APPENDIX J
AIR QUALITY DATA AND MODELING PROTOCOL

Appendix J1
MLGS Air Modeling Protocol

AIR QUALITY MODELING PROTOCOL FOR THE CONTRA COSTA NEW GENERATION PROJECT CONTRA COSTA COUNTY, CALIFORNIA

Prepared For:

- Bay Area Air Quality Management District

- California Energy Commission

- U.S. Environmental Protection Agency Region IX

- National Park Service

Prepared on behalf of:

Mirant California, LLC

January 31, 2008

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
(619) 294-9400 Fax: (619) 293-7920

TABLE OF CONTENTS

TABLE OF CONTENTS

Tables

Figures

Appendices

$\mu g/m^3$	micrograms per cubic meter
°C	degrees Celsius
AAQS	Ambient Air Quality Standards
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AFC	Application for Certification
AQRV	Air quality related values
ARB	Air Resources Board
ATC	Authority to construct
BAAQMD	Bay Area Air Quality Management District
BACT	Best available control technology
BPIP-Prime	Building Parameter Input Program – Prime
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCPP	Contra Costa Power Plant
CEC	California Energy Commission
CO	carbon monoxide
CTG	Combustion turbine generator
DAT	Deposition analysis threshold
DEM	digital elevation models
DOC	Determination of compliance
EC	element carbon
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLM	Federal Land Manager
GE	General Electric
GEP	good engineering practice
H_2S	hydrogen sulfide
HARP	Hotspots analysis and reporting program
HHV	higher heating value
HI	hazard index
HNO_3	nitric acid
HRA	Health risk assessment
HRSA	Health Risk Screening Analysis
HRSG	Heat recovery steam generator
ISCST3	Industrial Source Complex Short Term 3rd version
IWAQM	Interagency Workgroup on Air Quality Modeling
kg/ha-yr	kilogram per hectare per year
km	kilometers
LAC	level of acceptable change
LCC	Lambert Conformal Conic
LORS	Laws, ordinances, regulations, and standards
LULC	Land Use Land Cover
MEI	Maximally exposed individual
MICR	maximum individual cancer risk
MM5	mesocale meteorological
MW	megawatt

NAAQS	National Ambient Air Quality Standards
$(NH_4)_2SO_4$	Ammonium sulfate
NH_4NO_3	ammonium nitrate
NNSR	Non-attainment New Source Review
NO_2	Nitrogen dioxide
NO_3	nitrate
NO_x	Nitrogen oxides
NPS	National Park Service
NSR	New source review
NWS	National Weather Service
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OLM	ozone limiting method
Pb	lead
PG&E	Pacific Gas & Electric
PM_{10}	particulate matter less than 10 μm in diameter
$PM_{2.5}$	particulate matter less than 2.5 μm in diameter
PMS	Particulate Matter Speciation
ppb	parts per billion
ppm	parts per million
PSD	Prevention of significant deterioration
PTC	Permit to Construct
RH	relative humidity
ROC	Reactive organic compound
SCR	Selective catalytic reduction
SIL	Significant impact level
SO_2	Sulfur dioxide
SO_4	sulfate
SOA	Secondary organic aerosol
SO_x	sulfur oxide
STG	steam turbine generator
TAC	toxic air contaminants
the Project	Contra Costa New Generation Project
tpy	tons per year
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VOC	volatile organic compounds

SECTION 1 INTRODUCTION

1.1 BACKGROUND

The proposed Contra Costa New Generation Project (the Project) will consist of 4 new natural gas-fired power blocks and ancillary systems, constructed wholly within the existing Contra Costa Power Plant (CCPP) site (see Figure 1). The Project will be owned and operated by a wholly owned subsidiary of Mirant California, LLC. The Project consists of four power blocks: 1) two Siemens Flex Plant 10 units operating in combined cycle mode and 2) two GE Frame 7FA combustion turbine units operating in simple cycle mode. The total output of the Project is expected to be approximately 830 MW.

The Project is subject to the site licensing requirements of the California Energy Commission (CEC). The CEC will coordinate its independent air quality evaluations with the Bay Area Air Quality Management District (BAAQMD) through the Determination of Compliance (DOC) process. The Project will be a Major Source, as this term is defined in the United States Environmental Protection Agency's (USEPA) Prevention of Significant Deterioration (PSD) regulations, because it is a categorical source (fossil-fuel fired steam electric plant of more than 250 MMBtu/hr heat input) and will have a potential to emit more than 100 tons per year (tpy) of carbon monoxide (CO), particulate matter of diameter less than or equal to 10 microns (PM_{10}) and nitrogen oxides (NO_x). The Project's sulfur oxides (SO_x) emissions are expected to be less than the significant emission level or 40 tons per year. Thus PSD analyses are required for the criteria pollutants which the proposed Project's Potential to Emit exceed the PSD significant emission levels.

Since the Project triggers PSD review, the air dispersion modeling for this project will be conducted in conformance with PSD requirements. For example, worst-case predicted impacts will be compared with the applicable monitoring exemption limits to demonstrate that the Project will be exempt from the requirements relating to pre-construction ambient air quality monitoring. The PSD regulations apply only to those pollutants for which the project area is in attainment of the National Ambient Air Quality Standards (NAAQS). State and local new source review (NSR) and non-attainment NSR (NNSR) regulations potentially apply to all criteria pollutants, depending on the quantity of pollutants emitted.

The area around the Project is classified as attainment with respect to the NAAQS for nitrogen dioxide (NO_2), CO, and sulfur dioxide (SO_2), unclassified for particulate matter with diameter less than 2.5 micrometers and 10 micrometers ($PM_{2.5}$ and PM_{10}, respectively), and non-attainment for ozone (O_3). With respect to the California Ambient Air Quality Standards (CAAQS), the area around the Project is classified as attainment for NO_2, CO, sulfates, lead (Pb), hydrogen sulfide (H_2S), and SO_2, and non-attainment for O_3, PM_{10}, and $PM_{2.5}$. NO_x and SO_x are regulated as PM_{10} precursors, and NO_x and volatile organic compounds (VOC) as O_3 precursors. Project emissions of non-attainment pollutants and their precursors will be offset to satisfy federal and local NNSR regulations.

Source:
Topo USA, 2004; www.delorme.com

SITE VICINITY MAP

January 2008
28067344

Contra Costa New Generation Project
Mirant California, LLC
Contra Costa County, California

URS

FIGURE 1

1/30/08 vsa ..T:\Mirant Contra Costa\Graphics\BAAQMD\Fig 1_svm.cdr

1.2 PURPOSE

The CEC, BAAQMD and EPA all require the use of atmospheric dispersion modeling to demonstrate that a new power generation facility or modification to an existing facility will comply with applicable air quality standards. These agencies also require an assessment of the potential impacts on human health from the toxic air contaminants that may be emitted by such projects. In addition, CEC power plant siting regulations require modeling to evaluate the cumulative impacts of the proposed project with other new and reasonably foreseeable projects within 6 miles of the project site.

This document summarizes the procedures that are proposed for the air dispersion modeling for project certification and permitting. Modeling of both operation and construction emissions due to the proposed Project will be performed in accordance with CEC and BAAQMD guidance. This protocol is being submitted to the CEC and BAAQMD for their review and comment prior to completion of the applicable permit applications. The protocol is also being provided to U.S. Environmental Protection Agency Region IX and National Park Service, because of the need to obtain a PSD permit for the proposed Project. It is anticipated that BAAQMD soon will be re-delegated the authority to review the PSD permits by EPA and will thus conduct the PSD review for EPA. The proposed model selection and modeling approach is based on review of applicable regulations and agency guidance documents, and recent discussions with staffs of the responsible agencies.

SECTION 2 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The proposed Project will be constructed entirely within the existing Contra Costa Power Plant (CCPP) site, and is located about 1/10 mile from the Antioch city limits. The site is surrounded by industrial uses to the south and west, the San Joaquin River to the north and a commercial marina, industrial uses and open space to the east.

The proposed new generation units will be located on approximately 45 acres in the northwestern portion of the CCPP property, generally within the footprint of the area previously occupied by five fuel storage tanks. These structures would be demolished as part of the Project. The balance of the CCPP site, 69 acres, will remain unchanged. Figure 2 shows the locations of the proposed Project and existing structures.

2.2 DESCRIPTION OF THE PROPOSED SOURCES

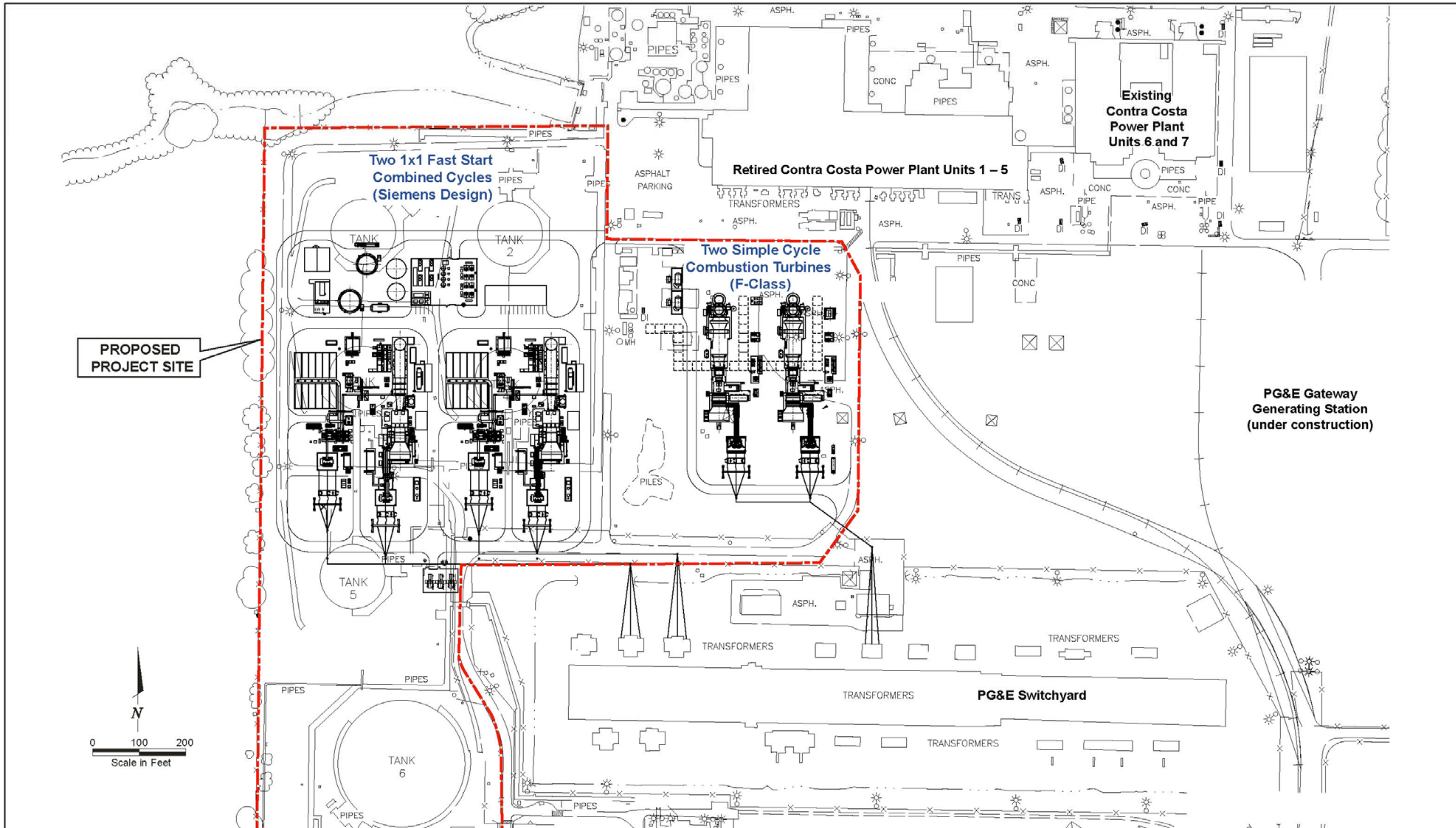
The Project consists of four power blocks: 1) two Siemens Flex Plant 10 (FP10) units operating in combined cycle mode and 2) two GE Frame 7FA combustion turbine units operating in simple cycle mode. The total output of the Project is expected to be approximately 830 MW. The combined cycle units are expected to operate at about a 75% capacity factor on an average annual basis. The simple cycle units are expected to operate at about a 10-15% capacity factor on an average annual basis. The combined cycle units will use air-cooled backpressure condenser technology to reduce consumptive water use.

Each Siemens FP10 power block includes one combustion turbine-electrical generator (CTG) equipped with dry low NO_X combustors and inlet air evaporative cooler, one heat recovery steam generator (HRSG), one steam turbine generator (STG), an air-cooled backpressure condenser (ACC), and associated auxiliary systems and equipment. Fuel for the CTGs will be pipeline-quality natural gas. The average net generating capacity of the two FP10 units will be approximately 500 net MW.

Each GE 7FA Simple Cycle unit will consist of one GE Frame 7FA natural gas-fired CTG with a dry low NO_X combustor system to control NO_X emissions. The nominal net generating capacity of the two simple cycle turbines will be approximately 330 net MW.

A dry low NO_X combustor system will be used to control the NO_X emissions from each unit. An additional post-combustion NO_X control system, a selective catalytic reduction (SCR) system, will be provided for each unit to further reduce the NO_X emissions to the atmosphere. The SCR system for each unit will operate with aqueous ammonia injected into the exhaust gas stream upstream of a catalyst bed to reduce NO_X to inert nitrogen and water. An oxidation catalyst system will also be incorporated to control emissions of CO and VOC.

Figure 2 shows the layout of the proposed Project, including the locations of all major new and existing equipment.



Source:
CH2MHill Lockwood Greene; General Arrangement Contra Costa All Layout Options, Drawing No: MR-GA-CC-01-01 (Rev. C, 11/12/07)

PLOT PLAN – CONTRA COSTA NEW GENERATION PROJECT

Contra Costa New Generation Project
Mirant California, LLC
Contra Costa County, California

January 2008
28067344

URS

FIGURE 2

1/30/08 vsa ..\T:\Mirant Contra Costa\Graphics\BAAQMD\Fig 2_plot plan-CC.ai

SECTION 3 REGULATORY SETTING

3.1 CALIFORNIA ENERGY COMMISSION REQUIREMENTS

For projects with electrical power generation capacity greater than 50 MW, CEC requires that applicants prepare a comprehensive Application for Certification (AFC) document addressing the proposed project's environmental and engineering features. An AFC must include the following air quality information (CEC, 1997):

- A description of the Project, including project emissions of air pollutants and greenhouse gases, fuel type(s), control technologies and stack characteristics;
- The basis for all emission estimates and/or calculations;
- An analysis of Best Available Control Technology (BACT) according to Bay Area Air Quality Management District (BAAQMD) Rules;
- Existing baseline air quality data for all regulated pollutants;
- Existing meteorological data, including temperature, wind speed and direction, and mixing height;
- A listing of applicable laws, ordinances, regulations, standards (LORS), and a determination of compliance with all applicable LORS;
- An emissions offset strategy;
- An air quality impact assessment (i.e., a demonstration of compliance with national and state ambient air quality standards [AAQS] and PSD review, when required) and protocol for the assessment of cumulative impacts of the proposed project along with recently permitted projects and those currently under construction within a 10 km radius; and
- An analysis of human exposure to air toxics (i.e., health risk assessment [HRA]).

