.

TABLE 5.9-1
Top Ten TACs Emitted by All Sources in the San Joaquin Valley Air Basin

		2006 Levels and Risks	
TAC	**2006 Emissions (tons/year)**	**Annual Average Concentration (ppbv)**	**Potential Health Risk[a] (in 1 million)**
Acetaldehyde	1,761	1.3	6
Benzene	1,789	0.36	34
1,3-Butadiene	503	0.07	26
Carbon tetrachloride	0	0.10 (2003)	26 (2003)
Chromium, hexavalent	0.22	0.05 ng/m^3	8
Para-Dichlorobenzene	147	0.15	10
Formaldehyde	4,396	2.8	20
Methylene chloride	429	0.11	<1
Perchloroethylene	588	0.03	1

[6] Personal communication from Michael Ringer, CEC staff to Eric Walther, January 29, 1999.

[7] No nursing homes or hospitals were found within 3 miles of the facility.

TABLE 5.9-1
Top Ten TACs Emitted by All Sources in the San Joaquin Valley Air Basin

		2006 Levels and Risks	
TAC	2006 Emissions (tons/year)	Annual Average Concentration (ppbv)	Potential Health Risk[a] (in 1 million)
Acetaldehyde	1,761	1.3	6
Diesel PM[b]	7,695	1.3 μg/m^3 (2000)	390 (2000)
Total Health Risk[c]			105

[a]Health Risk represents the number of excess cancer cases per million people based on a 70-year exposure to the annual average concentration. Health risk represents only the compounds listed in this table and only those with data for the year. There may be other significant compounds for which monitoring and/or health risk information are not available.

[b]The Diesel PM concentrations are estimates based on receptor modeling, and are available only for selected years.

[c]Total Health Risk shown excludes Diesel PM because Diesel PM concentrations are not available for 2006.

Notes:

μg/m^3 = micrograms per cubic meter
ng/m^3 = nanograms per cubic meter
ppbv = parts per billion by volume

Source: CARB. The California Almanac of Emissions and Air Quality, 2008 Edition, http://www.arb.ca.gov/aqd/almanac/almanac08/almanac2008all.pdf. Appendix C, Table C-34.

A variety of studies have been published regarding cancer and respiratory illnesses and diseases in Stanislaus County and in the broader San Joaquin Valley area. Asthma diagnosis rates in the San Joaquin Valley are comparable to average rates throughout the state.[8] In Stanislaus County, the percentage of adults who have been diagnosed with asthma was 11.9 percent in 2005, compared with 12.7 percent of the population statewide. However, rates for children in Stanislaus County are slightly higher, at 20.4 percent compared with 16.1 percent statewide for the same time period.[9] Cancer death rates in the county have declined slightly between 1999–2000 and 2003–2005, from over 200 per 100,000 to under 190 per 100,000. However, cancer death rates in the county remain slightly higher than the statewide average of 180 per 100,000 population.[10] [11] The local public health department, Stanislaus County Public Health Services, provides information on its website regarding public health issues for residents in the vicinity of the proposed power plant site.[12]

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8 Great Valley Center, "The State of the Great Central Valley of California—Assessing the Region Via Indicators—Public Health and Access to Care," Second Edition, 2007.

9 Stanislaus County Asthma Profile, July 2008, accessed at http://www.schsa.org/PublicHealth/pdf/dataPublications/ca-breathing-asthma-data-for-stanislaus.pdf

10 Great Valley Center, "The State of the Great Central Valley of California—Assessing the Region Via Indicators—Public Health and Access to Care," January 2003.

11 Great Valley Center, "The State of the Great Central Valley of California—Assessing the Region Via Indicators—Public Health and Access to Care," Second Edition, 2007.

