APPENDIX 5.1D

Modeling Protocol

Mariposa Energy Facility Dispersion Modeling Protocol

Prepared for

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AFC	Application for Certification
ARB	California Air Resources Board
BAAQMD	Bay Area Air Quality Management District
CCAR	California Climate Action Registry
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CTG	combustion turbine generator
DEM	Digital Elevation Model
DGC	Diamond Generating Corporation
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gas
GRP	General Reporting Protocol
HRA	health risk assessment
km	kilometer
MEF	Mariposa Energy Facility
MW	megawatt
N_2O	nitrous oxide
NAD27	North American Datum 1927
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NSR	New Source Review
O_3	ozone

OEHHA	Office of Environmental Health Hazard Assessment
OLM	ozone limiting method
PM_{10}	particulate matter less than 10 microns
$PM_{2.5}$	particulate matter less than 2.5 microns
ppmv	parts per million by volume
PSD	Prevention of Significant Deterioration
REL	reference exposure level
SCR	selective catalytic reduction
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide
SOx	sulfur oxides
TAC	toxic air contaminant
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	volatile organic carbon

SECTION 1.0

Introduction

Diamond Generating Corporation (DGC) proposes to operate a 194-megawatt (MW) simple-cycle peaker power plant. The project has been named the Mariposa Energy Facility (MEF). MEF will be located on property in the northeast corner of unincorporated Alameda County, referred to as the Lee Property, and will develop approximately 10 acres of the 158-acre parcel (Section 1, Township 2 South, Range 3 East). The Lee Property is located south of Kelso Road and east of Bruns Avenue. I-580 is approximately 3.5 miles to the south and the closest segment of the Byron Highway is approximately 2 miles to the northwest. The Lee Property includes relatively flat land and hills separated by gullies.

MEF will consist of four simple-cycle GE Model LM6000 combustion turbine generators (CTGs) and will be permitted through the California Energy Commission (CEC) Application for Certification (AFC) licensing process and the Bay Area Air Quality Management District (BAAQMD) New Source Review (NSR) permitting process. Natural gas will be the only fuel fired in the turbines. The turbines will use advanced combustion controls, combined with selective catalytic reduction (SCR), to limit emissions of nitrogen oxides (NOx) to 2.5 parts per million by volume (ppmv). Emissions of carbon monoxide (CO) will be limited to 6 ppmv and volatile organic carbon (VOC) to 2 ppmv through the use of the advanced combustion controls, combined with the use of an oxidation catalyst. Emissions of particulate matter less than 10 microns (PM_{10}) and sulfur dioxide (SO_2) will be kept to a minimum through the exclusive use of natural gas and the oxidation catalyst system. The project will also include a 300-horsepower (estimated) diesel-fired emergency fire water pump.

The proposed facility does not include steam generation. Therefore, the project would not be categorized as one of the 28 Prevention of Significant Deterioration (PSD) major source categories (40 CFR 52.21(b)(1)(i)) and the PSD threshold for this project would be 250 tons per year per regulated pollutant. The potential to emit for MEF is expected to be less than 250 tons per year for each of the PSD regulated pollutants (See Section 2.3). Therefore, the project would not be considered a major stationary source in accordance with PSD regulations.

However, in accordance with the NSR requirements outlined in BAAQMD Regulation 2, Rule 2, modeling will be conducted to demonstrate that the project would neither cause a new violation of a state or federal ambient air quality standard nor make an existing violation significantly worse for nitrogen dioxide (NO_2), CO, PM_{10}, particulate matter less than 2.5 microns ($PM_{2.5}$), and SO_2. Therefore, DGC intends to submit an air quality impact analysis to both BAAQMD and CEC that evaluates the impacts from commissioning, start-up/shutdown, and normal facility operations. In addition, a cumulative impacts analysis will be performed. The project will also be required to evaluate construction-based impacts per the CEC regulations. This document presents the methodology proposed for evaluating the potential air quality impacts related to the construction, commissioning, and operation of the proposed facility.

SECTION 2.0

Methodology for Estimating Project-related Emissions

2.1 Construction

Approximately 15 acres will be disturbed during construction activities, including 5 acres for construction laydown. The construction activities are expected to occur for approximately 5 months. Onsite construction activities will consist of installing four new CTGs, various auxiliary equipment, and administrative structures. Offsite construction activities will include the installation of an access road, a natural gas pipeline, a transmission line, and a water supply pipeline.

Although the BAAQMD *CEQA Guidelines* (BAAQMD, 1999) do not require detailed quantification of construction emissions, onsite and offsite project emissions will be calculated per CEC guidance. Onsite and offsite project emissions will be divided into three categories: vehicle and construction equipment exhaust, fugitive dust from vehicle and construction equipment, and windblown fugitive dust. The following criteria pollutant emissions will be calculated: NOx, sulfur oxides (SOx), VOC, CO, PM_{10}, and $PM_{2.5}$. Fugitive dust and construction equipment exhaust emissions will be estimated using URBEMIS2007 (version 9.2.4) emission factors. On-road exhaust emissions will be estimated using EMFAC2007 (version 2.3) emission factors.

Construction equipment greenhouse gas (GHG) emissions will be estimated using emission factors from the California Climate Action Registry (CCAR) General Reporting Protocol (GRP) (CCAR, 2008) and fuel consumption rates from the OFFROAD model. Vehicle emissions (trucks and worker commutes) will be estimated using emission factors from the CCAR GRP (CCAR, 2008) and United States Environmental Protection Agency (EPA) fuel economy values. Currently, the California Air Resources Board (ARB) is developing statewide California Environmental Quality Act (CEQA) significance thresholds for GHG emissions and is expected to present the recommended thresholds to the ARB Board in the spring of 2009. Therefore, emissions will be presented for informational purposes at this time and no conclusions regarding significance will be made during the analysis.