For the Project, the air quality impact assessment, the cumulative impacts assessment, and the HRA will be performed using dispersion models.

3.2 BAY AREA AIR QUALITY MANAGEMENT DISTRICT REQUIREMENTS

The BAAQMD has promulgated NSR requirements under Regulation 2, Rule 2. In general, all equipment with the potential to emit air pollutants is subject to the requirements of this rule, which has the following major requirements that potentially apply to new sources such as the Project:

- Installation of BACT.
- Ambient air quality impact modeling to demonstrate compliance with NAAQS and CAAQS and to evaluate impacts to plume visibility in Class I areas near the proposed source(s).
- Emission offsets.
- Statewide compliance for all applicant-owned or operated facilities in California.

Assembly Bill 2588, California Air Toxics Hot Spots Program and BAAQMD Regulation 2, Rule 5 establish allowable incremental health risks for new or modified sources of toxic air contaminant (TAC) emissions. The BAAQMD rule specifies limits for maximum individual cancer risk (MICR), cancer burden, and non-carcinogenic acute and chronic hazard indices (HI) for new or modified sources of TAC emissions. The health risks resulting from project emissions, as demonstrated by means of an approved health risk assessment, must not exceed established threshold values.

3.3 U.S. ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS

USEPA has promulgated PSD regulations applicable to new Major Sources and Major Modifications to existing Major Sources. The Project will be a Major Source because it is a fossil-fuel fired steam electric plant of more than 250 MMBtu/hr heat input and will have the potential to emit more than 100 tpy of NO_x, PM_{10} and CO. Many of the PSD requirements are the same as the AFC and BAAQMD Regulation 2, Rule 2 requirements described above (e.g., project description, BACT, ambient air quality standards analysis); thus it is anticipated that BAAQMD will review the PSD application for EPA, although the National Park Service will review the Class I area analyses. However, PSD permits require the following additional analyses:

- An analysis of the potential impacts from the new emissions from the Project relative to PSD Significant Impact Levels (SILs) and PSD Increments;
- An analysis of air quality related values (AQRV) to ensure the protection of visibility in federal Class I National Parks and National Wilderness Areas within 100 km of the proposed project;
- An evaluation of potential impacts on soils and vegetation of commercial and recreational value; and
- An evaluation of potential growth-inducing impacts.

However, as discussed further in Section 5.2 of this protocol, the National Park Service (NPS) is considering a policy change that would allow projects to be screened out of the requirement to conduct a Class I PSD increment analysis and Air Quality Related Values Analysis under certain conditions. If adopted, this policy would specifically allow projects to avoid these analyses if the ratio of the combined annual project emissions rates (tons per year) for NO_x, PM and SO_x to the distance (kilometers) between the source and the nearest Class I area is less than a threshold value. Thus, depending on the final screening criteria adopted by NPS, the portion of this protocol dealing with Class I increment and Air Quality Related Values Analysis for the Point Reyes National Seashore may not apply to the Contra Costa New Generation Project.

SECTION 4 AIR QUALITY IMPACT ANALYSIS FOR CLASS II AREAS

This section describes the dispersion models and modeling techniques that will be used in performing the near-field criteria pollutant impact analysis for the Project. The objectives of the modeling are to demonstrate that air emissions from the Project will not cause incremental impacts that exceed the Class II PSD Significant Impact Levels (SILs), nor contribute to exceedances of state or federal ambient air quality standards.

In November 2005, the USEPA officially recognized the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD) as the preferred dispersion model for regulatory applications, replacing the Industrial Source Complex Short Term 3 (ISCST3) model. Also, both CEC and BAAQMD staff recommend the use of AERMOD for power plant licensing/permitting analyses. Accordingly, AERMOD (Version 07026) will be used for the dispersion modeling associated with the Project.

4.1 TURBINE SCREENING MODELING

Two separate initial screening modeling analyses will be conducted to determine the turbine stack parameters that correspond to maximum ground-level pollutant concentrations for each class of turbine. The screening modeling for the two Siemens FP10 turbines with HRSG will be conducted over a range of load conditions and ambient temperatures, with and without power augmentation and evaporative cooling, to bracket partial impacts from these sources. The screening modeling for the two GE Frame 7FA turbines will be conducted over a similarly selected range of different load conditions and ambient temperatures, with and without evaporative cooling.

Each screening modeling analysis will consist of a series of AERMOD simulations with the full meteorological input data set (see Section 4.6) for the two turbine classes in consideration. Appropriate stack parameters for both turbines of each class will be input into the model to represent a different load and ambient temperature combination in each simulation. The stack parameters that align with the highest offsite impact for each set of turbines for each pollutant and averaging time period will be used in the subsequent refined modeling simulations.

4.2 REFINED MODELING

The purpose of the refined modeling analysis is to demonstrate that air emissions from the Project will not cause or contribute to an ambient air quality violation. The AERMOD model (version 07026) will be used for the refined modeling of criteria pollutants. Specific modeling procedures that will be used for evaluating project impacts versus the state and federal ambient air quality standards, PSD significance thresholds and applicable health risk criteria are discussed below. Table 4-1 shows the regulatory criteria that will be used to evaluate the significance of predicted pollutant concentrations. Refined modeling using AERMOD will be conducted to evaluate impacts from both the construction and operational phases of the Project.

Analysis of land uses adjacent to the Project was conducted in accordance with Section 8.2.8 of the Guideline on Air Quality Models (EPA-450/2-78-027R and Auer [1978]), EPA AERMOD implementation guide (2004), and its addendum (2006). Based on the Auer land use procedure, more than 50 percent of the area within a 3-km radius of the Project is classified as rural. This classification is at least, in part, a result of the Project's proximity to San Joaquin River across the entire northern CCPP site boundary. Since the Auer classification scheme requires more than 50 percent of the area within the

3-km radius around a proposed new source to be non-rural for an urban classification, the rural mode will be used in the AERMOD modeling analyses. All regulatory default options will be used, including building and stack tip downwash, default wind speed profiles, exclusion of deposition and gravitational settling, consideration of buoyant plume rise, and complex terrain.

Table 4-1
Relevant Ambient Air Quality Standards and Significance Levels

Pollutant	Averaging Time	CAAQS (a, b)	NAAQS (b, c)	PSD Class II Significance Impact Levels (μg/m³)	PSD Significant Emission Rates (tpy)	PSD Increments (μg/m³)	
						Class I	Class II
CO	8-hour	9.0 ppm (10,000 μg/m³)	9.0 ppm (10,000 μg/m³)	500	100		
	1-hour	20 ppm (23,000 μg/m³)	35 ppm (40,000 μg/m³)	2,000			
NO_2[(d)]	Annual		0.053 ppm (100 μg/m³)	1	40	2.5	25
	1-hour	0.25 ppm (470 μg/m³)					
SO_2	Annual		0.03 ppm (80 μg/m³)	1	40	2	20
	24-hour	0.04 ppm[(e)] (105 μg/m³)	0.14 ppm (365 μg/m³)	5		5	91
	3-hour		0.5 ppm (1,300 μg/m³)	25		25	512
	1-hour	0.25 ppm (655 μg/m³)					
PM_{10}	Annual	20 μg/m³	See footnote[(e)]	1	15	4	17
	24-hour	50 μg/m³	150 μg/m³	5		8	30
$PM_{2.5}$	Annual	12 μg/m³	15 μg/m³				
	24-hour		35 μg/m³				
O_3	8-hour	0.07 ppm (137 μg/m³)	0.08 ppm (157 μg/m³)	See footnote[(f)]			
	1-hour	0.09 ppm (180 μg/m³)	See footnote[(g)]				

Notes:

a. California standards for ozone (as volatile organic compound), carbon monoxide, sulfur dioxide (1-hour), nitrogen dioxide, and PM_{10}, are values that are not to be exceeded. The visibility standard is not to be equaled or exceeded.

b. Concentrations are expressed first in units in which they were promulgated. Equivalent units are given in parentheses and based on a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality area to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,013.2 millibars).

c. National standards, other than those for ozone and based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is ≤ 1.

d. NO_2 is the compound regulated as a criteria pollutant; however, emissions are usually based on the sum of all NO_x. In February 2007, the CARB approved new, more stringent CAAQS for NO_2. The new standards, which are expected to take effect fully in late 2007, are 338 μg/m³ (1 hour) and 56 μg/m³ (annual).

e. The federal annual PM_{10} standard was revoked by USEPA on October 17, 2006.

f. Modeling is required for any net increase of 100 tons per year or more of ROC subject to PSD.

g. New federal 8-hour ozone and fine particulate matter ($PM_{2.5}$) standards were promulgated by USEPA on July 18, 1997. The federal 1-hour ozone standard was revoked by USEPA on June 15, 2005.

4.2.1 PSD Modeling Analyses

As the proposed Project will trigger PSD as a Major Source, modeling will be required to determine whether its incremental impacts on ambient levels of attainment pollutants (NO_2, SO_2 and CO) will exceed Class II significant impact levels, or SILs. If these SILs were predicted to be exceeded, then a modeling analysis would be required to include all increment consuming sources that have been installed since the local PSD baseline date. However, it is anticipated that the increased emissions of these pollutants due to the Project will not cause incremental effects above the federal SILs.

4.2.2 Ambient Air Quality Standards Analysis

Compliance with the BAAQMD Regulation 2, Rule 2 modeling requirements for attainment pollutants will be demonstrated by modeling to determine the maximum ground-level concentrations of the proposed Project among all receptors, and adding conservative background concentrations, based on recent data from the most representative BAAQMD air quality monitoring station. The Project will not be considered to cause or contribute to a near-field ambient air quality violation unless impacts from these sources combined with the background concentration exceed the most stringent ambient air quality standard.

NO_2 impact estimates for both the 1-hour and annual averaging times will be modeled by executing AERMOD with the USEPA ozone limiting method (OLM) option for both hourly and annual impacts. Hourly ozone measurement data collected at the Pittsburg BAAQMD air quality monitoring station for the same years corresponding to the meteorological input data will be used when conducting the OLM modeling.

Note that emissions reduction credits will be obtained by the applicant to provide at least a one-to-one offsetting of all Project emissions increases of all non-attainment pollutants and their precursors (i.e., NO_x, reactive organic compound [ROC], PM_{10} and SO_2).

4.2.3 Health Risk Assessment Analysis

Both CEC and BAAQMD require a HRA to evaluate potential health effects of TAC emissions from the operation of the Project. Contaminants emitted by the Project with potential carcinogenic effects or chronic and/or acute non-carcinogenic effects will be considered. This health risk assessment will be performed following the Office of Environmental Health Hazard Assessment (OEHHA), Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA, 2003) and BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines (BAAQMD, 2005). As recommended by the OEHHA Guidelines, the California Air Resources Board (CARB) Hotspots Analysis and Reporting Program (HARP) will be used to perform an OEHHA Tier 1 health risk assessment for the Project. HARP includes two modules: a dispersion module and a risk module. The HARP dispersion module incorporates the USEPA ISCST3 air dispersion model, and the HARP risk module implements the latest Risk Assessment Guidelines developed by OEHHA. For consistency with the criteria pollutant modeling, the dispersion modeling will be conducted with AERMOD. The Air Resources Board (ARB) has created a beta version software package, HARP File Converter, to convert AERMOD dispersion results into a format that can be read into the HARP risk module. Thus HARP with AERMOD will be used for this HRA.

First, ground-level concentrations from the Project emissions will be estimated using the AERMOD dispersion model. The dispersion modeling analysis will be consistent with, and use similar input parameters as the modeling approach discussed above for the AAQS analyses using AERMOD. The same five-year meteorological data set that will be used for the criteria pollutant air quality impact assessment will be used in the HRA (see meteorological discussion in Section 4.6.1). The maximum 1-hour and annual impacts determined by AERMOD will be used in the HARP model to estimate the corresponding health risks.

Incremental cancer risk will be estimated using the "Derived (Adjusted)" calculation method. For the calculation of cancer risk, the duration of exposure to project emissions will be assumed to be 24 hours per day, 365 days per year, for 70 years, at all receptors. Chronic non-cancer risks will be calculated by means of the "Derived (OEHHA)" method. No drinking water reservoirs are near the Project; thus the drinking water consumption pathway will not be included in this analysis. All other pathways will be included.

The HRA performed by means of the HARP model will follow the following steps:

- Define the location of the maximally exposed individual (MEI) (i.e., the location where the highest carcinogenic risk due to emission sources of the Project may occur);
- Define the locations of the maximum chronic non-carcinogenic health effects and the maximum acute health effects;
- Calculate concentrations and health effects at locations of maximum impact for each pollutant; and
- Calculate cancer burden if the maximum cancer risk is predicted to be greater than one in a million.

4.3 MODELING EMISSIONS INVENTORY

4.3.1 Operational Project Sources

Operational emissions from the Project will be exclusively from the two Siemens (FP10) turbines and the two GE Frame 7FA turbines. The conceptual plant design includes SCR for NO_x and oxidation catalysts for CO that will comply with recent BACT determinations for similar projects in California and elsewhere. Emissions of SO_2 and PM_{10} will be maintained at low levels, owing to the exclusive use of interstate pipeline quality natural gas as fuel for the turbines. The four turbines will be the only emission sources from the Project. Table 4-2 summarizes the estimated annual emissions from the Project for each criteria pollutant.

Table 4-2
Approximate Annual Pollutant Emissions from the Project

Pollutant	Annual Emissions (tpy)
NO_x	97
CO	171
SO_2	12
PM_{10}	52
VOC	40

4.3.2 Project Construction Sources

Temporary construction emissions will result from heavy equipment exhaust (primarily NO_x and diesel particulate emissions), fugitive dust (PM_{10}) from demolition, earthmoving activities and vehicle traffic on paved and unpaved surfaces. A detailed Excel Workbook will be created to estimate criteria pollutant emissions for non-overlapping phases of Project construction, based on information from the Project design engineers on the equipment use by month throughout the construction schedule, and the area extent of ground disturbance that will occur during different construction phases. Depending on the magnitude of emissions for different pollutants and the proximity of construction activities to the property boundary for each phase, one or more emission scenarios representing reasonable worst-case construction or demolition activities, including emissions from combustion equipment and fugitive dust, for each averaging time will be selected for subsequent dispersion modeling to ensure that maximum off-site air quality impacts due to these temporary activities will be assessed. The selected emissions scenarios will be modeled using AERMOD with the same meteorological input data used for the modeling of the Project’s operational emissions. The construction site, including the corridors for new transmission lines, gas lines or water pipelines, parking areas and lay-down areas will be modeled as area or volume sources. Fuel burning equipment will be represented as point sources deployed in appropriate locations within the project site. Ultra-low sulfur diesel fuel (15 ppm by weight or less) will be utilized on any emission calculations for construction equipment used at the Project site.