12 http://www.schsa.org/PublicHealth/

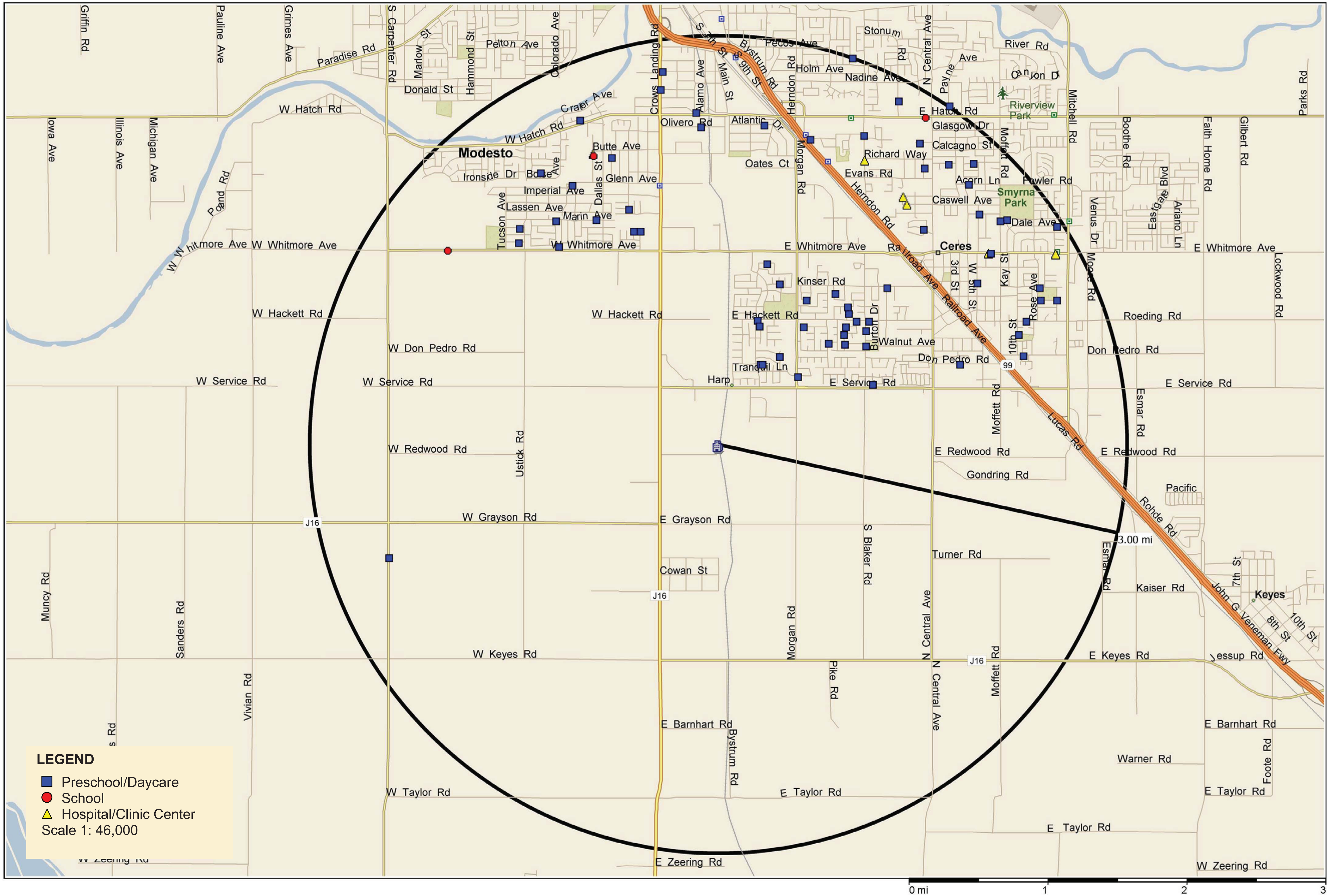

FIGURE 5.9-1
LOCATIONS OF SENSITIVE RECEPTORS
ALMOND 2 POWER PLANT
CERES, CALIFORNIA

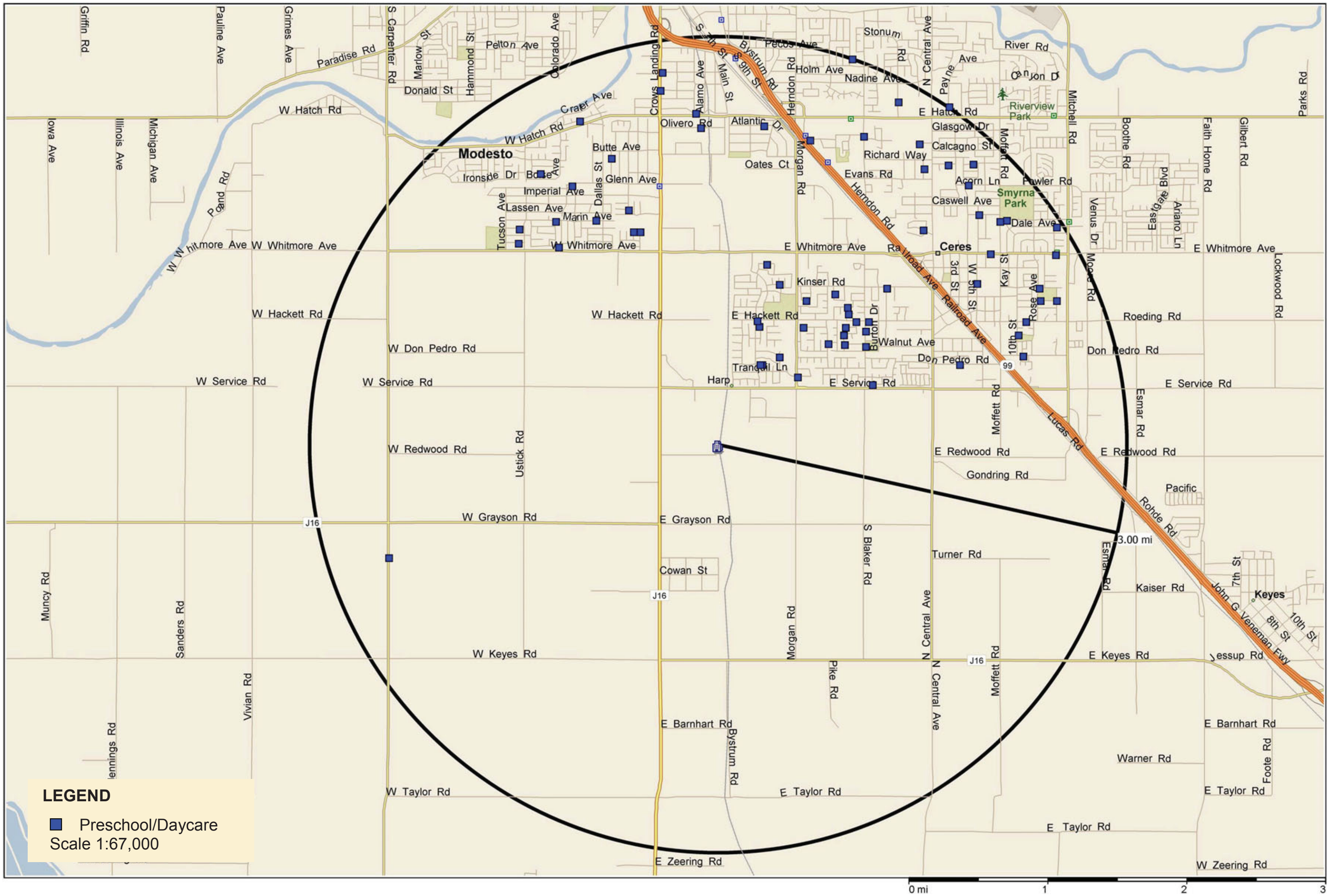

FIGURE 5.9-2A
LOCATIONS OF PRESCHOOL/DAYCARE FACILITIES WITHIN 3 MILES
ALMOND 2 POWER PLANT
CERES, CALIFORNIA

CH2MHILL

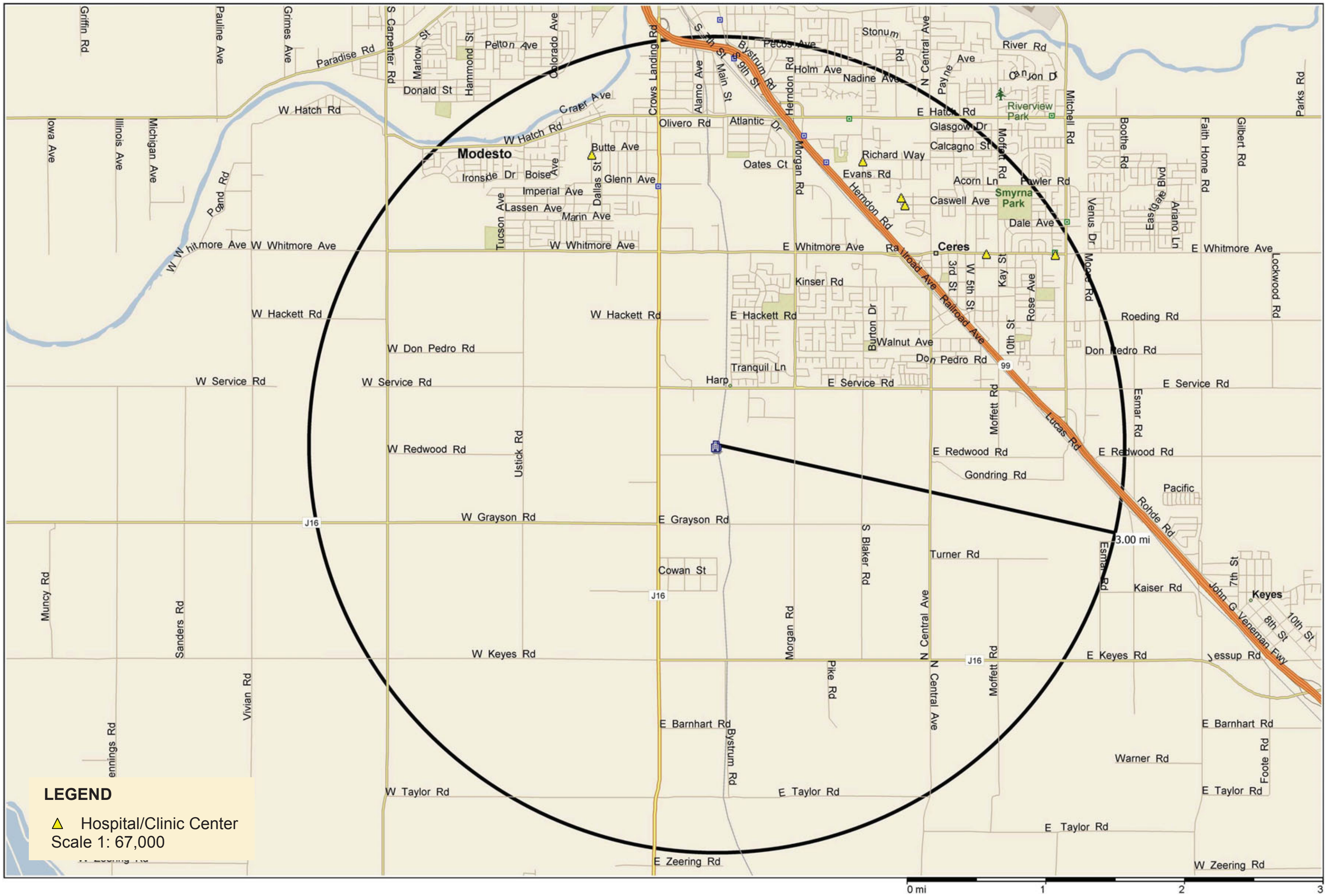

FIGURE 5.9-2B