2.2 Commissioning

During the commissioning phase, the LM6000s will initially be operated at various load rates without the benefit of the emission control systems to ensure proper operation of the equipment. However, maximum hourly emission rates for VOC, SO_2, PM_{10}, and $PM_{2.5}$ are expected to be equal to or lower than normal operating rates due to reduced loads during commissioning. Therefore, emission calculations for commissioning activities will be limited to NOx and CO. The NOx and CO emissions will be estimated based on turbine performance data provided by the vendor, estimated durations and control efficiencies of each commissioning event, and turbine operating rates.

2.3 Operation

Emissions of NOx, SOx, CO, VOC, PM_{10}, and $PM_{2.5}$ to the atmosphere from the proposed facility will occur from combustion of natural gas in each of the identical combustion turbines. Emission rates will be calculated based on vendor data and additional conservative assumptions of turbine performance. Turbine emissions and stack parameters, such as flow rate and exit temperature, will exhibit some variation with ambient temperature and operating load. Therefore, to evaluate the worst-case air quality impacts, dispersion modeling will be conducted at 50 percent load at 59 degrees Fahrenheit (°F) and 93°F; 100 percent load at 17°F, 59°F, 112°F; and one inlet air chiller scenario at 100 percent load. In addition to the load/temperature scenarios, emissions will also be estimated for startup and shutdown events. Emissions of NOx, CO, PM_{10}, $PM_{2.5}$, and SOx from the new diesel-fired emergency fire pump will also be included in the analysis. The diesel-fired emergency fire pump emission rates will be based on manufacturer data.

An estimate of the annual MEF criteria pollutant emissions are presented in Table 1. The estimates are based on preliminary engineering data, 4,000 hours of base load operation, and 300 startups and shutdowns per turbine. The emission estimates in Table 1 are provided for informational purposes and are subject to change. However, because the estimated facility emission totals are significantly less than the PSD applicability thresholds of 250 tons per year per pollutant, it is expected the project would not be subject to PSD review.

TABLE 1
Annual Facility Emission Estimates (tons per year)

	Facility Emission Totals (Estimate)				
Facility	**NO_2**	**SO_2**	**$PM_{10/2.5}$**	**VOC**	**CO**
Mariposa Energy Facility (~200 MW – Simple Cycle)*	49	3	26	11	69

*Assumes four GE LM6000 gas turbines operating 4,000 hr/yr per turbine, plus 300 startups/shutdowns.

Combustion of natural gas in the turbines and diesel fuel in the emergency fire pump engine will result in emissions of the following greenhouse gases: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Therefore, GHG emissions for normal facility operations will be calculated based on the maximum fuel usage predicted for MEF and emission factors contained in the CCAR GRP (CCAR, 2008). Currently, ARB is developing statewide CEQA significance thresholds for GHG emissions and is expected to present the recommended thresholds to the ARB Board in the spring of 2009. Therefore, emissions will be presented for informational purposes at this time and no conclusions regarding significance will be made during the analysis.

Criteria pollutant emissions and GHG emissions from worker commutes and material deliveries will also be calculated. Criteria pollutant emissions will be estimated using emission factors from EMFAC2007 (version 2.3). GHG emissions will be estimated using emission factors from the CCAR GRP (CCAR, 2008). Criteria pollutant and GHG emissions from worker commutes and material deliveries will be calculated for CEC informational purposes but will not be included in the dispersion modeling impact analysis.

SECTION 3.0

Air Quality Impact Analysis

The dispersion modeling methodology will follow the modeling guidance provided in the EPA's *Guideline on Air Quality Models* (EPA, 2005) as well as BAAQMD's modeling guidance (BAAQMD, 2005a and BAAQMD, 2005b).

3.1 Model Selection

Several EPA-approved dispersion models will be used to quantify the potential criteria pollutant air quality impacts resulting from the construction, commissioning, and normal operation of the proposed project. The models include the following:

- BPIP-Prime (Building Profile Input Program – Plume Rise Model Enhancement, dated 04274)
- AERMOD (AERMIC[1] Modeling System, Version 07026)
- AERMAP (AERMIC Mapping System, Version 09040)
- SCREEN3 (Version dated 96043)

AERMOD is a steady-state, multiple-source, dispersion model that also incorporates the BPIP-PRIME algorithm for the simulation of aerodynamic downwash induced by buildings. AERMAP will be used to calculate the receptor elevations and the controlling hill heights.

If hourly NOx concentrations need to be examined in a more refined manner, the EPA's AERMOD-OLM option will be used to calculate the NO_2 concentration based on the ozone limiting method (OLM). The Tracy-Patterson Street ozone data collected by the San Joaquin Valley Air Pollution Control District (SJVAPCD) will be used for this effort.

The effects of fumigation on the maximum modeled impacts will be evaluated using the EPA SCREEN3 model (Version 96043). For this evaluation, only impacts from the turbine stack will be evaluated.

Evaluation of Visibility Impacts to Class I areas are not required for this analysis since the facility emissions are expected to be below the PSD thresholds.

[1] American Meteorological Society/Environmental Protection Agency Model Improvement Committee

3.2 Model Settings

The technical options selected for the AERMOD model include:

- Regulatory default control options
- Rural dispersion mode (land use within 3 kilometers [km] of the facility is primarily classified as rural based on the Auer Method, therefore, AERMOD will be run in the rural dispersion mode)
- Receptor elevations and controlling hill heights will be obtained from AERMAP output.

3.3 Meteorological Data

3.3.1 Data Selection

The CEC requires a minimum of one year of meteorological data approved by ARB or the local air pollution control district to be used in the air dispersion modeling analysis. Per BAAQMD guidance, meteorological data from SJVAPCD's Patterson Pass monitoring station, the Stockton Airport, and the Oakland, California upper air sounding station, will be used for the dispersion modeling (Cordova, 2008). The following discussion describes the pre-processing steps used to combine the data from the three sources into a single AERMET data set, which will be used with AERMOD.