4.3.3 Toxic Air Contaminant Sources

TACs will also be emitted from the operational Project due to combustion of natural gas in the turbines. However, only small quantities of TACs will be emitted from these sources - primarily benzene, formaldehyde, and polycyclic aromatic hydrocarbons, since natural gas will be the only fuel used in the turbines. Emission estimates for TACs from the turbines will be based on emission factors obtained from standard CARB, and EPA factors and/or vendor data, if available.

4.3.4 Cumulative Impact Analysis Including Off-Property Sources

A cumulative modeling analysis will be performed using AERMOD to evaluate the combined impacts of the Project emissions increases with those of any other new sources within 6 miles from the Project that are currently either under construction, undergoing permitting or expected to be permitted in the near future. Requests will be made to the BAAQMD, Contra Costa County Planning Department, the City of

Antioch, and adjacent cities to request information that will be used to develop lists of all such new or planned emission sources. When received, these lists will be forwarded to CEC for review. Based on this information, and the CEC response, additional sources may be included in the cumulative source modeling analysis.

Since the Project will be located within the site property of the existing operational CCPP, another set of cumulative modeling runs will be conducted to evaluate the plant-wide impacts of emissions from the existing CCPP units with those of the Project. Thus two cumulative modeling analyses will be conducted, one to assess plant-wide impacts and another to assess impacts from the Project, existing CCPP sources and new or anticipated sources within a 10 kilometer radius of the Project, including the Gateway Generation Station currently under construction on northeast portion of the CCPP site. This dual modeling approach is consistent with CEC's guidance for cumulative impact analyses on other recent California projects where new generating units have been proposed on an existing power plant site.

4.4 BUILDING WAKE EFFECTS

The effect of building wakes (i.e., downwash) upon the stack plumes of emission sources at the facility will be evaluated in accordance with USEPA guidance (USEPA, 1985). Direction-specific building data will be generated for stacks below good engineering practice (GEP) stack height using the most recent version of USEPA Building Parameter Input Program – Prime (BPIP-Prime). Appropriate information will be provided in the AFC and other permit applications that describe the input assumptions and output results from the BPIP-Prime model.

4.5 RECEPTOR GRID

The receptor grids that will be used in the AERMOD modeling analyses described in this protocol for operational sources will be as follows:

- 25-meter spacing along the fenceline and extending from the fenceline out to 100 meters beyond the property line;
- 100-meter spacing from 100 m to 1 km beyond the property line;
- 500-meter spacing within 1 to 5 km of project sources; and
- 1,000-meter spacing within 5 to 10 km of project sources.

During the refined modeling analysis for operational Project emissions, if a maximum predicted concentration for a particular pollutant and averaging time is located within a portion of the receptor grid with spacing greater than 25 meters, a supplemental dense receptor grid will be placed around the original maximum concentration point and the model will be rerun. The dense grid will use 25-meter spacing and will extend to the next grid point in all directions from the original point of maximum concentration.

Due to the large computation time required to run AERMOD, this receptor grid, with the additional dense nested grid points, was determined to best balance the need to predict maximum pollutant concentrations and allow the all operational modeling runs to be completed in a reasonably timely manner.

Because construction emission sources release pollutants to the atmosphere from small equipment exhaust stacks or from soil disturbances at ground level, maximum predicted construction impacts for all pollutants and averaging times will occur within the first kilometer from the Project boundary. Accordingly, only the portion of the above grid out to a distance of 1 km will be used for the construction modeling.

For the HRA, boundary receptors will be placed every 25 meters along the property fence line. Grid receptors will be spaced every 100 meters out to 10 kilometers from the site in every direction. Any risks calculated by the HARP model at onsite grid receptors will be ignored.

Certain groups of individuals may be more susceptible to health risks due to chemical exposure, including children, pregnant women, the elderly, and people with chronic illnesses who could have higher sensitivity to toxic pollutants. Consequently, sensitive receptors, such as schools (public and private), day care facilities, convalescent homes, parks, and hospitals will receive particular attention in the health risk analysis. All sensitive receptors located within a 3-mile radius of the site will be included in the HRA.

Census receptors out to 10 km will be included; these receptors are located in the populated areas nearest to the proposed Project. Discrete receptors will also be placed at the locations of nearby residences.

A detailed project map will be provided in the AFC showing the locations of the grid receptors. Actual Universal Transverse Mercator (UTM) coordinates will be used. The CAAQS and NAAQS apply to all locations outside the applicant’s facility (i.e., everywhere where public access is not under the control of the applicant). Therefore, the fenceline will be placed along the facility’s property boundary, and the receptors will be placed on and outside of the fenceline.

4.6 METEOROLOGICAL AND AIR QUALITY DATA

4.6.1 Meteorological Data

Meteorological data collected by Pacific Gas and Electric (PG&E) at the nearby Pittsburg Power Plant will be used for the site specific data for AERMET. Excellent data capture occurred for the years 2002 through 2005, and thus these years were selected to be used to create the AERMET data input file.

The USEPA Meteorological Monitoring Guidance for Regulatory Modeling Applications (USEPA, 2000) outlines how to determine if site specific meteorological data are representative and thus acceptable for input for air quality modeling. The guidance states “in general, for use in air quality modeling applications, meteorological data should be representative of conditions affecting the transport and dispersion of pollutants in the “area of interest” as determined by the locations of the sources and receptors being modeled”.

The Project is located on the southern bank of the San Joaquin River. The meteorological station is located on the southern bank of Suisun Bay. Both sites are on the southern edge of large bodies of water that lie in an east-west orientation and are the same distances from prominent terrain features in the surrounding area. Wind and temperature data should be very similar at both the meteorological station and the Project, thus the meteorological station and the Project are within the area of interest.

The 2002 through 2005 data set represents data collection over four years. Although only one year of site specific data are required, a four-year data set was selected to better represent project site conditions, as well as to capture worst-case meteorological conditions. The meteorological station was re-calibrated annually to ensure quality data were collected.

In processing the data for input into AERMOD, additional parameters typically not collected at site specific stations are required; thus, the site specific data are supplemented with data from the nearest National Weather Service (NWS) station. Surface data will be obtained from the Concord Buchanan Field Airport for the same years, as the onsite data, 2002-2005. This station is approximately 15 kilometers southwest of the Project and is surrounded by suburban areas, in rolling terrain. The terrain immediately surrounding the Project site can be categorized as suburban with rolling hills; thus the land use and the location with respect to near-field terrain features are similar.

The Oakland Airport upper air data monitoring station is located approximately 45 kilometers southwest of the Project. This is the closest upper air station and was determined the most representative data available for use in this modeling analysis.

The land use surrounding the PG&E meteorological station and the Project can primarily be split into 2 categories, water with scattered wetlands to the north and suburban residential to the south. The AERSURFACE model was used to determine the surface characteristics from land cover data from United States Geological Survey (USGS).

AERSURFACE calculates that surface roughness from the land cover data for a 1 kilometer radius around the meteorological tower and the albedo and Bowen ratio from a 10 kilometer radius around the meteorological tower adhering to the recommendations from the AERMOD Implementation Guide (USEPA, 2008). The surface moisture input was set to average for Bowen ratio calculations. The default months assigned to each season were used, although winter was defined as not receiving continuous snow cover. Finally, the seasonal output obtained for the surface characteristics for both sectors, are presented in Table 4-3. These are the surface characteristics that will be used for input into AERMET.

An annual wind rose based on the four years of onsite meteorological data is provided as Appendix A to this protocol document. Winds blow predominantly from the west.

Table 4-3
Land Use Characteristics used in AERMET

Land Use Characteristic	Sector	Range	Spring	Summer	Fall	Winter
Albedo (α)	1	270°-90°	0.14	0.14	0.14	0.15
	2	90°-270°	0.14	0.14	0.14	0.15
Bowen Ratio (β)	1	270°-90°	0.27	0.31	0.35	0.35
	2	90°-270°	0.27	0.31	0.35	0.35
Surface Roughness (z_o) (m)	1	270°-90°	0.008	0.008	0.008	0.008
	2	90°-270°	0.032	0.032	0.031	0.027

4.6.2 Air Quality Monitoring Data

Air quality monitoring data to represent existing air quality in the Project area were obtained from the USEPA AirData (2006) and the CARB-California Air Quality Data website (2006). The most recent three years of data (2004-2006) from the Pittsburg, Concord, and Bethel Island monitoring stations were collected to determine the most representative baseline concentrations for each air pollutant and averaging period addressed in the California and National ambient air quality standards. The maximum concentration recorded at these monitoring stations over the three-year period will be used as a conservative representation of existing air quality condition at the site of the proposed Project.

The Pittsburg monitoring station is located approximately half a mile south of the Project site and monitors all criteria pollutants except $PM_{2.5}$. The Concord station is approximately 10 miles southwest of the site and also monitors all pollutants. The Bethel Island station is located to the east-southeast approximately 14 miles from the site and monitors all criteria pollutants except $PM_{2.5}$.

The selected maximum baseline concentrations for all pollutants are summarized in Table 4-4. These data will be added to the modeled maximum impacts due to project emissions for each pollutant and averaging time, and the totals will then be compared with the applicable AAQS. This is a conservative approach because it assumes that the highest recorded background values and the modeled maximum impacts occur at the same time and location for each pollutant and averaging time, a highly unlikely scenario. Note that the maximum background concentrations of PM_{10} and $PM_{2.5}$ currently exceed the corresponding CAAQS and NAAQS.

Table 4-4
Highest Monitored Pollutant Concentrations near the Project Site (2004 – 2006)

Pollutant	Averaging Time	Highest Monitoring Concentration	Monitoring Station	Year
CO	1 hour	4.1 ppm (4,715 μg/m³)	Pittsburg	2004
	8 hour	2.0 ppm (2,222 μg/m³)	Concord	2004
NO_2	1 hour	0.065 ppm (122.1 μg/m³)	Concord	2004
	Annual	0.012 ppm (22.4 μg/m³)	Concord	2004
SO_2	1 hour	0.090 ppm (235.8 μg/m³)	Concord	2004
	3 hour	0.044 ppm (114.4 μg/m³)	Concord	2004
	24 hour	0.010 ppm (26.3 μg/m³)	Concord	2004
	Annual	0.002 ppm (5.3 μg/m³)	Concord	2004
PM_{10} (Non-attainment area)	24 hour	84 μg/m³	Concord	2006
	Annual	22 μg/m³	Pittsburg	2004
$PM_{2.5}$ (Non-attainment area)	24 hour	74 μg/m³	Concord	2004
	Annual	12 μg/m³	Concord	2004

4.7 FUMIGATION MODELING

Fumigation can occur when a stable layer of air lies a short distance above the release point of a plume and unstable air lies below. Especially on sunny mornings with light winds, the heating of the earth's surface causes a layer of turbulence, which grows in depth over time and may intersect an elevated exhaust plume. The transition from stable to unstable surroundings can rapidly draw a plume down to ground level and create relatively high pollutant concentrations for a short period. Typically, a fumigation analysis is conducted using SCREEN3 when the project site is rural and the stack height is greater than 10 meters.

A fumigation analysis will be performed using the USEPA model SCREEN3. The SCREEN3 model will be used to calculate concentrations from both inversion breakup fumigation, and shoreline fumigation. A unit emission rate will be used (1 gram per second) in the fumigation modeling to represent the plant turbine emissions and the model results will be scaled to reflect expected plant emissions for each pollutant. Inversion breakup fumigation concentrations will be calculated for 1- and 3-hour averaging times using USEPA-approved conversion factors. These multiple-hour model predictions are conservative since inversion breakup fumigation is a transitory condition that would most likely affect a given receptor location for only a few minutes at a time.

SECTION 5 AIR QUALITY IMPACT ANALYSIS FOR CLASS I AREAS

An evaluation of potential impacts in Class I areas within 100 km of the Project will be conducted, because the potential emissions increases of some pollutants will be sufficiently high to be considered a Major Source, thus triggering the federal PSD program. A Major Source must evaluate impacts to visibility and other air quality related values (AQRV) at all Class I areas that are located within a 100-km radius of the facility. All pollutants for which Project emissions are above the Major Source threshold (in this case, 100 tpy) and all pollutants for which emissions are above the PSD Significant Emissions Rates must be evaluated. This section describes the dispersion models and modeling techniques that will be used in performing the Class I area air quality analyses for the Project. The objectives of the modeling are to demonstrate that air emissions from the Project will not cause or contribute to a PSD increment exceedance or cause a significant impact on visibility, regional haze or sulfur or nitrogen deposition in any Class I area.

One Class I area is located within 100 kilometers of the Project site: Point Reyes National Seashore. The nearest edge of the Point Reyes National Seashore is located approximately 82 kilometers from the Project, since this is more than 50 km and less than 100 km from the proposed facility, only far-field AQRV analyses will need to be completed. The CALMET/CALPUFF (full-CALPUFF) model will be used to evaluate potential impacts in the Point Reyes National Seashore Class I area, including potential air quality impacts, sulfur and nitrogen deposition, and impacts to visibility.