LOCATIONS OF HOSPITAL/CLINIC FACILITIES WITHIN 3 MILES
ALMOND 2 POWER PLANT
CERES, CALIFORNIA

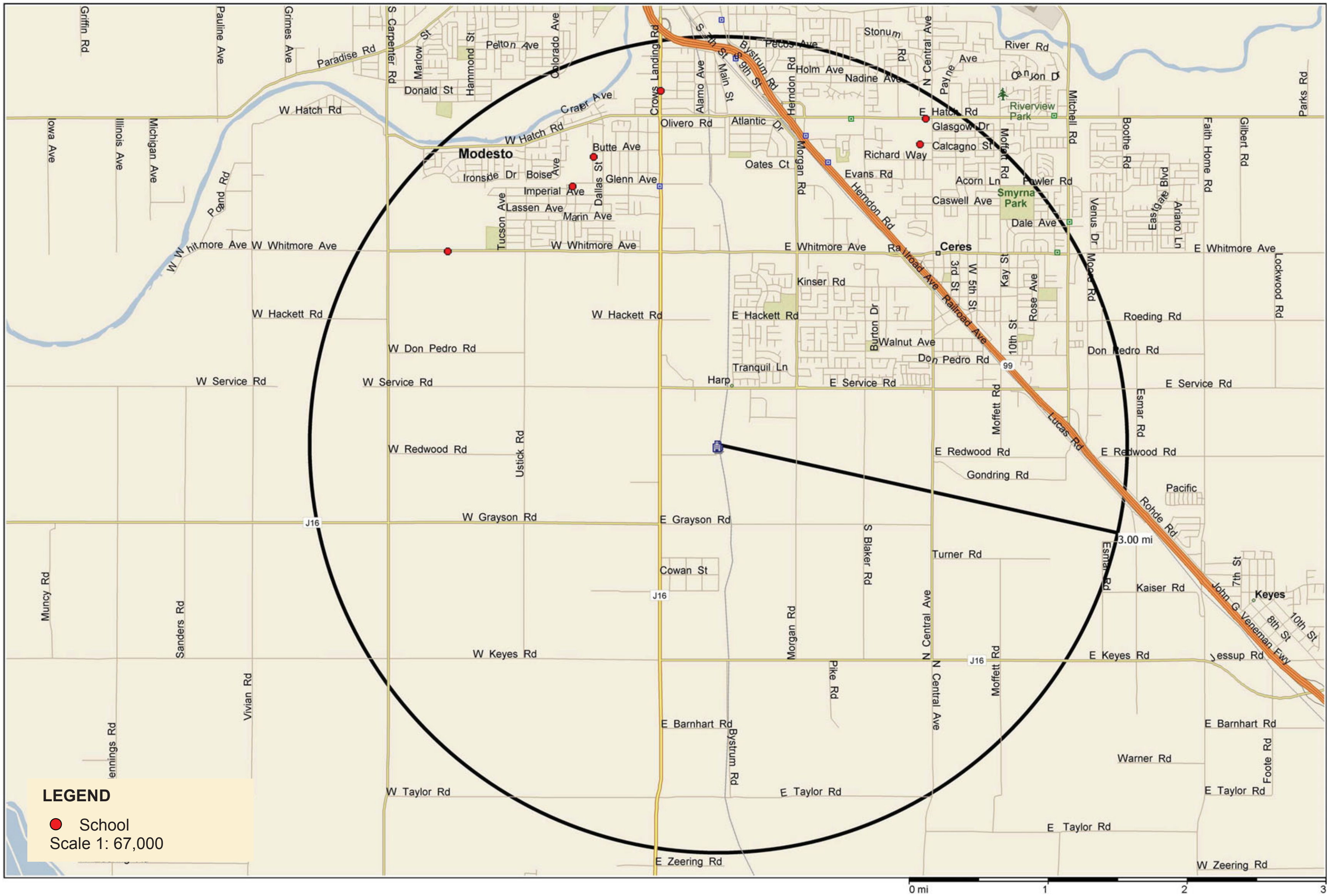

FIGURE 5.9-2C
LOCATIONS OF SCHOOLS WITHIN 3 MILES

ALMOND 2 POWER PLANT

CERES, CALIFORNIA

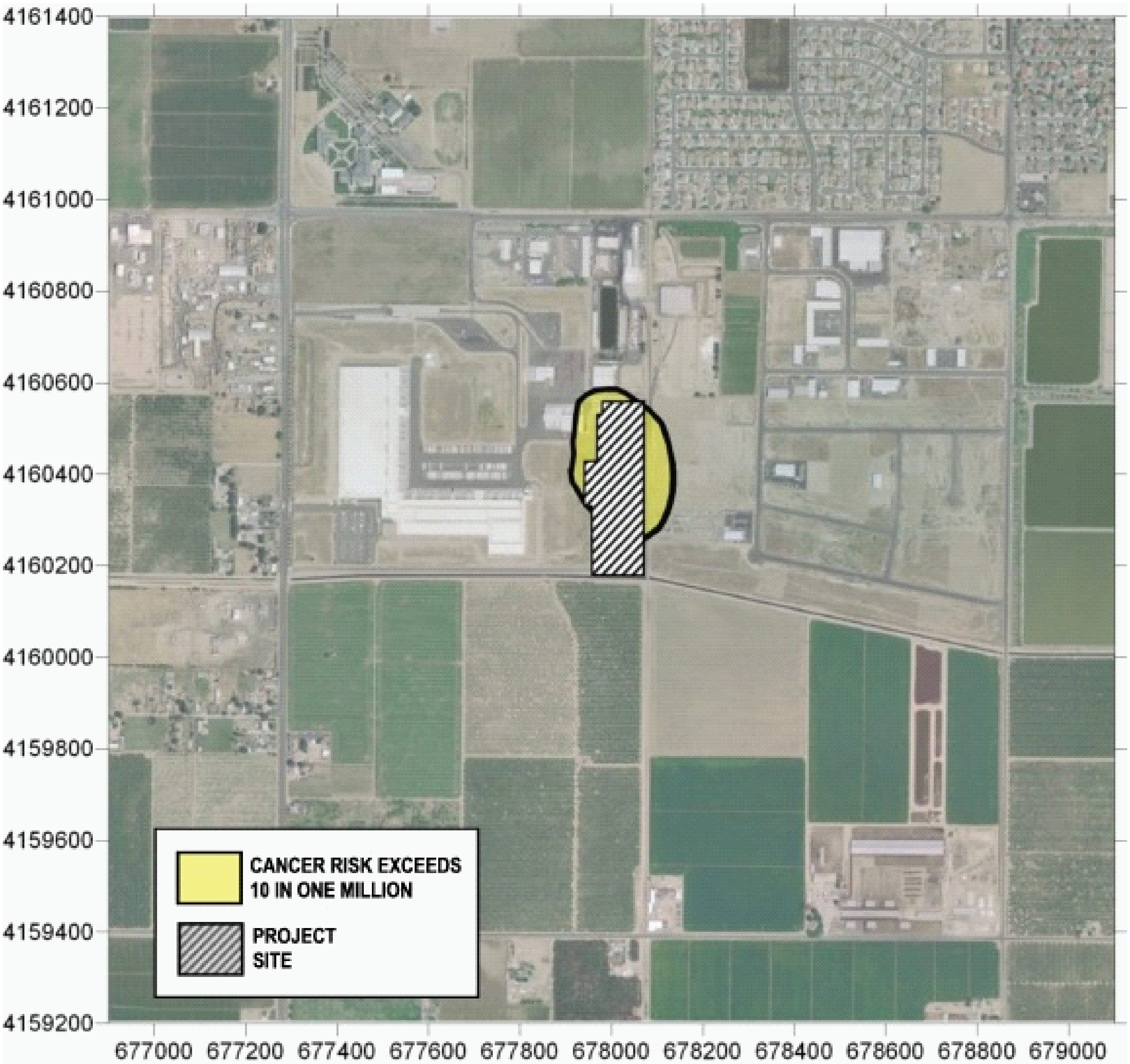

FIGURE 5.9-3
AREA WHERE CANCER RISK FROM DPM DURING CONSTRUCTION ACTIVITIES EXCEEDS 10 IN ONE MILLION
ALMOND 2 POWER PLANT
CERES, CALIFORNIA