The surface data collected at the Patterson Pass monitoring station for calendar years 1997 through 1999 were obtained from BAAQMD and the 2003 data were obtained from SJVAPCD. The Patterson Pass data contain hourly wind speed, wind direction, and ambient temperature data at 10 meters above ground level. A representative wind rose of the hourly wind speed and direction data is presented in Figure 1. Corresponding hourly cloud cover data from the Stockton Airport, California were also obtained along with the Patterson Pass wind and temperature data in order to determine stability and boundary layer conditions.

Upper air sounding data collected at Oakland, California were obtained from the National Climatic Data Center. The twice-daily sounding data were provided in forecast systems laboratory format for midnight and noon Greenwich Mean Time.

The EPA AERMET (version 06341) pre-processor was used to combine the upper air and surface data. BAAQMD recommended using the MODIFY keyword in the AERMET processing step for upper air data (Cordova, 2009). By specifying this key word, the following actions occur:

- Some mandatory levels are deleted from the sounding (e.g., if a mandatory sounding level is within one percent of a significant level).
- A nonzero wind direction is set to zero if the corresponding wind speed is zero.
- Missing ambient and dew point temperatures are replaced with interpolated values.

The AERSURFACE program (Version 08009) was used to determine the surface characteristics surrounding the Patterson Pass monitoring site. AERSURFACE was developed by EPA to assist in determining surface characteristics by using U.S. Geological

Survey (USGS) land use maps and converting the land use type to values described in the *AERMET User's Guide* (EPA, 2004).

AERSURFACE was used to determine the surface roughness values for each sector within a 1-km radius of the monitoring site, and the daytime wet, dry, and average Bowen Ratio and the mid-day albedo for a 10x10-km area. Table 2 summarizes the input and output from the AERSURFACE program for the wet, dry, and average Bowen ratios used in the stage three processing of AERMET. The surface roughness and mid-day albedo input and output data are presented in Section 3.3.2. The surface moisture conditions associated with each month and month-to-season correlations were provided by BAAQMD.

TABLE 2
Bowen Ratio Surface Characteristics Selected for Patterson Pass AERMET

	Bowen Ratio (Wet)[a]				Bowen Ratio (Dry)[a]				Bowen Ratio (Average)[a]			
Sector[b]	**Winter[c]**	**Spring[d]**	**Summer[e]**	**Autumn[f]**	**Winter**	**Spring**	**Summer**	**Autumn**	**Winter**	**Spring**	**Summer**	**Autumn**
01	0.45	0.26	0.36	0.45	1.96	1.01	1.71	1.96	0.84	0.36	0.64	0.84
02	0.45	0.26	0.36	0.45	1.96	1.01	1.71	1.96	0.84	0.36	0.64	0.84
03	0.45	0.26	0.36	0.45	1.96	1.01	1.71	1.96	0.84	0.36	0.64	0.84

[a]Dry: January, June, July, September, and October. Wet: April, May, August and December. Average: February, March, and November.
[b]Sectors are defined as:
Sector 1: between 14 and 84 degrees from true north,
Sector 2: between 84 and 287 degrees from true north,
Sector 3: between 287 and 14 degrees from true north.
[c]Late autumn after frost and harvest: November, December, and January
[d]Transitional spring: February and March
[e]Midsummer with lush vegetation: April, May, June and July
[f]Autumn with unharvested cropland: August, September, and October