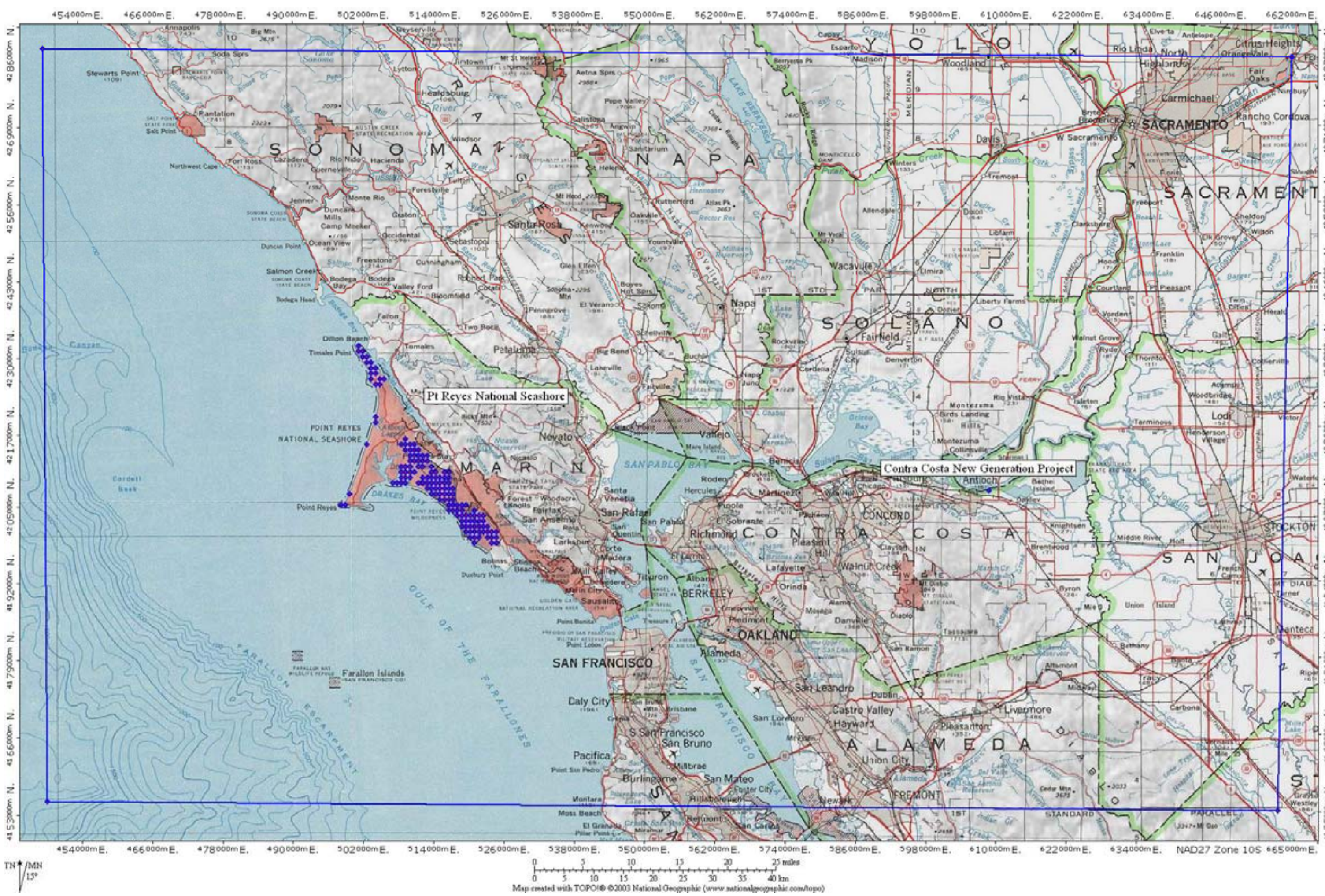
Figure 3 shows the location of this Class I area relative to the proposed Project site and Table 5.1 lists the distances from Project to the closest and farthest points within the Class I area. The federal authority in charge of the Point Reyes National Seashore is the National Park Service (NPS). The AQRV analyses for this Class I area will be conducted in a manner consistent with guidance from the NPS and the United States Forest Service (USFS), following the procedures set forth in the Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report (USFS, 2000) and the Calpuff Reviewer's Guideline (USFS and NPS, 2005).

The CALPUFF modeling domain selected for the modeling analyses will extend approximately 40 km past the farthest edge of Point Reyes National Seashore in order to reduce the probability that mass will be lost from the model calculations due to possible wind recirculation (Figure 3).

Table 5-1
Class I Areas within 100-km Radius of the Proposed Project

Class I area	Distance from the Project (km)	
Point Reyes National Seashore	Closest	82
	Farthest	110

Figure 3
Calpuff Domain and Receptors for the Class I Area Nearest to the Project



5.1 NEAR-FIELD CLASS I AREAS AIR QUALITY IMPACT ANALYSIS

There are no Class I Areas that are completely or partially within 50 km of the proposed Project location; therefore, no near field AQRV analyses are necessary.

5.2 FAR-FIELD CLASS I AREA AIR QUALITY IMPACT ANALYSIS: CALPUFF MODELING

Note: An email received by URS on January 28, 2008 from John Notar of the U.S. National Park Service indicated that the NPS is considering a policy change that would allow projects to be exempted from a Class I increment analysis and Air Quality Related Values Analysis, if the ratio of the project's annual emissions of NO_x, PM and SO_x (tons per year) to the distance of the project site to the nearest Class I area (in kilometers) is below a certain threshold value. Based on a distance of about 82 kilometers from the Contra site to the Point Reyes National Seashore and projected annual emissions of 97, 52 and 12 tons per year for NO_x, PM and SO_x, respectively, the screening ratio for the Contra Costa New Generation Project is about 1.96, which is apparently below the screening ratio threshold currently being considered. In the event that NPS determines that the Contra Costa project can be exempted from the Class I area analyses on this basis, then a letter to BAAQMD will be provided by NPS stating that such analyses are not required. In that case, this section of the protocol will become inoperative. However, a full description of the Class I analyses that would be conducted is provided below to cover the possibility that such a decision by NPS may not be forthcoming in time to affect the modeling analysis for this project.

The CALPUFF model will be used in conjunction with the CALMET diagnostic meteorological model to analyze visibility, PSD increment and sulfur and nitrogen deposition impacts in the Class I area located within 100 km from the proposed Project site. CALPUFF is a transport and dispersion model that simulates the advection and dispersion of "puffs" of material emitted from modeled sources. CALPUFF can incorporate three-dimensionally varying wind fields, wet and dry deposition, and atmospheric gas and particle phase chemistry. The CALMET model is used to prepare the necessary gridded wind fields for use in the CALPUFF model. CALMET can also accept as input; mesoscale meteorological (MM5) data, surface station, upper air, precipitation, cloud cover, and over-water meteorological data (all in a variety of input formats). These data are merged and the effects of terrain and land cover types are simulated. This process results in the generation of a gridded 3-dimensional wind field that accounts for the effects of slope flows, terrain blocking effects, flow channeling, and spatially varying land uses.

The USEPA-approved regulatory air quality dispersion model CALPUFF (version 5.8) will be used. In addition, all supporting Version 5 editions of the pre- and post-processors will be used. Recommendations from the regulatory guidance documents listed below will be followed.

- *Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase 1 Report (USEPA December 2000),* and
- *Interagency Workgroup on Air Quality Modeling (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts (USEPA December 1998),* and
- *Calpuff Reviewer's Guide (Draft), (USFS and NPS, 2005).*

Model options will be based on guidance from the Federal Land Manager (FLM) and from the above documents and direct discussions with NPS air quality staff.

Electronic copies of the model input and output files generated by this and all other modeling analyses described in this protocol will be provided with the final application.

5.2.1 CALPUFF/CALMET Description

5.2.1.1 Location and Land-Use

The CALMET and CALPUFF models incorporate assumptions regarding land-use classification, leaf-area index, and surface roughness length to estimate deposition of emitted materials during atmospheric transport. U.S. Geological Survey (USGS) 1:250,000 scale digital elevation models (DEMs) and Land Use Land Cover (LULC) classification files will be used to develop the geophysical input files required by the CALMET model. Outputs of the terrain pre-processor (TERREL) and land use pre-processor (CTGPROC) will be combined in the geo-physical preprocessor (MAKEGEO) to prepare the CALMET geo-physical input file. The CALMET model will incorporate the necessary parameters in the CALMET output files for use in the CALPUFF model.

The CALPUFF modeling domain will extend from the Project site approximately 150 km to the west, 125 km to the north, 60 km to the east, and 115 km to the south. The grid-cells over this domain will be 4 kilometers by 4 kilometers. The modeling domain will be specified using the Lambert Conformal Conic (LCC) projection system.

5.2.1.2 Meteorological Data

Pursuant to Federal Land Manager (FLM) guidance, a three-year meteorological data set will be developed for the Class I area modeling analysis using a combination of surface station and mesoscale meteorological (MM5) data for 2001-2003. Hourly CALMET data will be derived from the MM5 data for these three, years, which will be obtained from the WRAP BART modeling for the Nevada-Utah domain. Surface meteorological, precipitation and ozone data will also be obtained from the WRAP BART modeling for the Nevada-Utah domain. Upper air data from the Oakland Airport station will also be included.

CALMET wind fields will be generated using a combination of the MM5 data sets augmented with the surface data from the National Weather Service (NWS) stations described above. Per IWAQM guidance, the MM5 data will be interpolated to the CALMET fine-scale grid to create the initial-guess wind fields (IPROG = 14 for MM5).

5.2.1.3 Other Model Options

Size parameters for dry deposition of nitrate, sulfate, and PM_{10} particles will be based on default CALPUFF model options. Chemical parameters for gaseous dry deposition and wet scavenging coefficients will be based on default values presented in the CALPUFF User's Guide. For the CALPUFF runs that incorporate deposition and chemical transformation rates (i.e., deposition and visibility), the full chemistry option of CALPUFF will be activated (MCHEM = 1). The nighttime loss rates for SO_2, NO_x and nitric acid (HNO_3) will be set at 0.2 percent per hour, 2 percent per hour and 2 percent per hour, respectively. CALPUFF will also be configured to allow predictions of SO_2, sulfate (SO_4), NO_x, HNO_3, nitrate (NO_3) and PM_{10} using the MESOPUFF II chemical transformation module.

Hourly ozone concentration files for the CALPUFF modeling will be obtained from the WRAP BART modeling data for the Nevada-Utah domain. Only data from the ozone monitoring stations within the Project domain will be used.

Per the FLAG guidance, the background ammonia concentration for Pt Reyes National Seashore will be set to 0.5 ppb, which is representative for forests.

The regulatory default setting for MDISP=3 which utilizes the Pasquill-Gifford dispersion coefficients will be used in the CALPUFF modeling.

5.2.1.4 Receptors

Discrete receptors for the CALPUFF modeling within the Point Reyes National Seashore will be obtained from the NPS Class One Area receptor database. No modifications to the receptor locations or heights provided in the database will be made. Latitude/Longitude coordinates of the Class I receptors will be converted to LCC coordinates based on the domain setup shown in CALMET options. These receptors are shown in Figure 3.

5.2.2 Far-Field Class I Areas Visibility and Regional Haze Analysis

For the analysis of visibility effects due to the Project's emissions of air pollutants, CALPUFF requires project emission rate inputs for six pollutant species, i.e., directly emitted PM_{10}, NO_x, and SO_2, and secondary SO_4, HNO_3, and NO_3. The maximum 24-hour averaged emission rates of PM_{10}, NO_x and SO_2 from all sources of the Project will be used for the visibility impacts analysis. The turbine emissions of SO_2 will be speciated to SO_2 and SO_4 as indicated in the NPS Particulate Matter Speciation (PMS) guidelines for natural gas turbines (NPS, 2006). The total turbine PM_{10} emissions will be speciated to elemental carbon and organic carbon [emitted as Secondary Organic Aerosol (SOA)] per the PMS. Direct emissions of the remaining species, HNO_3 and NO_3, are assumed to be zero for the natural gas turbines.

Modeled impacts will be converted to visibility impacts using the CALPOST post processor. CALPOST will be used to post-process estimated 24-hour averaged concentrations of ammonium nitrate, ammonium sulfate, element carbon (EC), and SOA into extinction coefficient values for each day at each modeled receptor.

CALPUFF also requires a background light extinction reference level. The analysis will be run using the FLAG recommended background extinction values for the specific Class I area under consideration. The background extinction coefficient is composed of hygroscopic scattering components, wherein the addition of water enhances particle light-scattering efficiencies, non-hygroscopic scattering components and Rayleigh scattering. Ammonium sulfate and ammonium nitrate compose the hygroscopic scattering components, while organic aerosols, soils, coarse particles, particle absorption from elemental carbon and absorption from gases (primarily from nitrogen dioxide) compose the non-hygroscopic scattering components.

In accordance with the FLAG guideline the total background extinction coefficient is calculated for the Class I area using the following equation:

$$b_{ext} = b_{hygro} \cdot f(RH) + b_{non\text{-}hygro} + b_{Ray}$$

where:

b_{hygro} = the hygroscopic scattering component (Mm^{-1})
= $3[(NH_4)_2SO_4 + NH_4NO_3]$
$b_{non\text{-}hygro}$ = the non-hygroscopic scattering component (Mm^{-1})
= $b_{OC} + b_{Soil} + b_{Course} + b_{ap} + b_{ag}$
b_{Ray} = the Rayleigh scattering component (Mm^{-1}) = 10 Mm^{-1} (FLAG)
f(RH) = relative humidity adjustment factor

In the CALPOST post-processing program, the monthly background concentration of ammonium sulfate is set to one third of the hygroscopic scattering component, and the monthly background concentration of soil particles is set to the non-hygroscopic scattering component, as recommended in the FLAG report.

The FLAG relative humidity (RH) adjustment factors (MVISBK=2) and the RHMAX = 95 % will be used as suggested by the NPS FLM.

The extinction coefficient percent change (background extinction coefficient vs. modeled extinction coefficient), predicted by CALPUFF will be compared to the level of acceptable change (LAC) of 5%. If the change in extinction is greater than 5%, but less than 10%, the conditions surrounding that prediction will be examined to determine if inclement weather may obscure actual viewing of the plume in the Class I area.

5.2.3 PSD Class I Significance Analysis

A PSD analysis of incremental air pollutant concentrations in the Class I area will be required because the Project will be a Major Source as defined in the PSD regulations. Accordingly, the maximum predicted incremental criteria pollutant concentrations from the Project sources in the Class I area will be compared with the proposed PSD significant impact level for Class I areas (see Table 5-2) for each pollutant as a reference point.

Table 5-2
FLAG Proposed Class I Significance Impact Levels

Parameter	Modeled Scenario					
Concentration	NO_x	PM_{10}		SO_2		
	Annual	24-hour	Annual	3-hour	24-hour	Annual
Threshold	0.1	0.3	0.2	1	0.2	0.1

CALPUFF will be used to model ambient air concentrations of NO_2, PM_{10}, and SO_2 in the Class I Area for comparison with the PSD Class I significant impact levels. All NO_2, SO_2 and PM_{10}, sources of the proposed project will be modeled at the full potential-to-emit (PTE) in the CALPUFF PSD modeling for each averaging time. The full chemistry option of CALPUFF will be activated (MCHEM =1, MESOPUFF II scheme), and deposition options will also be turned on (MWET = 1 and MDRY = 1).

5.2.4 Deposition Analysis

CALPUFF will be used to evaluate the potential for nitrogen and sulfur deposition in the Class I area due to Project emissions of nitrogen and sulfur oxides emissions. Total deposition rates for each pollutant will be obtained by summing the modeled wet and/or dry deposition rates. The annual average PTE emission rates for Project sources will be used in this analysis, since annual deposition rates are to be estimated.

For sulfur deposition, the wet and dry fluxes of SO_2 and SO_4 are calculated, normalized by the molecular weight of sulfur, and expressed as total sulfur. Total nitrogen deposition is the sum of nitrogen contributed by wet and dry fluxes of HNO_3, nitrate (NO_3), ammonium nitrate (NH_4NO_3), ammonium sulfate ($(NH_4)_2SO_4$) and the dry flux of NO_x.

The total modeled nitrogen and sulfur deposition rates will be compared with the NPS/USFS deposition analysis thresholds (DAT) for western states. The DAT for nitrogen and sulfur are each 0.005 kilogram per hectare per year (kg/ha-yr), which converts to 1.59E-11 $g/m^2/s$.

5.2.5 Soils and Vegetation

Class I Areas may contain sensitive species within their different vegetative ecosystems. Sensitive species are impacted primarily by ozone but may also be impacted by nitrogen and sulfur compounds. Acidity in rain, snow, cloudwater, and dry deposition can affect soil fertility and nutrient cycling processes in watersheds, and can result in acidification of lakes and streams with low buffering capacity. Therefore, the soil and vegetation analysis will be conducted using the CALPUFF model to predict total sulfur and nitrogen deposition rates. In order to protect sensitive species, the USFS (Peterson et al, 1992) recommends that short-term maximum SO_2 levels should not exceed 40 to 50 parts per billion (ppb). Annual average SO_2 concentrations should not exceed 8 to 12 ppb, and annual average NO_2 concentration should not exceed 15 ppb.