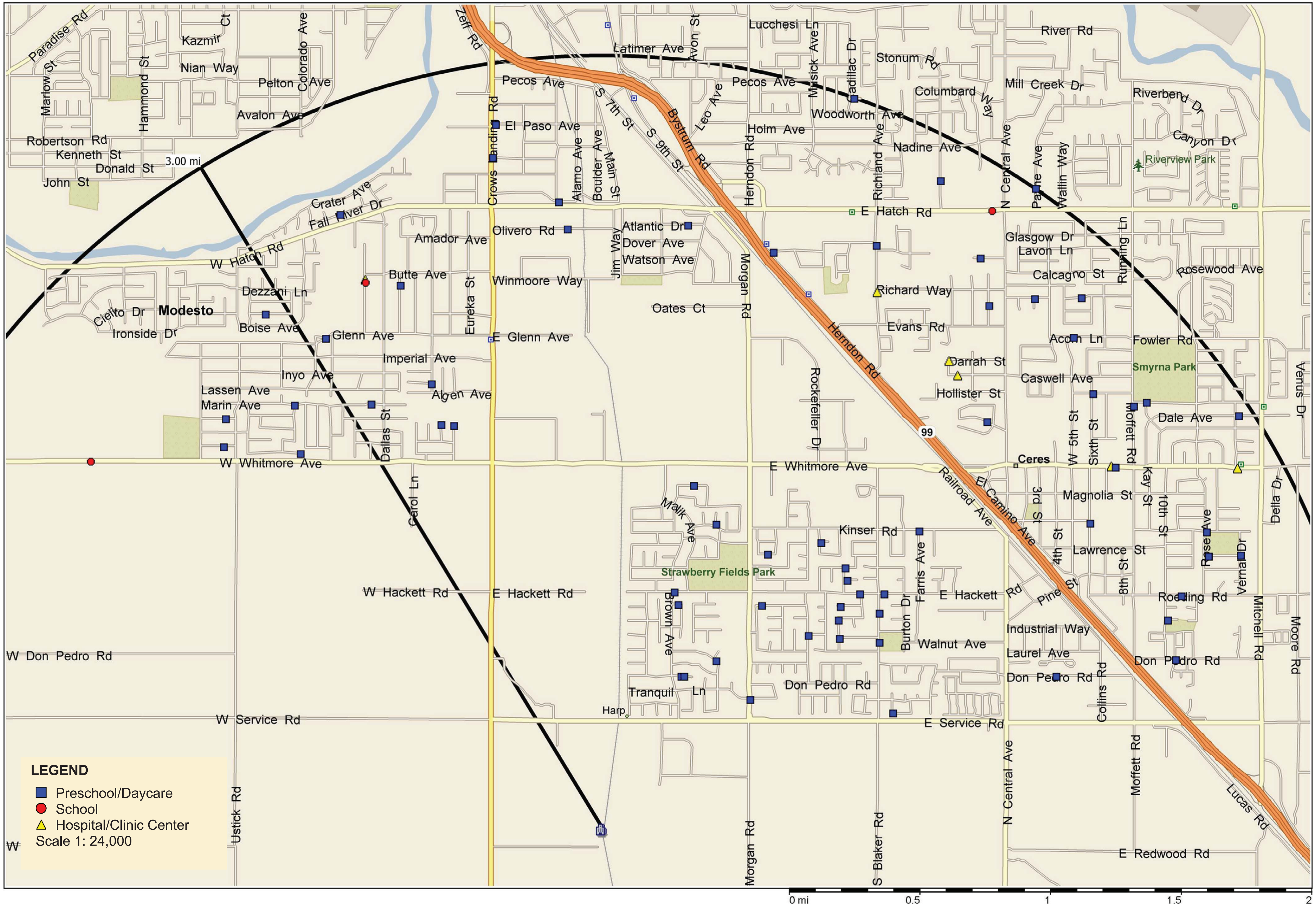

FIGURE 5.9-4A
LOCATIONS OF SENSITIVE RECEPTORS (NORTH HALF)
ALMOND 2 POWER PLANT
CERES, CALIFORNIA

FIGURE 5.9-4B
LOCATIONS OF SENSITIVE RECEPTORS (SOUTH HALF)
ALMOND 2 POWER PLANT
CERES, CALIFORNIA

CH2MHILL

5.9.3 Environmental Analysis

This section discusses the sources and different kinds of air emissions associated with construction and operation of the A2PP (see Section 5.1, Air Quality), the methodology used in health risk assessment, and the results of the assessment of potential health risks from the project. Other potential public health risks associated with the project are discussed in different sections of the AFC as follows:

- Potential exposure to wastes generated by the project is discussed in Section 5.14, Waste Management.
- Potential exposure to the hypothetical accidental release of anhydrous ammonia onsite or during offsite transport is discussed in Section 5.5, Hazardous Materials Handling.
- Potential safety and health impacts relative to the work environment of project employees are discussed in Section 5.16, Worker Health and Safety.
- Potential exposure to transmission line electric and magnetic fields is discussed in Section 3.3, Transmission System Safety and Nuisance.

Project emissions to the air will consist of combustion by-products from the natural gas-fired turbines. Inhalation is the main pathway by which air pollutants can potentially cause public health impacts. Other pathways, including dermal absorption and ingestion of soil, homegrown vegetables, and mother's milk, are also evaluated for potential exposure. As discussed below, these health impacts will not be significant.

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

5.9.3.1 Significance Criteria

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

5.9.3.1.1 Cancer Risk

Cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are assumed to have no threshold below which there would be no human health impact. Any exposure to a carcinogen is assumed to have some probability of causing cancer: the lower the exposure, the lower the cancer risk (i.e., a linear, no-threshold model). Under state and SJVAPCD regulations, an incremental cancer risk greater than 10-in-one million due to a project is considered to be a significant impact on public health if the emitting units are determined by SJVAPCD to be using Toxics Best Available Control Technology (T-BACT).[13] The 10-in-one-million risk level is also used by the Air Toxics "Hot Spots" (AB 2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

Animal studies or human epidemiological studies (often based on workplace exposures) are used to estimate the relationship between the dose of a particular carcinogen and the

[13] The threshold would be 1 in one million if the emitting units were determined not to be applying T-BACT.

resulting excess cancer risk. The cancer potency factor for that carcinogen is the slope of that dose-response relationship. Cancer risk is estimated by multiplying the dose of a particular carcinogen times its cancer potency factor. The dominant exposure pathway is inhalation; however, additional exposure pathways are considered in this screening health risk assessment.

5.9.3.1.2 Non-Cancer Health Impact

Non-cancer health effects can be either long-term (chronic) or short-term (acute). In determining potential non-cancer health risks from air toxics, it is assumed there is a dose of the TAC below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). A non-cancer health impact is measured in terms of a health hazard quotient for each TAC, which is the modeled maximum annual concentration of each TAC divided by its REL. Health hazard quotients for TACs affecting the same target organ are typically summed, with the resulting totals expressed as health hazard indices for each organ system. A health hazard index of less than 1.0 is considered by the regulatory agencies to be a less-than-significant health risk.