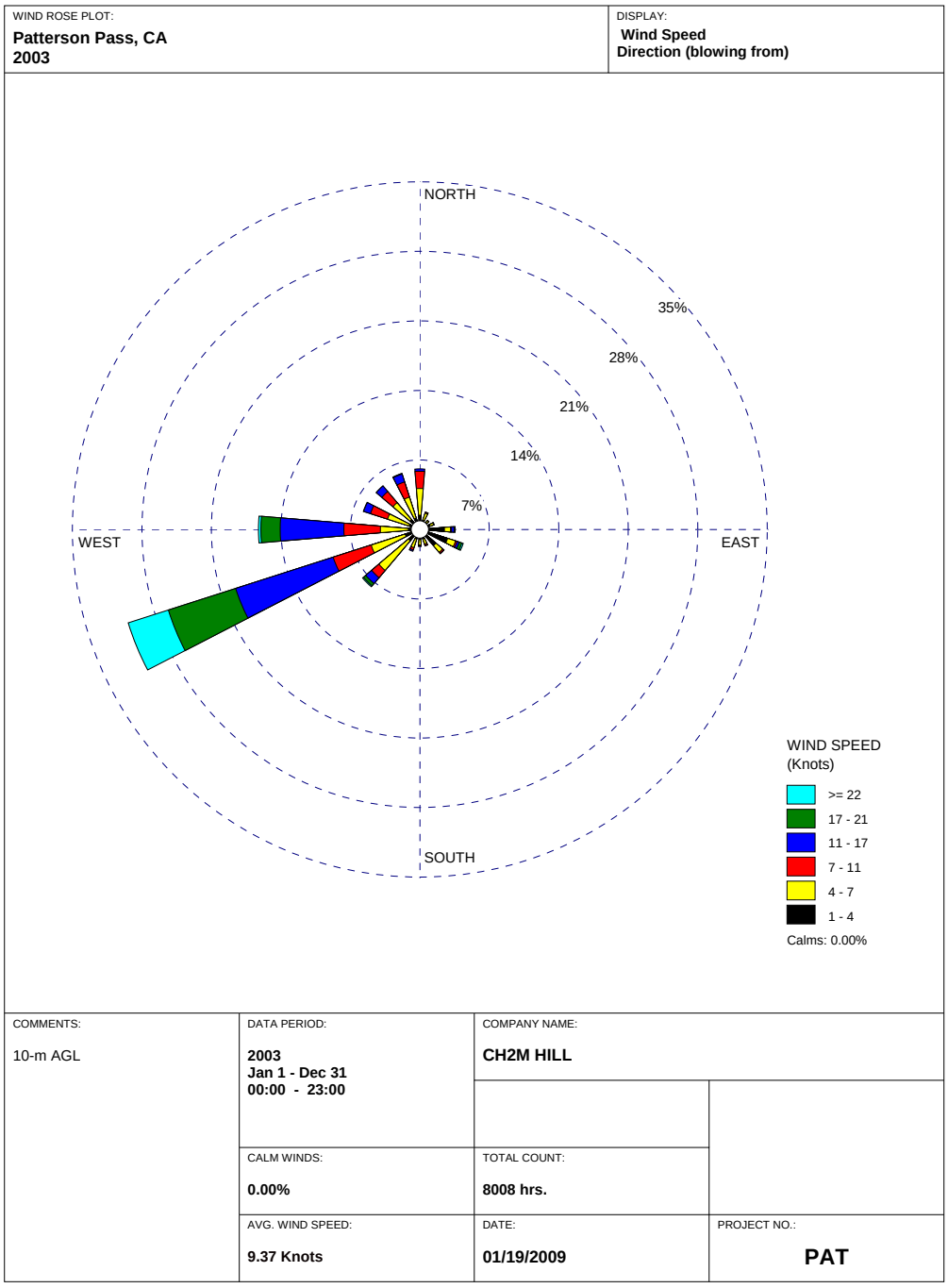

FIGURE 1
Wind Rose
Patterson Pass, California

3.3.2 Data Representativeness

Prior to using the meteorological data collected at an offsite monitoring station, EPA recommends an analysis to determine if the meteorological data collected is representative of the project site. Additionally, BAAQMD recommends a comparison of surface characteristic between the meteorological station and the proposed project site to determine representativeness.

The MEF would be located at 37.7882N, -121.6026W. This location would be approximately 5 miles northwest of the Patterson Pass monitoring site (37.7381N, -121.5344W). Topography surrounding each site is generally flat with low, rolling hills.

Terrain between the proposed project and the meteorological data collection site is generally flat and there are no complex or elevated terrain features between the two locations. Land use and elevation above mean sea level are also similar for the two locations. Additionally, there are no major obstacles that would cause a different wind regime at each location. Therefore, because of the relative proximity of the Patterson Pass monitoring station to the project site, similar terrain surrounding each site, and no major topography between the sites, the meteorological data collected at the Patterson Pass monitoring site would be representative of the meteorological conditions at the project site.

In addition to determining the representativeness of the general features surrounding each location, the surface characteristics including mid-day albedo, daytime Bowen ratio, and surface roughness lengths at each location were also examined. The mid-day albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio is an indicator of surface moisture, which is the ratio of the sensible heat flux to the latent heat flux. The Bowen ratio is used to determine the planetary boundary layer parameters for convective conditions. Surface roughness length is related to the height of obstacles to the wind flow and is the height at which the mean horizontal wind speed is zero. The AERMOD model uses the surface characteristics to define dispersion coefficients in the model. Surface characteristics can vary by season and region (sector) around the data collection site.

The sectors and surface characteristics used for the Patterson Pass monitoring station were defined by BAAQMD. The average surface moisture condition values and the seasons were also provided by BAAQMD. The surface characteristics for the project site were determined by land use types displayed in USGS land use maps and the values derived from the *AERMET User's Guide* (EPA November 2004) and the AERSURFACE pre-processor (version 08009). Tables 3 through 5 summarize the surface characteristic values used for the sectors surrounding the proposed project site and the Patterson Pass meteorological station.

TABLE 3
Comparison of Mid-day Albedo

Season	Sector	Patterson Pass Meteorological Station	MEF Site
Late Autumn after harvest, no snow	1	0.19	0.19
	2	0.19	0.19
	3	0.19	0.19
Transitional Spring	1	0.16	0.16
	2	0.16	0.16
	3	0.16	0.16
Midsummer	1	0.19	0.18
	2	0.19	0.18
	3	0.19	0.18
Autumn with unharvested cropland	1	0.19	0.18
	2	0.19	0.18
	3	0.19	0.18

Late autumn after frost and harvest, or winter with no snow: months 11, 12, 1
Transitional spring (partial green coverage, short annuals): months 2, 3
Midsummer with lush vegetation: months 4, 5, 6, 7
Autumn with unharvested cropland: months 8, 9, 10

TABLE 4
Comparison of Daytime Bowen Ratio

Season	Sector	Patterson Pass Meteorological Station	MEF Site
Late Autumn after harvest, no snow	1	0.84	0.78
	2	0.84	0.78
	3	0.84	0.78
Transitional Spring	1	0.36	0.35
	2	0.36	0.35
	3	0.36	0.35
Midsummer	1	0.64	0.61
	2	0.64	0.61
	3	0.64	0.61
Autumn with unharvested cropland	1	0.84	0.78
	2	0.84	0.78
	3	0.84	0.78

See Table 3 for description of terms.

TABLE 5
Comparison of Average Surface Roughness Length

Season	Sector	Patterson Pass Meteorological Station	MEF Site
Late Autumn after harvest, no snow	1	0.025	0.010
	2	0.014	0.010
	3	0.022	0.010
Transitional Spring	1	0.037	0.050
	2	0.037	0.051
	3	0.036	0.051
Midsummer	1	0.174	0.101
	2	0.119	0.101
	3	0.195	0.101
Autumn with unharvested cropland	1	0.174	0.101
	2	0.119	0.101
	3	0.195	0.101

See Table 3 for description of terms.