SECTION 6 PRESENTATION OF MODELING RESULTS

Two separate permit documents will be created with the results of the air quality analyses, an AFC for the CEC, and a permit to construction (PTC)/PSD application for the BAAQMD and EPA. The results from all of the air quality analyses to evaluate the construction and operational impacts of the Project will be summarized in the AFC, along with the two cumulative impact analyses. The results from the operational impact analyses and Class I area analyses will be summarized in the PTC/PSD application. The HRA results will be summarized in both applications.

6.1 PSD, NAAQS AND CAAQS ANALYSES

The results of the PSD and AAQS analyses to evaluate the construction and operational impacts of the Project will be presented in summary tables. A figure indicating the locations of the maximum predicted pollutant concentrations for each applicable pollutant and averaging time will be provided. The maximum modeled values of NO_2, SO_2 and CO will be compared with current Class II and proposed Class I SILs. If the model impact exceeds the SILs, the background concentrations (see Section 4.6.2) will be added to the maximum modeled values from the Project sources to yield total concentrations, which will be compared with the NAAQS and CAAQS. Isopleth drawing showing the predicted spatial distributions of criteria pollutant concentrations near the proposed Project will be prepared. The cumulative impact values from both the plant-wide and plant-wide plus new sources within 6 miles analyses will be added to the background concentrations for the corresponding pollutants and averaging times for comparison with the NAAQS and CAAQS.

6.2 HEALTH RISK ASSESSMENT ANALYSIS

Maps depicting the following data will be prepared:

- The locations of sensitive receptors, including schools, pre-schools, hospitals, etc., within a 3-mile radius of the Project, and the nearby residences included in the HRA;
- Isopleths for any areas where predicted exposures to air toxics result in estimated chronic non-cancer impacts and acute impacts equal to or exceeding a hazard index of 1; and
- Isopleths for any areas where exposures to air toxics lead to an estimated carcinogenic risk equal to or greater than one in one million.

Health risk assessment modeling results will be summarized to include maximum annual (chronic, carcinogenic, and non-carcinogenic) and hourly (acute) adverse health effects from the Project's toxic air contaminant emissions. The estimated cancer burden will be presented if the maximum off-site cancer risk is predicted to be greater than one in a million. Health risk values will be calculated and presented in the summary table for the points of maximum impact and the sensitive receptors with the maximum risk values.

6.3 CLASS I ANALYSIS

The results of the visibility, PSD, deposition, soil and vegetation analyses to evaluate the operational impacts of the Project will be presented in summary tables and compared with all relevant significance thresholds.

6.4 DATA SUBMITTAL

Electronic copies of the modeling input and output files for all the analyses described in this protocol will be provided to BAAQMD, CEC, EPA Region IX and National Park Service.

SECTION 7 REFERENCES

American Meteorological Society. Journal of Applied Meteorology, 17(5): 636-643. Correlation of Land Use and Cover with Meteorological Anomalies, August Auer Jr., May 1978.

ARB 2003. HARP User Guide – Software for Emission Inventory Database Management, Air Dispersion Modeling Analyses, and Health Risk Assessment version 1.3, Air Resources, Board, California Environmental Protection Agency. December 2003.

Bay Area Air Quality Management District. BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines, June 2005.

CEC, 1997. Regulations Pertaining to the Rules of Practice and Procedure and Plant Site Certification. Title 20, California Code of Regulations. Chapter 1, 2, 5.

CEC, 2006. Rules of Practice and Procedure & Power Plant Site Certification Regulations Revisions, 04-SIT-2, December 14, 2006.

National Park Service, 2006. Particulate Matter Speciation: http://www2.nature.nps.gov/air/permits/ect/index.cfm.

Office of Environmental Health Hazard Assessment (OEHHA), 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, August 2003.

Peterson, David L.; Schmoldt, Daniel L.; Eilers, Joseph M.; Fisher, Richard W.; Doty, Robert D., 1992. Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in California, USDA Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-136, November 1992.

United States Environmental Protection Agency, 1988. Workbook for Plume Visual Impact Screening and Analysis, U.S. Environmental Protection Agency, Research Triangle Park, NC. September 1988.

United States Environmental Protection Agency, 1990. New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting (Draft), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. October 1990.

United States Environmental Protection Agency, 1992. Addendum to Workbook for Plume Visual Impact Screening and Analysis, U.S. Environmental Protection Agency, Research Triangle Park, NC. October 1992.

United States Environmental Protection Agency, 1998. Interagency Workgroup on Air Quality Modeling (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts. EPA-454/R-98-019. December 1998.

United States Environmental Protection Agency, 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005, February 2000.

United States Environmental Protection Agency, 2004. User's Guide for the AMS/EPA Regulatory Model-AERMOD. September 2004.

United States Environmental Protection Agency, 2005. AERMOD Implementation Guide. September 2005.

United States Environmental Protection Agency, 2006. Addendum to User's Guide for the AMS/EPA Regulatory Model-AERMOD. December 2006.

United States Environmental Protection Agency, 2006. USEPA AirData.

United States Environmental Protection Agency, 2008. AERMOD Implementation Guide. January, 2008.

United States Environmental Protection Agency, 2008. AERSURFACE User's Guide. EPA-454/B-08-001, January, 2008.

United States Forest Service et al. 2000. Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase 1 Report. Prepared by U.S. Forest Service Air Quality Program, National Park Service Air Resources Division, U.S. Fish and Wildlife Service Air Quality Branch. December 2000.

USDA Forest Service and National Park Service, 2005. CALPUFF Reviewer's Guide (DRAFT) prepared by Howard Gebhart. September 2005.

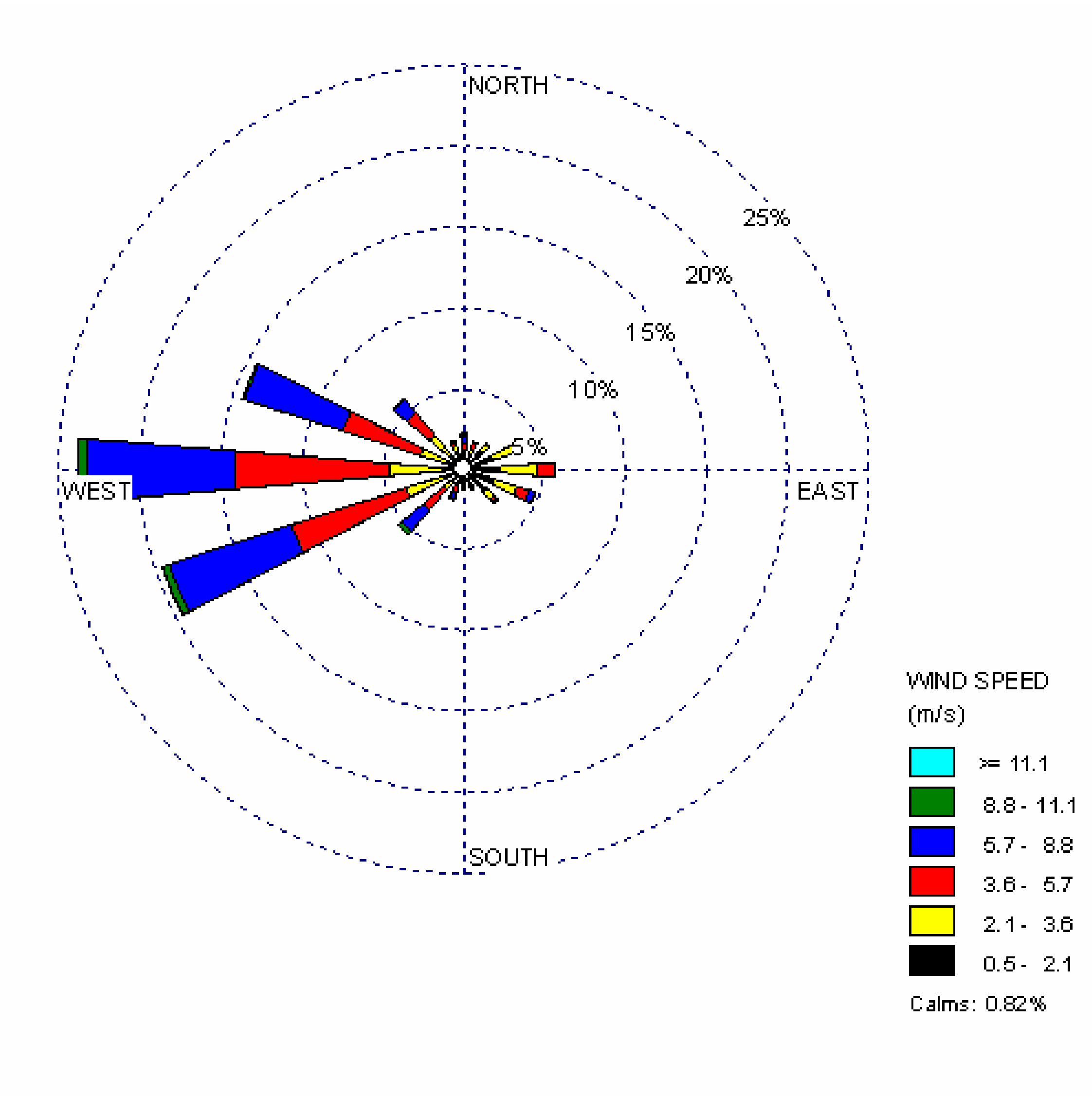


Figure A-1 Annual Windrose for the Pittsburg Meteorological Station for 2002-2005

Appendix J2
Agency Comments on Air Modeling Protocol

[All of the following agency comments have been incorporated into the analyses performed in Sections 7.1, Air Quality, and 7.6, Public Health, as necessary]

California Energy Commission Staff have reviewed the modeling protocol dated January 31, 2008 for the Mirant proposed Contra Costa New Generation Project located near the city of Antioch. Based on our review, we have the following comments about the protocol and issues that should be considered for inclusion in the air dispersion modeling analysis for the project.

Table 4-1 on page 4-2 shows that the 1-hour NO2 state ambient air quality standard is 0.25 ppm (470 $\mu g/m^3$), recent changes to the state standard will be ratified by the time the applicant submits the Application for Certification. Therefore, staff advises that the applicant modify the 1-hour NO_2 state ambient air quality standard in Table 4-1 to 0.18 ppm (338 $\mu g/m^3$).

The applicant states on page 4-3 that NO_2 modeling will be performed using AERMOD with the ozone limiting module. The applicant states that the meteorological data and ambient air quality data shall be taken from the same years. However, on pages 4-8 through 4-10 the identified meteorological data is from the years of 2002 through 2005 and the ambient air quality data is from the years of 2004 through 2006. Please identify the meteorological and ambient air quality data that the applicant intends to use for the purposes of AERMOD OLM modeling for the project NO_2 impacts.

The applicant states on page 2-1 that the demolition of the existing tank farm is to be considered part of the proposed project. However, no mention of demolition emissions or impacts is made on page 4-6. Please include the estimated emissions and impacts of the proposed demolition of the existing tank farm on the project site.

At this time staff is NOT recommending that the applicant include the modeling of nitrogen or sulfur deposition on nearby soils. However, information may become available during the licensing process that necessitates such modeling.

Since the applicant is proposing to use ambient air quality monitoring from the Bethel Island monitoring station (page 4-10), which is approximately 14 miles to the southeast of the project site, staff recommends that the project modeling include the operating portion of the existing Contra Costa Power Plant and the proposed Gateway Power Project. Staff recommends that the applicant modeling emissions of the Contra Costa New Generation Project both separately and in conjunction with the emissions of the operational portion of the existing Contra Costa Power Plant and the proposed Gateway Power Project. It is staff's opinion that adding the combined emissions from these emission sources to the ambient air quality background monitored at Bethel Island will produce a reasonable estimate of the likely impacts from these proposed project operations.

February 21, 2008

Mark Strehlow
URS Corporation
1333 Broadway, Suite 800
Oakland, CA 94612

Subject: Air Quality Modeling Protocol for the Contra Costa New Generation Project

Dear Mr. Strehlow:

Our staff has reviewed the January 31, 2008 "Air Quality Modeling Protocol for the Contra Costa New Generation Project Contra Costa County, California." Attached are our comments.

If you have any questions, feel free to contact me at (415) 749-4676 or Jane Lundquist at (415) 749-4675.

Sincerely,

Scott Lutz, Manager
Toxics Evaluation Section

SBL:jhl

Comments on the Air Quality Modeling Protocol for the Contra Costa New Generation Project, Contra Costa County, California dated January 31, 2008

1. Section 3.2 (Page 3-2): This section states that the BAAQMD rule specifies a limit for cancer burden. The BAAQMD rule does not specify a limit for cancer burden.

2. Table 4-1 (Page 4-2): This table should be updated to show the latest CAAS standard for annual and 1-hour average NO_2, and the BAAQMD Regulation 2, Rule 2, Section 233 PSD Class II Significant Impact level of 19 $\mu g/m^3$ for 1-hour average NO_2.

3. Section 4.2.2 (Page 4-3): This section states that hourly ozone measurement data collected at the Pittsburg BAAQMD air quality monitoring station will be used when conducting the OLM modeling. However, the Contra Costa Power Plant (CCPP) site is located midway between the Pittsburg and the Bethel Island BAAQMD monitoring stations. Higher peak ozone concentrations have been recorded at the Bethel Island monitoring station. The OLM modeling should be conducted using the hourly ozone data collected at the Bethel Island monitoring station for the same years corresponding to the meteorological input data.

4. Section 4.2.3 (Page 4-4): This section states that all pathways, except the drinking water consumption pathway will be included in the health risk screening analysis. Justification for the site parameters used in HARP for each included pathway should be provided.

5. Section 4.6.1 (Page 4-8): This section states that meteorological data collected at the Pittsburg Power Plant will be used for the site specific data. However, the Pittsburg monitoring station is more than 7 miles west of the project site. Meteorological data from the CCPP should be used for modeling. The CCPP meteorological tower is located within 100 meters of the project location. The CCPP Meteorological data suitable for modeling are available for the years 2000 – 2002, 2004, and 2005.

6. Section 4.6.1 (Page 4-9): A new sector analysis around the CCPP meteorological tower must be conducted. The District has conducted a land use analysis around the CCPP meteorological station and determined that the following sectors should be used:

- Sector 1: 274° - 62°
- Sector 2: 62° - 150°
- Sector 3: 150° - 182°
- Sector 4: 182° - 243°
- Sector 5: 243° - 274°

The Figure 1 shows the five sectors and the land use code types surrounding the CCPP meteorological station. Table 1 describes the land use codes depicted in Figure 1.