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 health hazard index was calculated as the sum of the chronic health hazard quotients, each of which is calculated as the chronic TAC annual concentration divided by the chronic REL of the TAC.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure of no more than 24 hours. For most chemicals, the air concentration required to produce acute effects is higher than the level required to produce chronic effects because the duration of exposure is shorter. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all acute health hazard quotients are typically summed to calculate the acute health hazard index. This method leads to an upper bound assessment.

The maximum one-hour average concentration of each TAC with acute health effects is divided by the specific TAC's acute REL to obtain a health hazard quotient for health effects caused by relatively high, short-term exposure to air toxics. RELs used in the hazard index calculations were those published in the CARB/OEHHA listings dated December 2008. The new RELs adopted by OEHHA on December 19, 2008, included 8-hour average RELs for acetaldehyde, acrolein and formaldehyde.[14] However, these 8-hour RELs are not yet included in CARB's Hotspots Analysis and Reporting Program (HARP) so are not evaluated in this screening health risk assessment. CARB indicates that the 8-hour health factors "will be added after OEHHA approves the Guidelines Manual (Part V)."[15]

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[14] Eight-hour RELs were also adopted for arsenic, manganese, and mercury. However, those chemicals are not emitted in any significant amount from natural gas-fired gas turbines so are not included in this screening HRA.

[15] CARB, "February 2009 Changes to the Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values," available at http://www.arb.ca.gov/toxics/healthval/changes.pdf.

5.9.3.2 Construction Impacts

Construction of the A2PP is expected to take approximately 12 months. No significant public health effects are expected during construction. Strict construction practices that incorporate safety and compliance with applicable LORS will be followed. In addition, mitigation measures to reduce air emissions from construction impacts will be implemented as described in Section 5.1.

Temporary air emissions from construction are presented in detail in Appendix 5.1E, followed by a criteria pollutant air dispersion analysis that demonstrates ambient air quality standards will not be exceeded by construction of the project. The dominant emission with potential health risk is Diesel particulate matter (DPM) from combustion of Diesel fuel in construction equipment (e.g., cranes, dozers, excavators, graders, front-end loaders, backhoes). DPM emissions from on-site construction are summarized in Table 5.9-2.

TABLE 5.9-2
Maximum Onsite Construction DPM Emissions

Emitting Activity	Pounds per Day	Tons per Year
Construction Equipment	3.86	0.40

The detailed health risk assessment (HRA) calculations in Appendix 5.1D demonstrate that the potential cancer risk of DPM emissions during project construction will exceed the significance threshold of 10 in one million. This HRA was performed in accordance with OEHHA (2003) guidance, which requires adjusting the 70-year lifetime exposure risk for an exposure period of 9 years (despite the fact that project construction will only last 12 months). The resulting maximum off-property cancer risk would be approximately 29 in one million. The area which exceeds the 10 in one million risk level extends only about 50 meters beyond the facility fenceline. Although the 10-in-one-million significance threshold is exceeded for temporary construction-related impacts, the affected area does not include any residences or sensitive receptors (see Figure 5.9-3).

Ambient air modeling for PM_{10}, CO, SO_2, and NO_2 was performed as described in Section 5.1.5.3 and Appendix 5.1D. Construction-related emissions are temporary and localized, resulting in no long-term significant health impacts to the public.

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

5.9.3.3 Operations Impacts

Potential human health impacts associated with the A2PP result from exposure to air emissions from operation of the natural gas-fired, simple-cycle gas turbines. The non-criteria pollutants emitted from the project include certain volatile organic compounds and polycyclic aromatic hydrocarbons (PAHs) from the combustion of natural gas and ammonia from the

SCR NOx control systems. These pollutants are listed in Table 5.9-3, and the detailed emission summaries and calculations are presented in Appendix 5.1D.

TABLE 5.9-3
Pollutants Emitted to the Air from Almond 2 Power Plant

Criteria Pollutants	**Non-criteria Pollutants (Continued)**
Carbon monoxide	Hexane
Oxides of nitrogen	Naphthalene
Particulate matter	Propylene
Oxides of sulfur	Propylene oxide
Volatile organic compounds	Toluene
	Xylene
Non-criteria (Toxic) Pollutants	Hexane
Ammonia	PAHs
Acetaldehyde	Benzo(α)anthracene
Acrolein	Benzo(α)pyrene
1,3-Butadiene	Benzo(β)fluoranthene
Benzene	Benzo(k)fluoranthene
Dichlorobenzene	Chrysene
Ethylbenzene	Dibenz(a,h)anthracene
Formaldehyde	Indeno(1,2,3-cd)pyrene

Emissions of criteria pollutants will not cause or contribute significantly to violations of the national or California ambient air quality standards as discussed in Section 5.1, Air Quality. The project will include Best Available Control Technology (BACT) as required under SJVAPCD rules.

Air dispersion modeling results (see Section 5.1.5) show that emissions will not result in ambient concentrations of criteria pollutants that exceed ambient air quality standards, with the exception of the state PM_{10} and federal $PM_{2.5}$ standards. For these pollutants, existing 24-hour and annual average PM_{10} and $PM_{2.5}$ background concentrations already exceed ambient standards, while modeling results indicate the project would not add a significant contribution. These standards are intended to protect the general public with a wide margin of safety. Therefore, the project will not have a significant impact on public health from emissions of criteria pollutants.

The health risk assessment presented in this section was performed using the latest version (1.4a) of CARB's HARP model, the February 2009 health database, and associated guidance.[16]

5.9.3.4 Public Health Impact Study Methods

Emissions of non-criteria pollutants from the project were analyzed using emission factors previously approved by the SJVAPCD, CARB, and the U.S. Environmental Protection

[16] OEHHA. Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, August 2003; and SDAPCD. Supplemental Guidelines for Submission of Air Toxics "Hot Spots" Program Health Risk Assessments (HRAs), March 2005.

Agency (EPA). Air dispersion modeling combined the emissions with site-specific terrain and meteorological conditions to analyze short-term and long-term arithmetic mean concentrations in air for use in the health risk assessment. The EPA-recommended air dispersion model, AERMOD, was used along with 4 years (2000-2004, excluding 2002) of compatible meteorological data from the Modesto meteorological station assembled and provided by the staff of SJVAPCD. The meteorological data combined surface measurements made at Modesto with upper air data from Oakland Airport. Because HARP is built on a previous EPA-approved air dispersion model, Industrial Source Complex Short Term, Version 3 (ISCST3), the CARB On-Ramp was used to integrate the air dispersion modeling output from the required air dispersion model, AERMOD, with the risk calculations in the HARP risk module.[17]

5.9.3.4.1 Risk Analysis Method

The screening analysis for the criteria pollutant modeling analysis was performed using the AERMOD model, the 4-year Modesto meteorological data set, specific receptor grids, and the stack parameters for operating cases at four different ambient temperatures. The results of the screening modeling analysis (see Section 5.1, Air Quality) were used to determine the turbine operating conditions that are expected to produce the highest annual and 1-hour average concentrations, and these conditions were used in modeling cancer risk and chronic health hazard index, and acute health hazard index, respectively. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of potential lifetime cancer risk (for carcinogenic substances), or comparison with RELs for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical Maximum Exposed Individual (MEI) located at the Point of Maximum Impact (PMI). The cancer risk to the MEI at the PMI is referred to as the Maximum Incremental Cancer Risk, or MICR. Human health risks associated with emissions from the project are unlikely to be higher at any other location than at the PMI. If there is no significant impact associated with concentrations in air at the PMI location, it is assumed to be unlikely that there would be significant impacts in any other location. Health risks were also evaluated for a hypothetical Maximally Exposed Individual Resident (MEIR), an individual assumed to be located at the MEIR point (i.e., a residential receptor) where the highest concentrations of air pollutants associated with facility emissions are predicted to occur, based on air dispersion modeling. The PMI (and thus the MICR) is not necessarily associated with actual exposure because in many cases the PMI is in an uninhabited area. Therefore, the MICR is generally higher than the MEIR. Both the MICR and the MEIR are residential risks and are based on 24 hour per day, 365 day per year, 70 year lifetime exposure.