The surface characteristics between the two sites vary slightly for the mid-day albedo and the daytime Bowen ratio; however, the differences are not expected to adversely impact the results of the dispersion modeling analysis. Although the differences in surface roughness length vary more than the albedo and Bowen ratio, the differences in surface roughness are also expected to be acceptable. Therefore, the Patterson Pass meteorological data set is expected to be representative of the proposed project site.

The surface characteristic maps used for each site are provided as an appendix to this report.

3.4 Background Data

According to Appendix B (g)(8)(G) of the CEC data adequacy checklist, the ambient concentrations of all criteria pollutants for the previous 3 years as measured at the three ARB-certified monitoring stations closest to the project site, along with an analysis of whether this data is representative of conditions at the project site, is required. The applicant may also substitute an explanation as to why information from one, two, or all stations is either not available or unnecessary.

The three closest ARB-certified monitoring sites are located approximately 12 miles southeast of the project site in Tracy, California (San Joaquin County), approximately 9 miles southwest of the project site in Livermore, California (Alameda County), and approximately 16 miles northwest of the project site at the Bethel Island monitoring station (Contra Costa County). The Stockton-Hazelton Avenue monitoring station is also located near the project site, approximately 18 miles to the northeast, in San Joaquin County.

The nearest monitoring station had been located approximately 5 miles from the project site at the Tracy 24371 Patterson Road monitoring station. However, the site was relocated to the Tracy Airport on January 11, 2005 (ARB, 2008). Therefore, a complete year of data for 2005 is not available at either of the Tracy monitoring locations. Furthermore, based on comments received from BAAQMD on the draft protocol, the Stockton–Hazelton Avenue station would be considered more representative than the Livermore monitoring site even though the Livermore Station is closer. Therefore, the monitoring data from the Stockton-Hazelton Avenue station will be included rather than the Livermore station.

Table 6 summarizes the pollutants monitored at each of the monitoring stations. The data at all four monitoring stations would meet the data quality requirements of 40 CFR Part 58, Appendices A and B, and PSD monitoring guidance and represent the three most recent years of data available.

TABLE 6
Summary of the Nearest Monitoring Stations and the Pollutants Monitored at Each Station

Monitoring Location	Ozone	NO_2	CO	SO_2	PM_{10}	$PM_{2.5}$
Tracy – Airport (2006–Present)	X	X	NA	NA	X	X
Tracy–Patterson Road (1995–2004)	X	X	NA	NA	NA	NA
Stockton–Hazelton Ave (pre-2005–Present)	X	X	X	NA	X	X
Bethel Island (pre-2005–Present)	X	X	X	X	X	NA

NA = Pollutant was not monitored at this location.

If possible, the background data combined with the modeled impacts should represent the areas where the maximum concentration would occur for the proposed stationary source, existing sources, and a combination of the proposed and existing sources. Based on a review of meteorological data collected at the Patterson Pass monitoring station, the San Joaquin County monitoring stations would be downwind of the proposed project location for most meteorological conditions. Therefore, it is expected that the maximum short- and long-term concentrations would occur in proximity to the Tracy monitoring stations. As a result, the three most recent years of background NO_2 and ozone (O_3) data from the Tracy Airport monitoring station will be added to the predicted concentrations and compared to the ambient air quality standards.

PM_{10} and $PM_{2.5}$ monitors were installed at the Tracy Airport monitoring station in 2006. Therefore, the 2006–2008 background PM_{10} and $PM_{2.5}$ data from the Tracy Airport monitoring station will be used if the 2008 data is available at the time of AFC preparation. If the 2008 data is unavailable, the 2004 data collected at the Stockton–Hazelton Avenue station will be combined with the 2006 and 2007 Tracy Airport monitoring station data.

As shown in Table 2, CO data were not recorded at the Tracy monitoring stations. Therefore, the three most recent years of CO data recorded at the Stockton–Hazelton Avenue monitoring station will be used. The data collected at the Stockton–Hazelton Avenue station represents a conservative estimate of the background CO concentrations in the project area because the area surrounding the Stockton–Hazelton Avenue station is more densely populated than the proposed project site.

SO_2 concentrations were not measured in Alameda County or San Joaquin County between 2005 and 2008. Therefore, measurements from Bethel Island (Contra Costa County), which is approximately 16 miles north of the proposed site, will be used to estimate the existing SO_2 background concentrations in the vicinity of the project.

The BAAQMD and ARB ambient air quality data summaries will be used as the primary sources of data, and the EPA AIRS database summaries will be used when data are unavailable in the BAAQMD and ARB summaries. The maximum ambient background concentrations will be combined with the modeled concentrations and used for comparison to the ambient air quality standards.

3.5 Receptors

Receptor and source base elevations will be determined from USGS Digital Elevation Model (DEM) data using the 7½-minute format (30-meter spacing between grid nodes). All coordinates will be referenced to Universal Transverse Mercator (UTM) North American Datum 1927 (NAD27), Zone 10. Every effort will be made to maintain receptor spacing across DEM file boundaries.

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. To minimize model run times and control file size, a coarse- and fine-grid approach will be used for the impact analysis. The following coarse grid will be used to identify the areas of maximum concentration:

- Fence line receptors will be spaced at 25-meter intervals
- 100-meter spacing from property boundary to 1 km from the origin
- 500-meter spacing from beyond 1 km to 10 km from the origin
- Concentrations within the facility fence line will not be calculated

The following refined grid will be used to further evaluate the areas of maximum impact identified during the coarse-grid analysis:

- 25-meter spacing surrounding areas of maximum impact within 1 km of the facility extending 100 meters from the maximum location.
- 50-meter spacing surrounding areas of maximum impact beyond 1 km of the facility extending 500 meters from the maximum location.