Figure 1

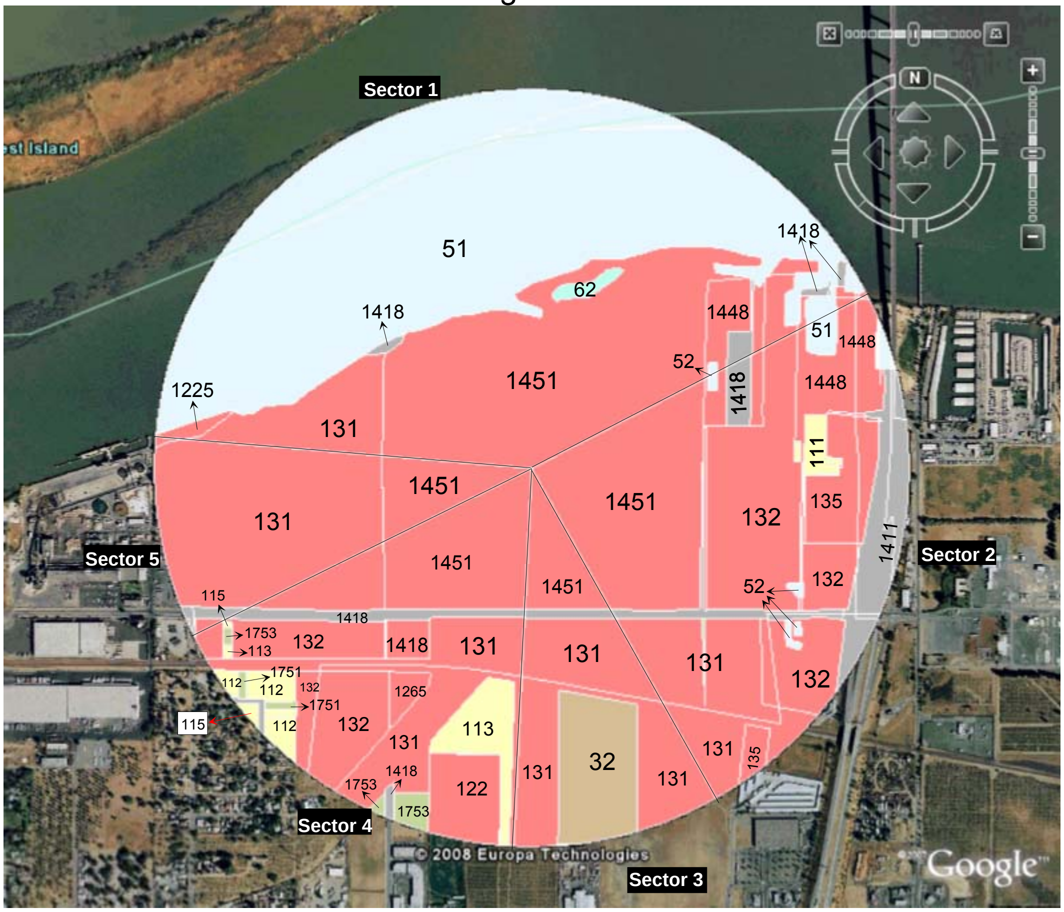


Table 1: Land Use by parcel (1km radius around the CCP met tower)

Code	Description
32	TOTAL RANGELAND: Shrub and Brush
51	Streams and Canals
52	Lakes
62	Nonforested Wetlands
111	Residential: 1-plus to 5 acre lots (approx. one dwelling unit (DU) per metric hectare (2.47 acres)
112	TOTAL RESIDENTIAL LAND - 1-3 units/acre (Not Mobile Home Parks)
113	TOTAL RESIDENTIAL LAND - 3-8 units/acre (Not Mobile Home Parks)
115	TOTAL RESIDENTIAL LAND - >8 units/acre, Multifamily, Group Quarters
122	Commercial intensive outdoor recreation
131	TOTAL INDUSTRIAL [excluding mixed]: Heavy Industrial
132	TOTAL INDUSTRIAL [excluding mixed]: Light Industrial
135	TOTAL INDUSTRIAL [excluding mixed]: Food Processing, Warehousing
175	TOTAL URBAN OPEN: Vacant--Undeveloped:
1265	TOTAL COMMERCIAL/SERVICES: City Halls/County Administration
1411	TOTAL MAJOR INFRASTRUCTURE: Roads, Highway and Related Facilities
1418	Road transportation facilities: Local streets and roads
1448	Marine transportation facilities: Marina
1451	Power facilities: Electricity – Power plant
1751	TOTAL URBAN OPEN: Vacant--Undeveloped:
1753	TOTAL URBAN OPEN: Vacant--Undeveloped:

7. Section 4.6.1 (Page 4-9): For processing the data input into AERMOD:

- The meteorological data from the Concord Buchanan Field Airport can be used to supply cloud cover information. Surface winds from Concord Buchanan Field should not be substituted for missing hours in the CCPP data sets.
- The MODIFY option should be chosen in AERMET for the Oakland RAOB data.
- The seasonal albedo and Bowen ratio should be determined for the 10 kilometer by 10 kilometer region centered on the CCPP meteorological tower.
- The Bowen ratio should be determined by obtaining local precipitation data and applying the percentile method outlined in the last bullet item of section 2.2 of the AERSURFACE User's Guide. The Antioch Pump Plant 3 is the closest climate station of record with at least 30 years of continuous records. The District has been collecting the precipitation data from Antioch Pump Plant 3 and can provide the applicant the monthly Bowen Ratio determination of wet, dry, or average for each year modeled.
- The San Francisco Bay Area (BA) does not experience typical seasons. Typically, the BA experiences a relatively short spring. The BA also experiences a prolonged dry season that extends several months after the growth of lush vegetation. It is advised that monthly surface values be used in lieu of the default seasons in AERSURFACE. The breakdown of the months in each season should be as follows:

Season	**Months**	**AERSURFACE Category**
Spring	February and March	5
Summer	April, May, June, and July	1
Fall	August, September, and October	2
Winter	November, December, and January	3

8. Section 4.6.2 (Page 4-10): The descriptions of the locations of the air quality monitoring stations relative to the project site need to be corrected. The Pittsburg station is more than 8 miles west of the project site, the Concord station is about 15.5 miles southwest, and the Bethel Island station is about 6.5 miles east.

9. Section 4.7 (Page 4-11): A Type I and Type III fumigation analysis must be performed. The SCREEN3 model can be used to perform both of these analyses. For Type III, the default Thermal Internal Boundary Layer (TIBL) factor in the SCREEN3 model is normally set at a value of 6. Shoreline fumigation for TIBL factors from 2 to 6 must also be calculated. The highest impact result from varying the TIBL factor is then considered the maximum shoreline fumigation impact.

For multiple sources, shoreline fumigation impacts are determined for each source. The shoreline fumigation impacts are then summed over all of the sources. For a more refined approach, ISCST3 can be run to determine the impacts of the other sources at the location of the fumigation impact for each source. Using F stability and a stack height wind speed of 2.5 m/s, ISCST3 is run for the other sources whose plume are under the TIBL. A receptor is placed at the location of the maximum shoreline fumigation concentration for that source (the maximum of varying the TIBL factor from 2 to 6). The concentration from the shoreline fumigation from the one source is then combined with the ISCST3 impact from the other sources. The resulting highest combination is the reported shoreline fumigation impact.

Fumigation impacts can affect concentrations longer than 1-hour average. Section 4.5.3 of Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (EPA-454/R-92-019) provides guidance on converting to 3-, 8- and 24-hour average concentrations.

Appendix J3
Air Quality Modeling Calculations

Mirant - Marsh Landing Generating Station
Siemens Flex Plant 10s - Combined Cycle
Potential Emission Estimates

Ambient Temperature	**UNITS**	**Winter Minimum - 20°F**			**Yearly Average- 59°F**			**Summer Maximum - 94°F**					
CTG Load Level	%	100%	85%	70%	100%	85%	70%	100%	100%	100%	100%	85%	70%
Case No From Siemens Data		1	2	3	4	8	9	19	18	17	16		
Evap Cooling Status	off / on	Off	Off	Off	Off	Off	Off	On	On	Off	Off	Off	Off
Power Augmentation Status	off / on	Off	Off	Off	Off	Off	Off	On	Off	On	Off	Off	Off
Stack Outlet Temperature	(°F)	350	346	343	340	337	334	338	348	333	341	346	343

Average Emission Rates from each Gas Turbine (lbs/hr/turbine) - Normal Operation

	UNITS	**Winter Minimum - 20°F**			**Yearly Average- 59°F**			**Summer Maximum - 94°F**					
Net Power	kw	286,700	244,200	203,000	259,400	221,400	184,300	268,700	250,100	255,900	233,300	N/A	N/A
Heat Rate,	Btu/kWh (LHV)	7,135	7,330	7,695	7,160	7,410	7,795	7,115	7,130	7,020	7,185	N/A	N/A
Fuel Flow	MMBtu/hr (LHV)	2,046	1,790	1,562	1,857	1,641	1,437	1,912	1,783	1,796	1,676	1,509	1,358
Fuel Flow	MMBtu/hr (HHV)	2,271	1,987	1,734	2,062	1,821	1,595	2,122	1,979	1,994	1,861	1,674.6	1,507.1
Fuel Heating Value	Btu/scf	908	908	908	908	908	908	908	908	908	908	908.0	908.0
Oxygen	VOL%	12.3	12.4	12.6	12.3	12.5	12.7	10.9	12.0	11.1	12.3		
CO_2	VOL%	4.0	3.9	3.8	3.9	3.8	3.7	4.0	3.9	3.9	3.8		
H_2O	VOL%	8.0	7.9	7.7	8.5	8.4	8.2	14.9	9.9	14.1	9.1		
N_2	VOL%	74.9	74.9	75.0	74.4	74.4	74.5	69.4	73.3	70.0	73.9		
Ar	VOL%	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.8	0.9		
Oxygen	lbm/hr	604,147.8	534,359.7	482,753.5	557,810.4	502,428.7	455,837.0	501,141.7	525,617.5	487,406.3	510,555.9	459,500.3	413,550.3
CO_2	lbm/hr	267,228.7	232,086.9	200,765.1	242,994.2	213,078.2	184,520.4	250,167.8	233,504.7	170,789.3	159,522.8	143,570.5	129,213.4
H_2O	lbm/hr	220,485.3	191,262.8	165,477.9	217,605.1	191,070.1	166,290.6	386,375.4	242,824.1	617,906.9	378,451.1	340,606.0	306,545.4
N_2	lbm/hr	3,215,827.9	2,822,939.8	2,508,565.3	2,950,136.9	2,629,121.3	2,346,416.4	2,799,994.9	2,801,704.9	3,066,324.5	3,069,151.4	2,762,236.2	2,486,012.6
Ar	lbm/hr	54,528.1	48,378.2	42,944.7	50,345.8	44,837.4	39,973.1	47,726.0	47,959.1	36,785.4	36,557.3	32,901.6	29,611.4
MW of exhaust gas	lb/lbmol	28.5	28.5	28.5	28.4	28.4	28.4	27.7	28.2	27.8	28.3	28.3	28.3
NO_x (@ 2.0 ppm)	lbm/hr	17.4	15.1	13.1	15.8	13.9	12.0	16.3	15.2	15.3	14.3	12.9	11.6
CO (@ 2.0 ppm)	lbm/hr	10.6	9.2	8.0	9.7	8.5	7.4	10.0	9.3	9.4	8.7	7.8	7.0
CO (@ 3 ppm)	lbm/hr	15.9	13.8	12.0	14.6	12.8	11.1	15.0	14.0	14.1	13.1	11.7	10.6
VOC (@ 2.0 ppm)	lbm/hr	6.2	5.4	4.6	5.6	5.0	4.2	5.8	5.4	5.4	5.0	4.5	4.1
SO_2 (based on 0.4 gr total S / 100 scf)	lbm/hr	2.6	2.3	2.0	2.3	2.1	1.8	2.4	2.2	2.3	2.1	1.9	1.7
SO_2 (based on 1.0 gr total S / 100 scf) worst-case	lbm/hr	6.4	5.6	4.9	5.8	5.2	4.5	6.0	5.6	5.6	5.3	4.7	4.3
PM_{10}	lbm/hr	10.0	8.9	8.0	9.3	8.3	8.0	8.9	8.8	8.5	8.5	7.7	6.9
NH_3 (@ 5 ppm slip)	lbm/hr	16.1	14.0	12.1	14.7	12.8	11.2	15.1	14.1	14.2	13.2	11.9	10.7
% of HC as VOC (using CO @ 3ppm)	%	28.1	28.1	27.7	27.8	28.2	27.5	27.9	27.9	27.7	27.7	27.7	27.7
Total Inerts	lbm/hr	4,363,324	3,828,197	3,400,631	4,018,750	3,580,309	3,193,018	3,985,700	3,851,272	3,800,335	3,675,203	3,307,683	2,976,914
Total	lbm/hr	4,363,392	3,828,256	3,400,683	4,018,812	3,580,364	3,193,066	3,985,764	3,851,332	3,800,395	3,675,259	3,307,733	2,976,960
Total Inerts	lbmol/hr	153,368	134,559	119,446	141,605	126,112	112,430	143,940	136,425	136,850	129,820	116,838	105,154
Total Inerts	ft^3/min	1,511,297	1,319,398	1,166,852	1,378,149	1,222,758	1,086,000	1,397,371	1,341,016	1,320,217	1,265,033	1,145,639	1,027,236
Exit Velocity	fps	70.5	61.5	54.4	64.3	57.0	50.6	65.2	62.5	61.6	59.0	53.4	47.9

notes:

All turbine operating parameters and emissions data provided by Siemens based on expected operating parameters at the Contra Costa Site

Assumed average sulfur content in gas (for annual emission):	0.4	gr total S / 100 scf
Assumed average sulfur content in gas (for short term emissions):	1	gr total S / 100 scf
Assumed fuel heating value:	908	Btu/scf
HHV/LHV	1.11	ratio
Stack Diameter	21.33	ft

Mirant - Marsh Landing Generating Station
Siemens Flex Plant 10s - Combined Cycle
Potential Emission Estimates

Startup / Shutdown Emissions from Turbine (1CT)

Startup (41° F)			Shutdown (41° F)		
12 (min. in startup)	1-hr. (w/1 SU) (lb/hr)	SU emissions (lb/12min)	7 (min. in shutdown)	1-hr. (w/1 SD) (lb/hr)	SD emissions (lb/7min)
NO_X	38.7	24.8	NOx	25.9	10.5
CO	279.8	267.1	CO	149.5	135.4
VOC	17.7	12.7	VOC	10.7	5.2
SO_2 (based on 0.4 gr total S / 100 scf)	2.7	0.6	SO_2	2.4	0.2
SO_2 (based on 1.0 gr total S / 100 scf) worst-case	6.7	1.6	SO_2 worst - case	6.1	0.4
PM_{10}	11.1	3.1	PM_{10}	9.9	1.1

notes:

Startup and shutdown emissions data provided by Siemens based on expected operating parameters at the Contra Costa Site

Startup and shutdown SO_2 emissions are calculated based on the total amount of fuel used for each and the emission rate of SO_2 at winter minimum - 20°F; 100% load

Fuel use for startup on natural gas @ 41 °F	24,173	lb/start
Fuel use for shutdown on natural gas @ 41 °F	6,525	lb/shutdown

Average Annual Emissions

			Pollutant	Turbine Emissions (lb/yr/CT)	Emissions for Both Turbines (ton/yr/2CT)
Total Hours of Operation	4,383				
Total Number of Starts	193		NO_X	77,103	77.1
Start Duration (hr)	0.2		CO	142,371	142.4
Total Number of Shutdowns	193		CO_2	1,093,738,123	1,093,738
Shutdown Duration (hr)	0.1		VOC	28,459	28.5
Yearly Average w/Power Augmentation Operation (hr)	4000		SO_2	10,521	10.5
Normal Operation (hr)	322		PM_{10}	39,400	39.4

notes:

Average annual emissions are calculated using yearly average- 59°F, at 100 % load for Normal Operation

Power augmentation emissions are calculated using summer maximum - 94°F, at 100 % load with power augmentation and evaporative cooling ON.