Health risks are also assessed for the hypothetical Maximally Exposed Individual Worker, or MEIW, at the PMI. This assessment reflects potential workplace risks, which have a shorter duration than residential risks. Workplace risks reflect 8 hour per day, 245 day per year, 40 year exposure.

Health risks potentially associated with concentrations of carcinogenic pollutants in air were calculated as estimated excess lifetime cancer risks. The total cancer risk at any specific location is found by summing the contributions from each carcinogen.

[17] HARB On-Ramp Version 1, accessed at http://www.arb.ca.gov/toxics/harp/downloads.htm.

The inhalation cancer potency factors and RELs used to characterize health risks associated with modeled concentrations in air are taken from the *Consolidated Table of OEHHA/CARB Approved Risk Assessment Health Values* (CARB, February 9, 2009) and are presented in Table 5.9-4.

TABLE 5.9-4
Toxicity Values Used to Characterize Health Risks

Toxic Air Contaminant	Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Chronic Reference Exposure Level ($\mu g/m^3$)	Acute Reference Exposure Level ($\mu g/m^3$)
Acetaldehyde	0.010	140	140
Acrolein	—	0.35	2.5
Ammonia	—	200	3,200
Benzene	0.10	60	1,300
1,3-Butadiene	0.60	20	—
Ethylbenzene	0.0087	2,000	—
Formaldehyde	0.021	9	55
Hexane	—	7,000	—
Naphthalene	0.12	9.0	—
PAHs (as BaP for HRA)	3.9	—	—
Propylene	—	3,000	—
Propylene oxide	0.013	30	3.100
Toluene	—	300	37,000
Xylene	—	700	22,000

Source: CARB/OEHHA, December 19, 2008.

5.9.3.5 Characterization of Risks from Toxic Air Pollutants

The estimated potential maximum cancer risks for the MICR at the location of maximum impact (PMI), for the MEIW and the MEIR are shown in Table 5.9-5. The maximum carcinogenic risk is well below the SJVAPCD's 10 in one million threshold of significance for sources applying T-BACT. The natural gas fuel and oxidation catalysts that will be used by the A2PP's Combustion turbine generators are T-BACT for this class and category of source.

Cancer risks potentially associated with the project 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 maximum product of any potential carcinogenic risk greater than 1 in one million and the number of individuals at that risk level. Because the MICR is less than 1 in one million, the potential cancer burden is zero.[18]

[18] If the potential MICR had substantially exceeded 1 in one million, then the worst-case estimate of cancer burden would have been calculated based on the following assumptions:

- The MICR concentration would have been applied to all affected portions of identified census tracts within the radius area defined by the distance to the 1st high (MEIR) concentration;
- A detailed listing and map of affected census tracts and year 2000 population estimates would then have been provided; and

TABLE 5.9-5
Summary of Estimated Maximum Potential Health Risks of the A2PP

Receptor	Carcinogenic Risk[a] (per million)	Cancer Burden	Acute Health Hazard Index	Chronic Health Hazard Index
Maximum Incremental Cancer Risk (MICR) at PMI	0.7	0	0.01	0.01
Maximally Exposed Individual Receptor (MEIR)	0.04	0	n/a[b]	0.01
Maximally Exposed Individual Worker (MEIW) at PMI	0.1	0	n/a[b]	n/a[c]
Significance Level	10	1.0	1.0	1.0

[a]Derived (OEHHA) Method used to determine significance of modeled risks.

[b]Acute analysis is always done as a single point exposure and is not affected by the type of analysis or exposure duration.

[c]The worker is assumed to be exposed at the work location for 8 hours per day, instead of 24; for 245 days per year, instead of 365; and for 40 years, instead of 70. Therefore, a 70-year-based chronic health hazard index is not applicable to a worker.

The maximum potential acute non-cancer health hazard index associated with concentrations in air is shown in Table 5.9-5. As indicated in Table 5.9-5, the acute non-cancer health hazard index for all target organs falls below 1.0, the threshold of significance.

Similarly, the maximum potential chronic non-cancer health hazard index associated with concentrations in air is also shown in Table 5.9-5. The chronic non-cancer health hazard index also falls below 1.0, the threshold of significance.

Therefore, the analyses of cancer and non-cancer risks associated with chronic or acute exposures demonstrates that the risks fall below significance thresholds used for regulating emissions of toxic air contaminants to the air.

Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. 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 (i.e., the assumption being that humans are as sensitive as the most sensitive animal species). Therefore, the risk is not likely to be higher than risks estimated using inhalation cancer potency factors and is most likely lower, and could even be zero (EPA, 1991).

The analysis of potential cancer risk described in this section employs methods and assumptions generally applied by regulatory agencies for this purpose. Given the importance of assuring public health, this analysis uses highly conservative methods and

- Figures would then have been presented to show the 1-, 2-, and 3-mile radius plots in relationship to the census tract locations and site.

This procedure, if it had been needed, would have resulted in a conservatively high estimate of cancer burden. However, as described above, because the calculated MICR for the project is less than 1 in one million, this procedure is not required.

assumptions, meaning they tend to over-predict the potential for adverse effects. Conservative methodology and assumptions include the following:

- The analysis includes representative weather data over a period of 4 years to ensure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included. The analysis then assumes that these worst-case weather conditions, which in reality occurred only once in 4 years, will occur every year for 70 years;
- The A2PP is assumed to operate at hourly, daily, and annual emission conditions that produce the highest ground-level concentrations. In reality, the power plant is not intended to be a baseload facility and is expected to operate at a variety of conditions that will produce lower emissions and impacts; and
- The location of the highest ground-level concentration of A2PP emissions is identified and the analysis then assumes that a sensitive individual resides at this location 24 hours a day, seven days a week over the entire 70-year period, even though these assumptions are physically impossible. In reality, people rarely live in their homes for 70 years, and even if they do, they leave their homes to attend school, go to work, go shopping, and so on.

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

A separately transmitted compact disc contains the HRA modeling input and output files.

5.9.3.6 Hazardous Materials

Hazardous materials will be used and stored at the A2PP site. The hazardous materials stored in significant quantities onsite and descriptions of their uses are presented in Section 5.5. 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 result in significant impacts to public health. Best management practices will be used and mitigation measures will be in place to prevent releases. However, if an accidental release migrated offsite, potential impacts to the public could result.

The California Accidental Release Prevention (CalARP) Program regulations and Code of Federal Regulations (CFR) Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for acutely hazardous materials. These regulations require, among other things, preparation of a Risk Management Program (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. Anhydrous ammonia is currently stored and used at the existing Almond Power Plant, and no new ammonia storage facilities will be constructed as part of the project. The facility will follow the RMP that is currently in place for the existing anhydrous ammonia tank.

5.9.3.7 Operation Odors

A small amount of ammonia used to control NO_x emissions can "slip" past the SCR catalyst and be emitted from the exhaust stack, but this amount emitted at the design stack height is less than that required to produce an odor off site. The expected exhaust gas ammonia concentration, known as ammonia "slip," will not exceed 10 parts per million by volume (ppmv). After mixing with the atmosphere, the concentration at ground level will be far below the detectable odor threshold of 5 ppmv that the Compressed Gas Association has determined to be acceptable, as well as being below the ACGIH[19] TLV[20] and STEL[21] values of 25 and 35 ppm respectively (adopted 2003). Therefore, potential ammonia emissions would not create a significant odor. Other combustion contaminants are not present at concentrations that could produce a significant odor.