3.6 Evaluation of Impacts

3.6.1 Construction Impact Assessment

The short-term construction emissions will not be compared to daily or annual thresholds because BAAQMD has not published quantitative thresholds of significance for construction emissions. According to the BAAQMD *CEQA Guidelines*, implementation of the basic control measures would reduce fugitive PM_{10} emissions during construction to less than significant levels (BAAQMD, 1999). Although these control measures would not

directly address exhaust emissions generated during construction, construction equipment exhaust emissions (CO, NO_x, and VOC) are included in the emissions inventory, which is the basis for the regional air quality plans (BAAQMD, 1999). Therefore, construction emissions are not expected to impede attainment or maintenance of the ozone standards in the Bay Area (BAAQMD, 1999).

However, to meet CEC requirements, modeled concentrations of NO_x, CO, PM_{10}, $PM_{2.5}$, and SO_x from construction activities related to the project will be combined with the ambient background concentrations and compared to the ambient air quality standards. The construction site will be represented as a set of volume sources and an area source in the modeling analysis. The exhaust emissions will be modeled as a set of volume sources with a plume centerline height of 4.6 meters (15 feet), and the wind-blown and fugitive dust emissions will be modeled as an area source assuming an average release height of one meter.

3.6.2 Commissioning Impact Assessment

The LM6000 stacks will be modeled as point sources. Exhaust parameters will be based on information provided by the vendor for each commissioning phase. Only maximum hourly impacts for NOx and CO will be modeled for each commissioning phases. Emission rates of PM_{10}, $PM_{2.5}$, and SOx are expected to be equal to or lower than normal operating rates due to reduced loads during commissioning.

The short-term concentrations of NO_2 and CO (the 1-hour and 8-hour impacts) from the commissioning phase of the project will be combined with the ambient background concentrations and compared to the short-term ambient air quality standards. Because the commissioning phase is only expected to occur over 6 months, annual impacts will not be evaluated for the commissioning phase of the project.

3.6.3 Operational Impact Assessment

The LM6000 stacks and diesel-fired emergency fire pump will be modeled as point sources. Exhaust parameters will be based on information provided by the vendor. A coarse-grid operational impact assessment will be conducted to determine the turbine operating scenario with the highest short- and long-term offsite impacts.

Based on the outcome of the coarse-grid impact assessment, emission rates for the turbine scenario with the highest impact will be modeled using the refined receptor grids. The maximum modeled concentrations from the refined analysis will then be added to representative background concentrations, and the results compared to the state and federal ambient air quality standards for SO_2, NO_2, CO, PM_{10}, and $PM_{2.5}$. The highest ambient concentration from the most recent 3 years of ambient monitoring data will be used as the background concentration.

3.6.4 Fumigation Impact Assessment

Fumigation can occur during the breakup of the nocturnal radiation inversion by solar warming of the ground surface. SCREEN3 will be used to determine the predicted impacts associated with this inversion breakup. The maximum modeled concentrations from the fumigation impact assessment will then be added to representative background

concentrations, and the results compared to the state and federal ambient air quality standards. The condition would be short-lived, therefore impacts will only be compared to the 1-, 3-, 8-, and 24-hour standards (i.e., impacts of NOx, CO, and SO_2).

SECTION 4.0

Air Toxics

A human health risk assessment (HRA) will be performed to evaluate the potential cancer, chronic, and acute health impacts related to the proposed project. The HRA will follow the latest version of the *Air Toxics Hot Spots Program Risk Assessment Guidelines* (Office of Environmental Health Hazard Assessment [OEHHA], 2003), and the EPA *Guideline on Air Quality Models* (EPA, 2005). In addition, for predicted cancer risks for residential receptors where the inhalation pathway is the dominant exposure pathway for cancer risks, the Derived (Adjusted) Method outlined in the ARB *Recommended Interim Risk Management Policy for Inhalation-based Residential Cancer Risk*, (ARB, 2003), will be used for the cancer risk evaluation.

Toxic air contaminants (TAC) from the turbines and the diesel-fired emergency fire pump will be included in the HRA. Turbine emissions will be estimated assuming that all four turbines would operate simultaneously under normal load conditions. For maximum hourly emissions, the maximum natural gas consumption rate per turbine will be used. For annual emissions, the annual average natural gas consumption rate per turbine will be used, assuming that the turbines would operate 4,000 hours per year. Ammonia emissions associated with potential ammonia slip from the SCR system will be calculated based on a permit limit maximum of 5 parts per million by volume, dry at 15 percent oxygen.

TAC emissions for the diesel-fired emergency fire pump will be estimated based on vendor data. Emissions will be estimated assuming 1 hour per week for routine testing.

Per communication with BAAQMD, an assessment of the potential health impacts from TACs from construction activities will not be required by BAAQMD (Long, 2008).

4.1 Model Selection

The HRA modeling for the normal project operations will be conducted using the ARB *Hotspots Analysis Reporting Program* (HARP), along with the ARB HARP file converter (version 1), and AERMOD. The HARP file converter converts the AERMOD output files to files compatible with the HARP modeling system. The AERMOD modeling approach, such as default options, source parameters, meteorological data, receptor spacing, and terrain data, will be similar to the criteria pollutant modeling analysis. The receptor grid will also include sensitive receptors as defined by BAAQMD and CEC regulations (Appendix B (g)(9)(E)(i)). The sensitive receptors included in the analysis will be based on a search conducted by Environmental Data Resources and supplemented with school, hospital, and care facility information presented on a Google™ Earth overlay. A unit emission rate (1 gram per second) will be used to model each source, as outlined in the HARP converter program manual.