SO_2 emissions are based on 0.4 gr total S / 100 scf.

Modeling Worst-Case 1 hr Emissions per Turbine

Pollutant	lb/hr/CT	g/sec/CT
NOx	38.7	4.9
CO	279.8	35.3
SO_2	6.7	0.8
PM_{10}	11.1	1.4

notes:

Startup emissions represent worst case hr for NOx, CO, and SO_2 and were used for the worst-case scenario

SO_2 emissions are based on 1 gr/100 scf

Modeling Worst-Case 3 hr Emissions per Turbine

	(hr)	emission rate (lb/hr)	Emissions (lb/CT)	
Total Hours of Operation	3.0			
Startup Duration	0.6		4.7	contribution over 3 hr from start up
Shutdown Duration	0.0		0.0	contribution over 3 hr from shut down
Hours of Operation	2.4	6.4	15.4	contribution over 3 hr from operation
SO_2 worst-case 3 hr emissions per turbine	20.1	lb/3 hr		
SO_2 worst-case 1 hr emissions per turbine	6.7	lb/hr		
SO_2 modeling worst-case emissions per turbine	0.8	g/sec		

notes:

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

Operational emissions using "worst-case" (winter minimum - 20°F; 100% load)

SO2 emissions are based on 1 gr/100 scf

Worst-case 3 hr emissions assumes a start up of : 3

Worst-case 3 hr emissions assumes a shut down of : 0

Conservatively assumes 3 startups in a 3 hr period, no shut downs

Mirant - Marsh Landing Generating Station
Siemens Flex Plant 10s - Combined Cycle
Potential Emission Estimates

Modeling Worst-Case 8 hr Emissions per Turbine

	(hr)	max emission rate (lb/hr)	Emissions (lb/8 hr/CT)	
Total Hours of Operation	8.0			
Startup Duration	0.4		534.2	contribution over 8 hr from start up
Shutdown Duration	0.1		135.4	contribution over 8 hr from shut down
Hours of Operation	7.5	15.9	119.0	contribution over 8 hr from operation
CO worst-case 8 hr emissions per turbine	788.6	lb/8 hr		
	98.6	lb/hr		
	12.4	g/sec		

notes:

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

Operational emissions using "worst-case" (winter minimum - 20°F; 100% load)

Worst-case 8 hr emissions assumes a total start up of : 2

Worst-case 8 hr emissions assumes a total shut down of : 1

Modeling Worst-Case 24 Hour Emission Rate

SO_2 (lb/day/CT)	154.3	based on 1.0 gr/100 scf
SO_2 (g/s/CT)	0.8	based on 1.0 gr/100 scf
PM_{10} (lb/day/CT)	243.0	
PM_{10} (g/s/CT)	1.3	

Assumptions:

Only SO2 and PM10 are considered for an average 24-hour Ambient Air Quality Standard.

SO2 Conservative estimate: all 24 hrs of baseline operation are in winter minimum - 20°F; 100% load

PM10 Conservative estimate: 24 hrs taken from worst-case daily below.

Worst-Case Daily Emissions per Turbine

Pollutant	Time in Start Up (hr)	Startup Emission Rate (lb/start)	Time in Shut Down (hr)	Shutdown Emission Rate (lb/start)	Time in Operation (hr)	Operational Emission Rate (lb/start)	Worst-Case Daily Emissions (lb/day/CT)	Modeling Worst-Case 24 Hr Emission (g/s/CT)	
NOx	0.6	24.8	0.4	10.5	23.1	17.4	507.0		
CO	0.6	267.1	0.4	135.4	23.1	15.9	1,574.1		
VOC	0.6	12.7	0.4	5.2	23.1	6.2	196.6		
SO_2	0.6	1.6	0.4	0.4	23.1	6.4	154.2	0.8	based on 1.0 gr/100 scf
PM_{10}	0.6	3.1	0.4	1.1	23.1	10.0	243.0	1.3	based on 1.0 gr/100 scf

Assumptions:

For NOx, CO, VOC, SO_2 and PM_{10} -- emissions are calculated assuming:

Worst-case daily emissions assumes a total start up of : 3

Worst-case daily emissions assumes a total shut down of : 3

Remainder of time is spent in operation at "worst-case" (winter minimum - 20°F; 100% load)

Mirant - Marsh Landing Generating Station
SiemensSSC6-5000F Simple Cycle Gas Turbines
Potential Emission Estimates

Turbine Operating Parameters

Ambient Temperature	UNITS	Winter Minimum - 20°F/ 90% RH			Yearly Average- 60°F / 64% RH			Summer Maximum - 94°F		
CTG Load Level	%	**100%**	**75%**	**60%**	**100%**	**75%**	**60%**	**100%**	**75%**	**60%**
Evap Cooling Status	On / Off	Off	Off	Off	85%	OFF	OFF	On	Off	Off
Gas Turbine Outlet Temperature	ºF	**1,065**	**1,065**	**1,065**	**1,090**	**1,090**	**1,091**	**1,123**	**1,123**	**1,122**
Stack Outlet Temperature	ºF	**750**	**750**	**750**	**750**	**750**	**750**	**750**	**750**	**750**

Average Emission Rates from each Gas Turbine (lbs/hr/turbine) - Normal Operation

	UNITS	Winter Minimum - 20°F/ 90% RH			Yearly Average- 60°F / 64% RH			Summer Maximum - 94°F		
Heat Input, LHV	MMBtu/hr	1,984	1,565	1,333	1,800	1,441	1,229	1,624	1,315	1,125
Fuel Heating Value, LHV	Btu/lb	20,670	20,670	20,670	20,670	20,670	20,670	20,670	20,670	20,670
Fuel Heating Value, LHV	Btu/scf	912	912	912	912	912	912	912	912	912
Fuel Flow, LHV	scf/hr	2,174,637	1,715,376	1,461,084	1,972,957	1,579,461	1,347,091	1,780,045	1,441,354	1,233,098
Exhaust Flow	lbm/hr/turbine	4,366,477	3,547,986	3,136,246	4,021,343	3,336,206	2,953,373	3,677,383	3,095,213	2,745,451
O_2	lbm/hr	1,072,080	880,116	787,879	1,047,892	879,547	788,662	1,026,953	874,706	782,932
CO_2	lbm/hr	260,577.1	205,783	175,316	236,053	189,163	161,845	213,656	173,022	147,980
H_2O	lbm/hr	214,831	169,594	144,895	212,327	170,814	146,487	208,140	169,927	146,607
N_2	lbm/hr	4,710,183	3,829,038	3,386,564	4,519,319	3,751,341	2,172,501	4,344,348	3,658,137	3,243,100
Ar	lbm/hr	80,254	65,210	57,643	76,779	63,698	56,445	73,627	62,280	55,187
NO_x as NO2 (@ 2.5 ppm)	lbm/hr	20.83	16.39	13.89	18.89	15.00	12.78	16.94	13.89	11.67
CO (@ 3.0 ppm)	lbm/hr	15.00	12.00	10.20	13.50	11.25	9.30	12.75	9.75	8.70
VOC (@ 2.0 ppm)	lbm/hr	5.80	4.60	3.87	5.20	4.20	3.60	4.80	3.80	3.27
SO_2 (using 0.4 gr/100scf)	lbm/hr	2.48	1.96	1.67	2.25	1.80	1.54	2.03	1.65	1.41
SO_2 (using 1 gr/100scf)	lbm/hr	6.21	4.90	4.17	5.63	4.51	3.84	5.08	4.11	3.52
PM_{10}	lbm/hr	9	8	8	8	8	8	8	8	8
NH_3 (@ 10 ppm slip)	lbm/hr	32.91	26.73	23.61	30.46	25.24	13.69	27.99	23.54	20.86
% of HC as VOC (CO@3 ppm)	%	38.67	38.33	37.91	38.52	37.33	38.71	37.65	38.97	37.55
Total Inerts (Flue Gas + Dilution Air)	lbm/hr	6,337,924	5,149,741	4,552,297	6,092,370	5,054,562	3,325,941	5,866,723	4,938,073	4,375,806
Stack Gas MW	lb/lbmol	28.46	28.47	28.49	28.39	28.41	28.43	28.33	28.34	28.36
Total Inerts	lbmol/hr	222,696	180,883	159,786	214,596	177,915	116,987	207,085	174,244	154,295
Total	ft^3/min	3,278,539	2,662,970	2,352,374	3,159,287	2,619,272	1,722,288	3,048,718	2,565,228	2,271,538
Exit Velocity	fps	70.9	57.6	50.8	68.3	56.6	37.2	65.9	55.4	49.1

notes:

All turbine operating parameters and emissions data provided by CH2M Hill based on expected operating parameters at the Contra Costa Site

Assumed average sulfur content in gas (for annual emission):	0.4	gr total S / 100 scf
Assumed average sulfur content in gas (for short term emissions):	1	gr total S / 100 scf
Assumed fuel heating value:	1,015	Btu/scf
hhv/lhv ratio:	1.11	ratio
Stack Diameter:	31.333	ft

Mirant - Marsh Landing Generating Station
SiemensSSC6-5000F Simple Cycle Gas Turbines
Potential Emission Estimates

Startup / Shutdown Emissions from Turbine (1CT)

Startup			Shutdown		
11 (min. in startup)	Max 1-hr. (lb/hr)	Total (lb/ 11 min)	6 (min. in shutdown)	Max 1-hr. (lb/hr)	Total (lb/ 6 min)
NO_X (2.5 ppm)	29.0	12	NOx	28.8	10
CO (3 ppm)	225.25	213	CO	124	110
VOC (2 ppm)	15.7	11	VOC	10.2	5
SO_2 (based on 0.4 gr total S / 100 scf)	2.19	0.17	SO2	2.4	0.15
SO_2 (based on 1.0 gr total S / 100 scf) worst-case	5.49	0.42	SO_2 worst	5.7	0.37
PM_{10}	8.4	1	PM10	9.1	1

notes:
Startup and Shutdown Emissions from Mirant CC_Siemens SSC6-5000F SC Stack Emissions_04-02-08_Rev 1.xls
Fuel use for SO2 calculations from Mirant_Estimated SU SD Emissions - SGT6-5000F(4) 9 ppm ULN on Natural Gas @ 59 F 3.27.08.pdf
Estimated Startup data are from CTG ignition through 100% CTG load.
Startup and Shutdown Emissions for NOx, CO, VOC and PM10 from data provided by Siemens based on 59°F ambient temperature.
NOx emissions assume SCR is not in operation (no removal).
CO and VOC emissions assume CatOx is not in operation (no removal)
SO_2 emissions assume complete conversion of all sulfur to SO_2.

Worst-Case 1 hr Emissions per Turbine

	lb/hr	g/sec
NOx	29.0	3.66
CO	225.3	28.38
SO_2	6.2	0.78
PM_{10}	9.1	1.15

notes:
SO_2 emissions are based on 1 gr/100 scf

Average Annual Emissions

		Pollutant	Turbine Emissions (lb/yr/CT)	Emissions for Both Turbines (ton/yr/2CT)
Total Hours of Operation	877			
Total Number of Cold Starts	100	NO_X	18,230.4	18.2
Cold Start Duration (hr)	0.18	CO	43,757.0	43.8
		CO_2	207,018,336	207,018
Total Number of Shutdowns	100	VOC	6,013.1	6.0
Shutdown Duration (hr)	0.10	SO_2	1,943.3	1.9
Average Operation (hr)	849	PM_{10}	6,989.3	7.0

notes:
Average annual emissions are calculated using yearly average- 59°F, at 100 % load.
SO_2 emissions are based on 0.4 gr total S / 100 scf.

Max Annual Emissions

Annual	Turbine Emissions (lb/yr/CT)	Emissions for Both Turbines (ton/yr/2CT)
NO_X	19,881	19.9
CO	45,030	45.0
VOC	6,522	6.52
SO_2	2,139	2.14
PM_{10}	7,838	7.84

notes:
SO_2 emissions are based on 0.4 gr total S / 100 scf.

Worst-Case 3 hr Emissions per Turbine	lb/3-hrs	g/sec
SO_2	18.6	0.78

notes:
Only SO_2 is considered for a 3-hour average Ambient Air Quality Standard.
assumes no start ups or shut downs, only operational emissions from "worse-case" (winter minimum - 20°F; 100% load)
SO_2 emissions are based on 1 gr total S/100 scf

Worst-Case 8 hr Emissions per Turbine	lb/8hr	g/sec
CO (3ppm)	967.8	15.24

notes:
Only CO is considered for an 8-hour average Ambient Air Quality Standard.
Worst-case daily emissions assumes a total start up of : 3
Worst-case daily emissions assumes a total shut down of : 2
Remainder of time is spent at "worst-case" (winter minimum - 20°F; 100% load).