5.9.3.8 Electromagnetic Field Exposure

The A2PP will connect to the proposed Grayson Substation[22] located east of the intersection of Grayson Road and Crows Landing Road through two 115-kV lines. The project will include additional onsite electric power-handling transformers and associated equipment, which are discussed in more detail in Section 3.0. Based on findings of the National Institute of Environmental Health Sciences (NIEHS, 1999), electromagnetic field exposures from the electric power generating and handling equipment and associated transmission lines would not result in a significant impact on public health. The NIEHS report to the U.S. Congress found that "the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm"(NIEHS, 1999).

5.9.3.9 Summary of Impacts

Results from the health risk assessment based on emissions modeling indicate that there will be no significant incremental public health risks from construction or operation of the proposed project. Results from criteria pollutant modeling for routine operations indicate that potential ambient concentrations of NO_2, CO, SO_2, and PM_{10} would not exceed ambient air quality standards, with the exception of the state PM_{10} and $PM_{2.5}$ standards. For these pollutants, existing 24-hour and annual average PM_{10} and $PM_{2.5}$ background concentrations

19 American Congress of Government Industrial Hygienists

20 Threshold Limit Value

21 Short-term Exposure Level

22 The proposed Grayson Substation is a component of the TID Hughson-Grayson 115-kV Transmission Line and Substation Project (the "Hughson-Grayson project"). In addition to the substation, the Hughson-Grayson project consists of an approximately 10-mile-long, 115-kV transmission line; a 0.5-mile-long, 69-kV transmission line from the existing TID Almond Power Plant; and a second 69-kV transmission line that extends 0.8 mile east from the proposed substation. An environmental impact report for the Hughson-Grayson project (State Clearinghouse Number 2009012075) is currently being prepared. The Notice of Preparation was issued on January 26, 2009, and reissued February 10, 2009. The Draft Environmental Impact Report is anticipated to be issued in July 2009.

already exceed applicable standards, while the project would not add a significant contribution. The ambient air quality standards protect public health with a margin of safety for the most sensitive subpopulations (Section 5.1).

5.9.4 Cumulative Effects

An analysis of potential cumulative air quality impacts that may result from the A2PP and other past, present, and reasonably foreseeable projects is required by the CEQA. TID submitted letter to SJVAPCD on January 12, 2009, requesting the following information regarding other projects that qualify for review under the cumulative air quality impact analysis:[23]

- Projects located within a 6-mile radius of the A2PP project site; and
- Projects issued a new Authority to Construct permit after January 1, 2008.

SJVAPCD has not yet provided the information required to prepare a cumulative impacts analysis. Therefore, the cumulative impacts analysis provided here consists of an evaluation of the simultaneous operation of the existing TID Almond Power Plant with the proposed A2PP project. TAC emissions from the existing TID Almond Power Plant are shown in Table 5.1A-11, Appendix 5.1A (Air Quality). Details of the cumulative HRA are provided in Appendix 5.9A. If SJVAPCD identifies additional projects that meet the criteria above, the cumulative health risk assessment will be updated.

The results of the cumulative impact assessment of TACs are summarized in the Table 5.9-6. These results show that the maximum acute and chronic risks from the new plant and the existing plant combined are well below the levels that are considered significant. In 2006 and 2007, the existing Almond Power Plant fire pump operated approximately 14 hours each year. Using the actual number of hours the fire pump ran in 2006 and 2007, the maximum incremental cancer risk from the existing facility would be 1.7 in one million, well below the 10 in 1 million considered to be significant. Assuming for the purposes of this analysis that the fire pump were instead to be operated at its permitted maximum hours (100 hours per year), the maximum incremental cancer risk of the existing facility exceeds the 10 in one million risk threshold at the point of maximum impact, due to DPM emissions from the existing emergency Diesel fire pump engine. Moreover, the area where the hypothetical modeled cancer risk exceeds 10 in one million is extremely small and localized at the southern boundary of the Almond Power Plant (see Figure 5.9-5). This area is well away from any residences. Even under worst-case conditions (assuming 100 hours per year of fire pump engine operation), the maximum modeled hypothetical cancer risk at the nearest residential receptor is only 0.14 in one million, while the maximum modeled workplace risk is 0.23 in one million. Therefore, the hypothetical maximum potential risk to exposed individuals will be an order of magnitude below the 10 in one million threshold of significance.

23 Copies of the correspondence with SJVAPCD are provided in Appendix 5.1G.

TABLE 5.9-6
Summary of Potential Cumulative Health Risks, A2PP and Almond Power Plant

Receptor	Cancer Risk[a] (per million)	Acute Health Hazard Index	Chronic Health Hazard Index
Maximum Incremental Cancer Risk at the PMI, A2PP	0.7	0.01	0.01
Maximum Cumulative Combined Cancer Risk at the PMI, existing Diesel fire pump engine at maximum permitted annual operation (100 hours per year)	11.3	0.02	0.01
Cumulative Combined Cancer Risk at the PMI, actual operation of Diesel fire pump engine (14 hours per year)	1.7	0.02	0.01
Maximum Incremental Cancer Risk for the MEIW at the PMI, A2PP	0.1	n/a[b]	n/a[c]
Maximum Cumulative Combined Cancer Risk for the MEIW at the PMI	1.7	n/a[b]	n/a[c]
Significance Level	10	1.0	1.0

[a]Derived (OEHHA) Method used to determine significance of modeled risks. MEIR reflects residential (70-year) exposure.

[b]Acute analysis is always done as a single point exposure and is not affected by the type of analysis or exposure duration.

[c]The worker is assumed to be exposed at the work location for 8 hours per day, instead of 24; for 245 days per year, instead of 365; and for 40 years, instead of 70. Therefore, a 70 year-based chronic health hazard index is not applicable to a worker.

5.9.5 Mitigation Measures

The project has been designed to minimize toxic air contaminant emissions and impacts. No additional mitigation measures are needed for the A2PP TAC emissions because the potential air quality and public health impacts are less than significant.

5.9.6 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 A2PP are identified in Table 5.9-7. The compliance of the project with each of the LORS applicable to public health is also presented in this table.