4.2 Evaluation of Impacts

Cancer risks will be evaluated for each source and the project based on the annual TAC ground-level concentrations, inhalation cancer potency, oral slope factor, frequency and duration of exposure at the receptor, and breathing rate of the exposed persons. Cancer risks will be estimated using a conservative assumption of 70-year continuous exposure duration for residential receptors and a 40-year, 5-day week, 8-hours-per-day exposure duration for commercial/industrial receptors. In addition, for predicted cancer risks for residential receptors where the inhalation pathway is the dominant pathway of cancer risks, the Derived (Adjusted) Method in HARP will be used for the cancer risk evaluation, based on the *Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk* (ARB, 2003). To assess chronic and acute non-cancer exposures, annual and 1-hour TAC ground-level concentrations will be compared with the Reference Exposure Levels (RELs) developed by OEHHA to obtain a chronic or acute hazard index.

In addition to inhalation exposure, the HRA will assess potential health impacts related to exposure from homegrown produce, dermal absorption, soil ingestion, and mother's milk, as required by OEHHA guidelines (OEHHA, 2003). The inhalation cancer potency, oral slope factor values, and RELs used to characterize health risks associated with the modeled impacts will be obtained from the most recent version of the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (OEHHA and ARB, 2009).

The modeled health risk values for each source will be compared to the following de minimus thresholds:

- Incremental increase in cancer risk of 1 in one million individuals
- Chronic hazard index of 0.20

The modeled health risk values for the overall project will be compared to the following de minimus thresholds:

- Incremental increase in cancer risk of 10 in one million individuals
- Chronic hazard index of 1.0
- Acute hazard index of 1.0

Predicted cancer risk and hazard indices less than the above thresholds would be considered an acceptable increase in risk associated with the proposed project.

SECTION 5.0

Cumulative Impacts

Per CEC requirements, a cumulative air quality modeling impacts analysis for the project's typical operating mode will be conducted as part of the AFC process. Impacts from the project will be combined with other stationary emission sources within a 6-mile radius that have received construction permits but are not yet operational, or are in the permitting process (such as, the NSR or CEQA permitting process). The stationary emission sources included in the cumulative impacts assessment will be limited to new or modified sources that would cause a net increase of 5 tons or more per modeled criteria pollutant. Therefore, VOC sources, equipment shutdowns, permit-exempt equipment registrations, rule compliance, permit renewals, or replacement/upgrading of existing systems will not be included in the cumulative impacts analysis. TAC emissions would also be excluded from the cumulative impacts analysis.

The sources to be included in the cumulative impact analysis will be determined by consulting BAAQMD, SJVAPCD and CEC. The applicant will work with the BAAQMD, SJVAPCD, and CEC staffs to identify those new air pollution sources within the 6-mile area surrounding MEF, which is centered approximately at 623,176 meters (East); 4,183,148 meters (North) (UTM, NAD27, zone 10).

The cumulative air quality impact analysis will be performed using the model settings and refined receptor grid outlined in Section 3.6. The facility fence lines for the cumulative sources will not be included in the modeling analysis.

The maximum predicted cumulative impacts will represent the impact at the receptor location identified as the maximum receptor for each pollutant in the ambient air quality impact assessment. The maximum modeled concentrations from the refined analysis will then be added to representative background concentrations, and the results compared to the state and federal ambient air quality standards for SO_2, NO_2, CO, PM_{10}, and $PM_{2.5}$. The highest ambient concentration from the most recent 3 years of ambient monitoring data will be used as the background concentration.

SECTION 6.0

References

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APPENDIX

AERMET Sectors and Surface Characteristics

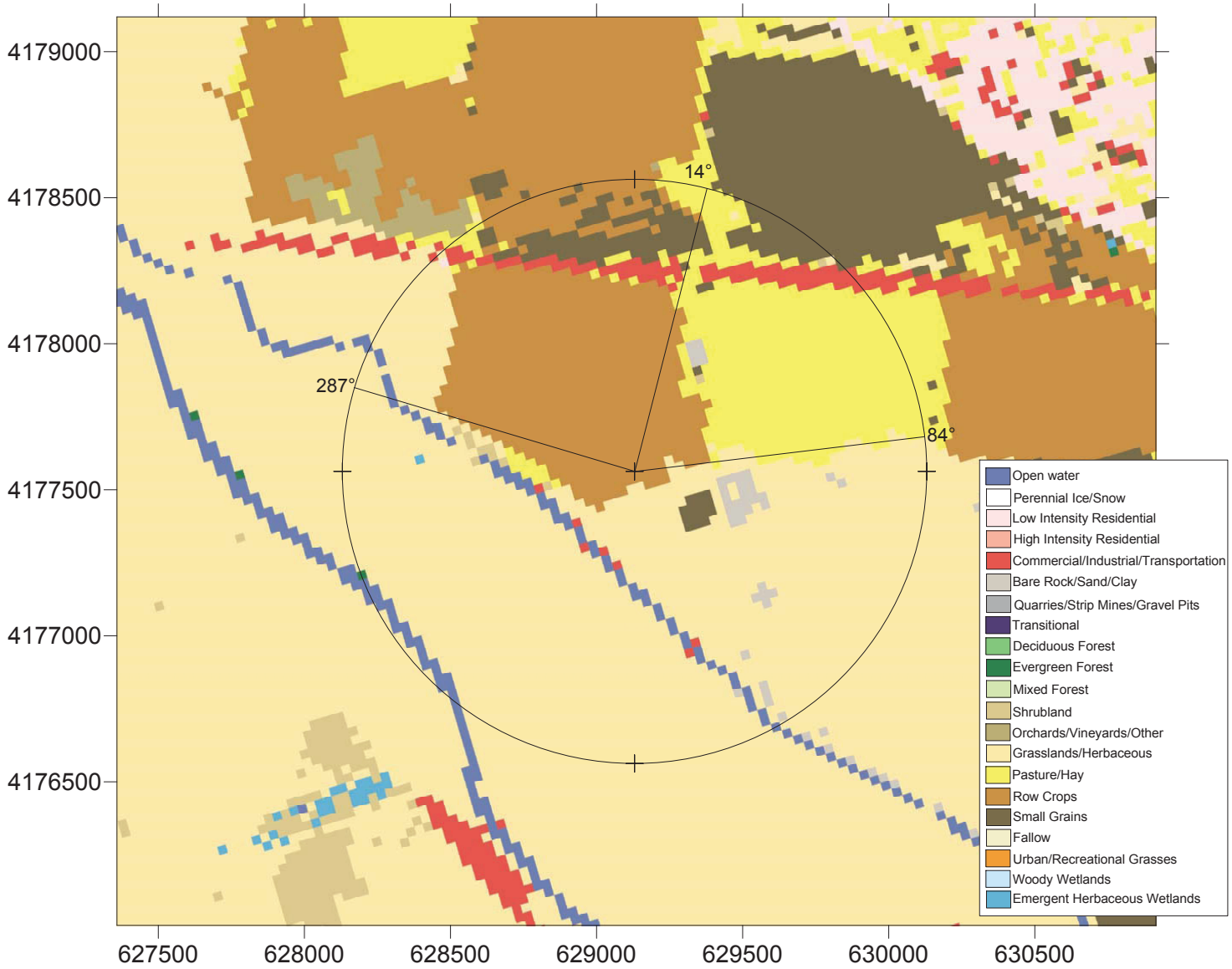
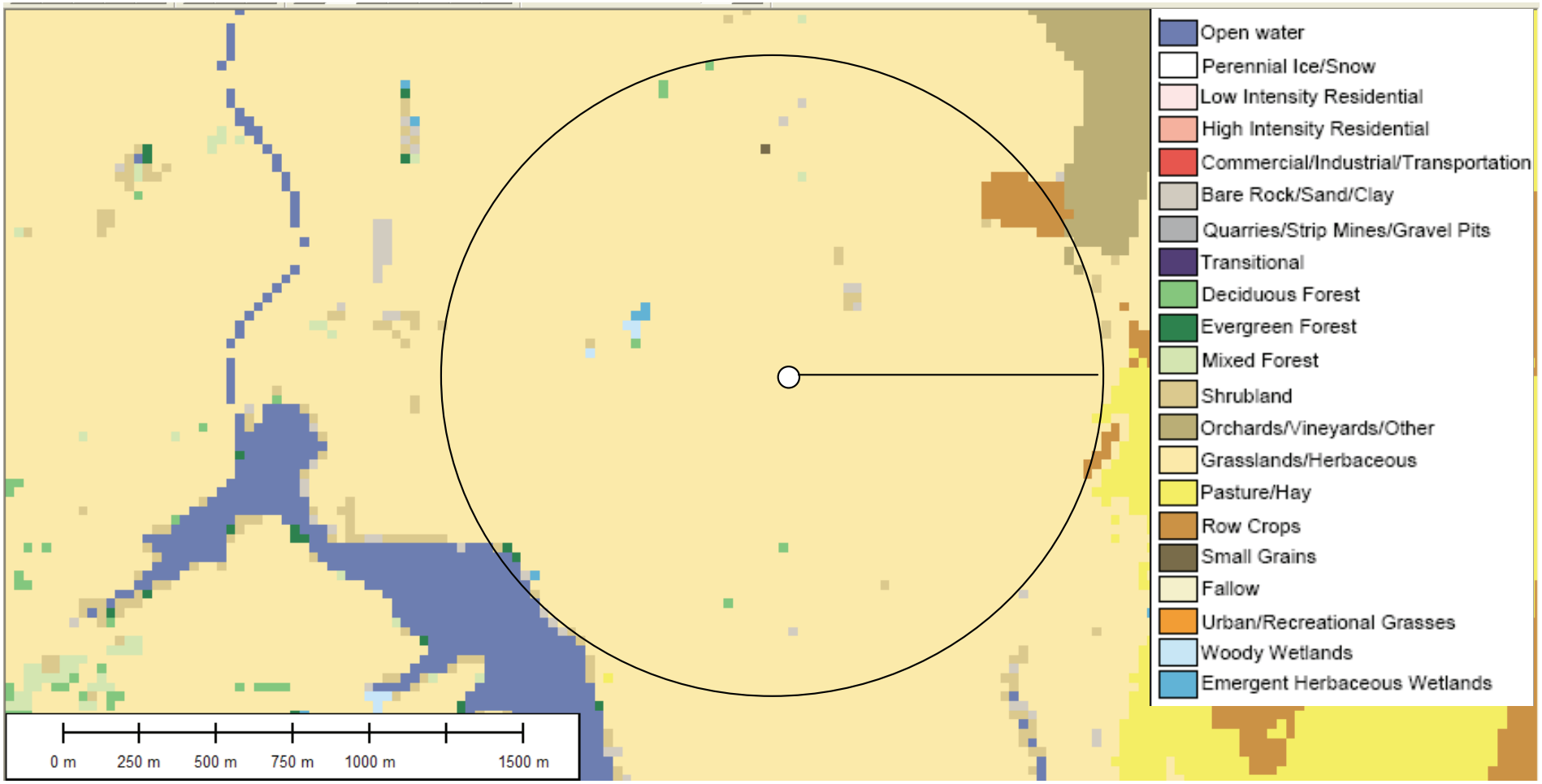


FIGURE A-1
AERMET Sectors and Surface Characteristics for the Patterson Pass Meteorological Station
DGC Mariposa Energy Facility

Source: Bay Area Air Quality Management District, 2009



Stack Location: 37.78821N, 121.60256W

FIGURE A-2
AERMET Surface Characteristics for the Project Site
DGC Mariposa Energy Facility