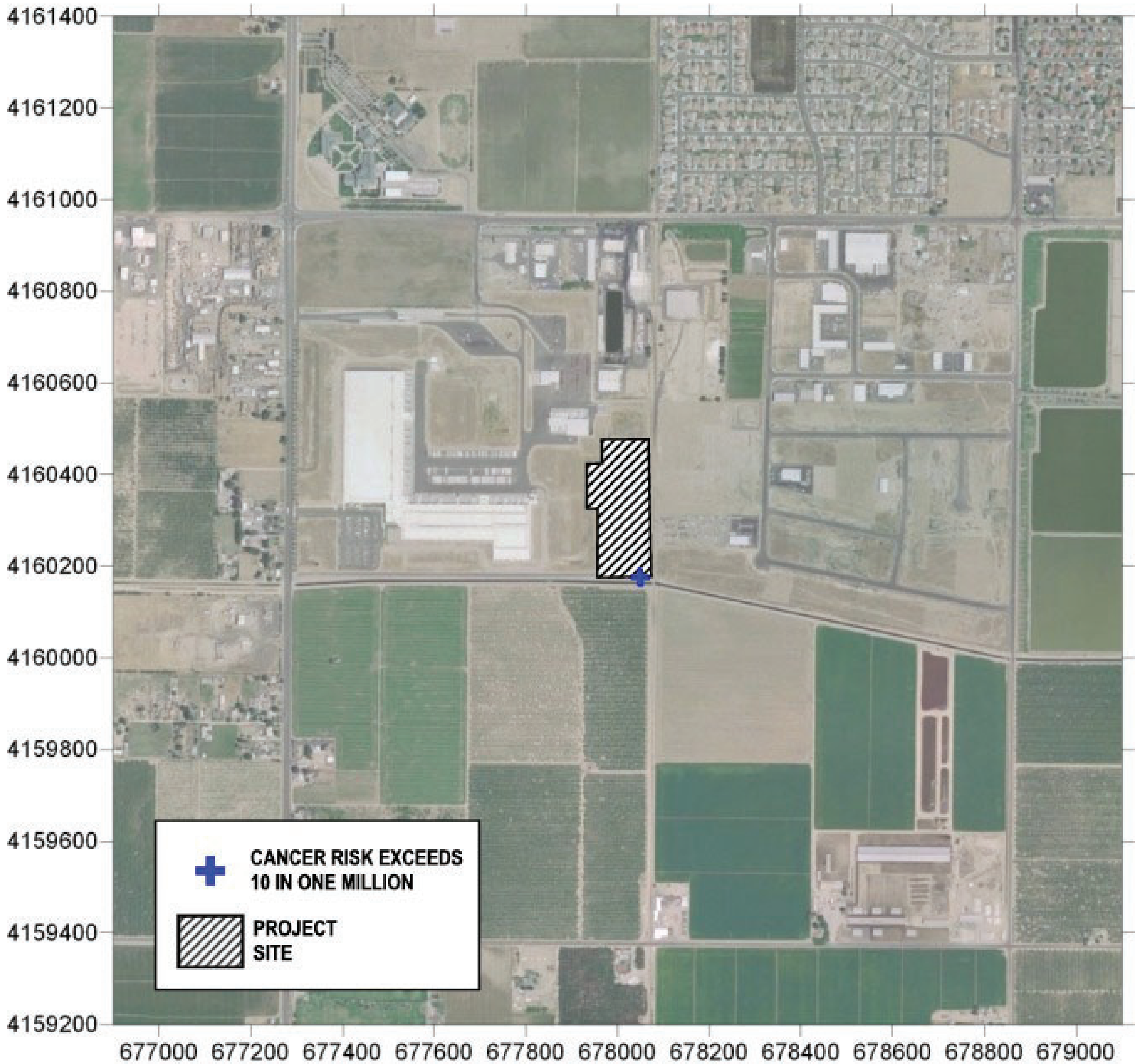

FIGURE 5.9-5
LOCATIONS WHERE CUMULATIVE CANCER RISK FOR THE A2PP AND EXISTING ALMOND POWER PLANT WOULD EXCEED 10 IN ONE MILLION
ALMOND 2 POWER PLANT
CERES, CALIFORNIA

CH2MHILL

TABLE 5.9-7
Laws, Ordinances, Regulations, and Standards for Public Health

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
Clean Air Act	Protect public health by limiting emissions and resulting exposure to air pollutants	U.S. Environmental Protection Agency (EPA) Region 9 CARB SJVAPCD	Based on a health risk assessment that follows CARB/OEHHA and SJVAPCD guidelines, project emissions of non-criteria pollutants do not result in a significant health risk. (§5.9.4.5, p. 5.9-25) Based on an ambient air quality modeling analysis performed in accordance with SJVAPCD and EPA Guidance, project criteria pollutant impacts would not exceed primary ambient air quality standards established to protect public health. (§5.1.5.8, p. 5.1-37)
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Inform public at a facility of potential exposure to chemicals known to cause cancer or reproductive toxicity	OEHHA	Based on a health risk assessment that follows CARB/OEHHA and SJVAPCD guidelines, non-criteria pollutant emission rates and resulting doses and carcinogenic risks (see Section 5.9.4) will not exceed thresholds that require Proposition 65 exposure warnings.
40 CFR Part 68 (Risk Management Plan)	Public exposure to acutely hazardous materials	EPA Region 9 Stanislaus County Environmental Resources Department	As discussed in Section 5.5, Hazardous Materials Handling, an RMP is in place for the existing ammonia tank at the Almond facility. The RMP will be updated to include the A2PP prior to commencement of facility operations.
Health and Safety Code, Article 2, Chapter 6.95, Sections 25531 to 25541; CCR Title 19 (Public Safety), Division 2 (Office of Emergency Services), Chapter 4.5 (California Accidental Release Prevention Program)	Public exposure to regulated substances	Stanislaus County Environmental Resources Department	As discussed in Section 5.5, Hazardous Materials Handling, a RMP is in place for the existing ammonia tank at the Almond facility. The RMP will be updated to include the A2PP prior to commencement of facility operations.
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Limit public exposure to toxic air contaminants based on a priority rating system.	SJVAPCD CARB	Non-criteria pollutant concentrations will not exceed acceptable levels, based on the emission inventory for the existing TID Almond Power Plant and proposed for A2PP, and the maximum potential health impacts identified in Tables 5.9-5 and 5.9-6.

5.9.7 Agencies and Agency Contacts

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

TABLE 5.9-8
Agency Contacts for Public Health

Issue	Agency	Contact
Public exposure to air pollutants	EPA Region 9	Gerardo Rios EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (415) 972-3974
Public exposure to air pollutants	CARB	Mike Tollstrup Project Assessment Branch California Air Resources Board 1001 I Street Sacramento, CA 95812 (916) 323-8473
Public exposure to air pollutants	San Joaquin Valley Air Pollution Control District	Rupi Gill Permit Services Manager Northern Region 4800 Enterprise Way Modesto, CA 95356-8718 (209) 557- 6400
Public exposure to chemicals known to cause cancer or reproductive toxicity	Cal-EPA, Office of Environmental Health and Hazard Assessment (OEHHA)	Cynthia Oshita or Susan Long Office of Environmental Health Hazard Assessment 1001 I Street, Sacramento, CA 95814 (916) 445-6900
Public exposure to accidental releases of hazardous materials	EPA Region 9	Deborah Jordan EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (916) 947-4157
Public exposure to accidental releases of hazardous materials	California Office of Emergency Services	Moustafa Abou-Taleb Governor’s Office of Emergency Services 3650 Schriever Avenue Mather, CA 95655 (916) 845-8741

5.9.8 Permits and Permit Schedule

Agency-required permits related to public health are listed in Table 5.9-9, and include an RMP for hazardous materials, and the SJVAPCD Final Determination of Compliance (FDOC). Upon approval of the A2PP by the CEC, the FDOC will serve as the SJVAPCD Authority to Construct. A Permit to Operate will be issued by the SJVAPCD after construction and commencement of operation. These requirements are discussed in detail in Sections 5.1 (Air Quality) and 5.5 (Hazardous Materials Handling).

TABLE 5.9-9
Permits and Permit Schedule for Public Health

Permit	Agency Contact	Schedule
Determination of Compliance / Authority to Construct/ Permit to Operate	Rupi Gill San Joaquin Valley APCD 4800 Enterprise Way, Modesto, CA 95356-8718 (209) 557-6400 rupi.gill@valleyair.org	District must issue a Preliminary DOC within 180 days after issuing the Application Completeness Determination Letter.
Risk Management Plan (CalARP)	Stanislaus County Environmental Resources Hazardous Materials Division Beronia Beniamine and Robert Reiss Senior HMS Officers 3800 Cornucopia Way Suite C Modesto, CA 95358 (209) 525-6746 bbeniamine@envres.org rreiss@envres.org	Approximately 60 days before any regulated substance comes on site

5.9.9 References

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

California Air Resources Board (CARB). HARP Model, Version 1.4a, http://www.arb.ca.gov/toxics/harp/harp.htm.

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.

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

San Joaquin Valley Air Pollution Control District (SJVAPCD). 2007. Guidance for Air Dispersion Modeling. January.

U.S. Environmental Protection Agency (EPA). 1991. Risk Assessment for Toxic Air Pollutants: A Citizen's Guide. EPA 450/3-90-024. March 1991. http://www.epa.gov/ttn/atw/3_90_024.html