Worst-Case 24 hr Emissions per Turbine	lb/24hr	g/sec
NOx	540.4	2.84
CO	1207.8	6.34
VOC	177.9	0.93
SO_2	58.5	0.31
SO_2	146.3	0.77
PM_{10}	214.3	1.12

notes:
Worst-case daily emissions assumes a total start up of : 3
Worst-case daily emissions assumes a total shut down of : 2
Remainder of time is spent at "worst case" (winter minimum - 20°F; 100% load)

Mirant - Marsh Landing Generating Station
Construction Equipment List

				2009			2010												2011												2012						
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	
Construction Equipment	**Percent Usage**	**HP**	**Fuel**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Total**
On-Road Vehicles																																					
Concrete Pumper Truck	15%	350	Dsl			1	1	1	1													1	1	1	1	1	1	1	1	1	1						14
Dump Truck	35%	300	Dsl			1	1	1	1	10												1	2	2	2	2	2	2	2	1	1	1	1				33
Fuel/Lube Truck	25%	150	Gas	4	4	4	4	4	4	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	49
Pickup truck	75%	150	Gas	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	80
Water Truck	50%	300	Dsl	2	2	2	2	2	2													1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	27
Off-Road Vehicles																																					0
Air Compressor	80%	50	Gas	3	3	3	3	3	4	2	2	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	51
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	70%	75	Gas	2	2	2	2	2	6	4	6	6	12	12	10	10	10	12	12	6	4						1	3	5	9	9	9	9	12	12	12	201
Backhoe Loader	40%	80	Dsl			2	2	2	2	2	1	1	1	1	1							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	30
Jumping Jack Compactors	60%	7.5	Gas																				1	1	2	2	2	2	2	2	2	2	2				20
150 Ton Crawler Crane	50%	300	Dsl	1	1	1		1	1	1	1	1	1	1	1	1														1	1	1	1	1	1	1	19
M2250 Crawler Crane	25%	500	Dsl						1	1	1																			1	1	1	1	1	1		9
Hydraulic Crane (45 Ton	65%	250	Dsl	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1									1	1	1	1	1	1	1	25
Hydraulic Crane (55 Ton)	65%	300	Dsl	2	2	2	2	2	3	2	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	42
Bull Dozer	80%	300	Dsl																				1	1	1	1	1	1									6
Hydraulic Excavator	85%	250	Dsl	2	3	5	5	5	4	3	1	1	1	1	1							1	1	2	2	2	2	2	2	2	2	1	1				52
Forklift	75%	40	Gas	2	2	2	2	3	3	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	2	61
Front End Loader	70%	130	Dsl		1	1	1	1	1	1	1	1	1	1	1	1						1	2	2	2	2	2	2	2	2	2	2	2				35
Light Plant	30%	25	Gas		1	1	1	1									1	1	1	1																	8
Tractor	50%	195	Dsl	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	33
Vibratory Roller	80%	125	Gas			1	1	1	1														1	1	1	1	1	1	1	1	1	1	1				15
Walk Behind Vibratory Roller	60%	25	Gas			1	1	1	1														1	1	2	2	2	2	2	1	1	1	1				20
Welder (Diesel)	70%	25	Dsl	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	47
Total				**24**	**27**	**35**	**33**	**35**	**40**	**34**	**23**	**21**	**27**	**26**	**24**	**22**	**21**	**23**	**21**	**13**	**10**	**15**	**21**	**22**	**24**	**25**	**26**	**28**	**29**	**34**	**34**	**34**	**36**	**31**	**31**	**28**	**877**

5/28/2008

Mirant - Marsh Landing Generating Station
Monthly Construction Emissions

	CO		CO_2		CH_4		N_2O		NO_x		PM_{10}		$PM_{2.5}$		SO_x		ROG[1]	
Month	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**	**Monthly Emissions (tons)**	**12-Month Total (tons)**
October, 2009	6.90	NA	265.94	NA	0.0149	NA	0.0058	NA	2.41	NA	0.098	NA	0.0896	NA	0.00289	NA	0.4743	NA
November, 2009	7.70	NA	308.54	NA	0.0173	NA	0.0066	NA	2.85	NA	0.117	NA	0.1071	NA	0.00339	NA	0.5213	NA
December, 2009	9.52	NA	377.99	NA	0.0206	NA	0.0078	NA	3.55	NA	0.161	NA	0.1471	NA	0.00416	NA	0.6312	NA
January, 2010	9.46	NA	362.91	NA	0.0194	NA	0.00744	NA	3.38	NA	0.1540	NA	0.1407	NA	0.00399	NA	0.6124	NA
February, 2010	10.10	NA	378.43	NA	0.0207	NA	0.00787	NA	3.55	NA	**0.1603**	NA	0.1465	NA	0.00417	NA	0.6367	NA
March, 2010	**11.20**	NA	**395.56**	NA	**0.0230**	NA	**0.0086**	NA	**3.68**	NA	0.163	NA	**0.1490**	NA	**0.00431**	NA	**0.6946**	NA
April, 2010	4.61	NA	272.41	NA	0.0148	NA	0.0058	NA	2.60	NA	0.13	NA	0.1149	NA	0.00289	NA	0.4643	NA
May, 2010	5.28	NA	152.09	NA	0.0106	NA	0.0037	NA	1.44	NA	0.06	NA	0.0531	NA	0.00168	NA	0.2743	NA
June, 2010	4.06	NA	128.11	NA	0.0085	NA	0.0030	NA	1.20	NA	0.05	NA	0.0461	NA	0.00143	NA	0.2254	NA
July, 2010	5.82	NA	151.64	NA	0.0101	NA	0.0036	NA	1.34	NA	0.05	NA	0.0477	NA	0.00169	NA	0.2768	NA
August, 2010	5.22	NA	149.95	NA	0.0100	NA	0.0035	NA	1.33	NA	0.05	NA	0.0475	NA	0.00166	NA	0.2683	NA
September, 2010	4.64	**84.51**	142.10	**3,085.68**	0.0094	**0.1793**	0.0033	**0.0671**	1.28	**28.61**	0.05	1.24	0.0469	**1.136**	0.00158	**0.034**	0.2512	**5.33**
October, 2010	4.55	82.16	120.30	2,940.05	0.0082	0.1727	0.0029	0.0642	1.05	27.26	0.04	1.18	0.0369	1.083	0.00133	0.032	0.2209	5.08
November, 2010	5.12	79.58	100.80	2,732.30	0.0067	0.16	0.0024	0.0601	0.83	25.24	0.03	1.10	0.0262	1.003	0.00113	0.030	0.1954	4.75
December, 2010	5.70	75.77	108.64	2,462.96	0.0073	0.15	0.0026	0.0548	0.88	22.57	0.03	0.96	0.0268	0.882	0.00121	0.027	0.2126	4.33
January, 2011	5.65	71.96	93.57	2,193.62	0.0060	0.14	0.0022	0.0496	0.71	19.90	0.02	0.83	0.0205	0.762	0.00105	0.024	0.1938	3.91
February, 2011	3.27	65.13	62.26	1,877.45	0.0040	0.12	0.0015	0.0432	0.53	16.87	0.02	0.69	0.0184	0.634	0.00070	0.021	0.1149	3.39
March, 2011	2.03	55.96	53.41	1,535.29	0.0034	0.10	0.0012	0.0358	0.48	13.67	0.02	0.55	0.0174	0.502	0.00059	0.017	0.0959	2.79
April, 2011	1.78	53.13	102.57	1,365.45	0.0052	0.09	0.0022	0.0322	0.94	12.00	0.05	0.47	0.0453	0.433	0.00111	0.015	0.1834	2.51
May, 2011	3.70	51.54	149.68	1,363.03	0.0075	0.09	0.0030	0.0315	1.50	12.07	0.09	0.50	0.0798	0.459	0.00163	0.015	0.2636	2.50
June, 2011	3.74	51.22	167.13	1,402.05	0.0085	0.09	0.0033	0.0318	1.68	12.55	0.09	0.54	0.0854	0.499	0.00182	0.015	0.2804	2.56
July, 2011	4.82	50.23	168.86	1,419.28	0.0086	0.08	0.0034	0.0316	1.70	12.91	0.11	0.60	0.0975	0.549	0.00187	0.016	0.2858	2.57
August, 2011	5.42	50.42	170.55	1,439.89	0.0087	0.08	0.0034	0.0315	1.71	13.29	0.11	0.65	0.0977	0.599	0.00189	0.016	0.2942	2.59
September, 2011	5.71	51.49	174.47	1,472.25	0.0090	0.08	0.0035	0.0317	1.74	13.75	0.11	0.71	0.0980	0.650	0.00194	0.016	0.3028	2.64
October, 2011	6.29	53.23	182.32	1,534.26	0.0096	0.08	0.0037	0.0325	1.78	14.48	0.11	0.78	0.0986	0.712	0.00202	0.017	0.3199	2.74
November, 2011	6.76	54.88	168.18	1,601.65	0.0090	0.09	0.0035	0.0336	1.53	15.17	0.10	0.84	0.0871	0.773	0.00187	0.018	0.3034	2.85
December, 2011	7.12	56.29	219.49	1,712.49	0.0137	0.09	0.0050	0.0360	2.04	16.33	0.10	0.91	0.0901	0.836	0.00240	0.019	0.3662	3.00
January, 2012	7.12	57.77	220.73	1,839.65	0.0138	0.10	0.0050	0.0388	2.05	17.67	0.10	0.99	0.0909	0.906	0.00241	0.020	0.3692	3.18
February, 2012	8.20	62.69	201.01	1,978.40	0.0130	0.11	0.0047	0.0421	1.85	18.99	0.09	1.06	0.0817	0.970	0.00221	0.022	0.3679	3.43
March, 2012	4.85	65.51	278.07	2,203.06	0.0143	0.12	0.0059	0.0467	2.71	21.23	0.1335	1.17	0.1216	1.074	0.00296	0.024	0.4682	3.81
April, 2012	2.90	66.62	221.32	2,321.81	0.0105	0.13	0.0047	0.0493	1.95	22.24	0.10	1.23	0.0944	1.123	0.00230	0.025	0.3522	3.97
May, 2012	1.62	64.55	226.94	2,399.07	0.0103	0.13	0.0047	0.0509	2.02	22.76	0.11	**1.2499**	0.0934	1.136	0.00233	0.0260	0.3642	4.07
June, 2012	2.74	63.55	199.09	2,431.03	0.0089	0.13	0.00	0.0517	1.74	22.82	0.09	1.2497	0.0844	1.135	0.00205	0.0263	0.3178	4.11
Maximum (100 % load)	**11.20**	**84.51**	**395.56**	**3,085.68**	**0.0230**	**0.18**	**0.0086**	**0.0671**	**3.68**	**28.61**	**0.1630**	**1.25**	**0.1490**	**1.136**	**0.00431**	**0.0338**	**0.6946**	**5.33**
Average (75 % load)	**8.40**	**63.38**	**296.67**	**2,314.26**	**0.0173**	**0.13**	**0.0065**	**0.05**	**2.76**	**21.46**	**0.12**	**0.94**	**0.11**	**0.85**	**0.0032**	**0.03**	**0.52**	**4.00**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Assuming 75% operational average load

Mirant - Marsh Landing Generating Station
Fugitive Dust Emissions Calculations

Fugitive Dust PM_{10} and $PM_{2.5}$ Calculation		
Emission factor	1.30	lb/hr-acre
Hours per day	10.00	hr/day
Days per month	22.00	days/month
Months per year	12.00	months/year
Total acreage disturbed	23	acres
Percent disturbed at any one time	25	%
Average acreage	5.83	acre
Unmitigated PM10 emissions	10.00	tons/year
Unmitigated PM2.5 emissions	2.08	tons/year
Mitigation factor	83.23	percent
Mitigated PM10 emissions	1.68	tons/year
Mitigated PM2.5 emissions	0.35	tons/year

Note:

- Emission factor: 1.3 lb/hour-acre of ground disturbance - emission factor for fugitive dust emissions recommended in a study
- Assumed work schedule: 10 (hours/day), 22 (days/month), and 12 (months/year) (or 2,640 work hours/year) (Information provided by Applicant)
- Daily ground disturbance: 7 (acres) - based on the assumption that 25 percent of total acreage is disturbed per day (URBEMIS2007 (Version 9.2) model)
- Earthmoving activity is expected to last for 13 months, which means that in one year it is possible for earthmoving activities to take place each month. Therefore, the worst-case annual fugitive dust emissions, were calculated by multiplying the monthly fugitive dust emission rate by 12 months.
- $PM_{2.5}$ values were calculated according to the South Coast AQMD's recommended method, which is to use a conversion factor to obtain the $PM_{2.5}$ emissions directly from PM10 emissions. Conversion factors are published as Appendix A of the Methodology to Calculate Particulate Matter $(PM)_{2.5}$ and $PM_{2.5}$ Significance Thresholds from October 2006.
- Limiting vehicle speed to 15 mph or less: about 57% control efficiency for unpaved roads (WRAP Fugitive Dust Handbook)
- Watering (every 3 hours to the disturbed areas): at least 61% efficiency for general construction activities (WRAP Fugitive Dust Handbook)
- Mitigated emissions calculated as unmitigated emissions (ton/year) x (100 - 83.23)/100

Mirant - Marsh Landing

Transportation Information	Comment
- Total HHDT Miles Per Year = 55,440	Truck miles based on the assumption that they will travel 15 miles/trip, there will be an average of 14 1-way trips/day and 22days/month of construction Truck numbers determined from Project Description Table 2.7-3
- Total LDA Miles Per Year = 1,607,760	Passenger vehicle miles based on the assumption that they will travel an average 15 miles/trip , there will be an average of 406 1-way trips/day and 22days/month of construction Passenger numbers determined from Project Description Table 2.7-3

DATA FROM EMFAC2007

Equipment Description	Vehicle Miles Traveled per Day	Tons Per Day				
		CO	NO_x	PM_{10}	$PM_{2.5}$	SO_x
Heavy-Heavy Duty Diesel Truck 2009	405,000	2.24	7.92	0.32	0.28	0.01
Passenger Vehicles 2009	13,268,000	61.54	5.32	0.48	0.27	0.06

Note:
- Emission factors for on-road, heavy-heavy-duty vehicles and light duty autos are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the HHDT and LDA vehicles within Contra Costa County in the respective year. PM_{10} values include
- $PM_{2.5}$ emission factors were determined by multiplying PM_{10} numbers by a "$PM_{2.5}$ fraction of PM_{10}" value. Fractional values for $PM_{2.5}$ were taken from the SCAQMD guidance: Final - Methodology to Calculate $PM_{2.5}$ and $PM_{2.5}$ Significance Thresholds, October 2006: Appendix A - Updated
  - $PM_{2.5}$ Fraction of PM_{10}, Brake wear: 0.429
  - $PM_{2.5}$ Fraction of PM_{10}, Diesel: 0.920
  - $PM_{2.5}$ Fraction of PM_{10}, Tire wear: 0.250

CALCULATION OF EMISSION FACTOR

Equipment Description	Pounds per Mile				
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_x
Heavy-Heavy Duty Diesel Truck 2009	1.11E-02	3.91E-02	1.58E-03	1.36E-03	4.94E-05
Passenger Vehicles 2009	9.28E-03	8.02E-04	7.24E-05	4.11E-05	9.04E-06

Note:
- The following equation was used to obtain the emission factors:

$$EF = ER / VMT * 2000$$

Where: EF= emission factor in pounds per mile
ER = Emission Rate in tons per day
VMT = Average vehicle miles traveled per day in Contra Costa county

CFP CONSTRUCTION TRUCK EMISSIONS

Equipment Description	Tons Emitted Per Year				
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_x
Heavy-Heavy Duty Diesel Truck 2009	0.31	1.08	0.04	0.04	0.00
Passenger Vehicles 2009	7.46	0.64	0.06	0.03	0.01
TOTAL	7.76	1.73	0.10	0.07	0.01

Note:
- The following equation was used to obtain the emission factors:

$$M = EF * D / 2000$$

Where: M = Mass emissions rate from refinery related activities in tons per year
EF= emission factor in pounds per mile
D = Distance traveled by trucks to the refinery in miles per year.

Mirant - Marsh Landing

Entrained Dust Calculation - Dry Paved Road

$$E = k\left(\frac{sL}{2}\right)^{0.65} \times \left(\frac{W}{3}\right)^{1.5} - C$$

Entrained Dust Calculation - Natural Mitigation With Precipitation Correction Factor

$$E_{ext} = \left[k\left(\frac{sL}{2}\right)^{0.65}\left(\frac{W}{3}\right)^{1.5} - C\right]\left(1 - \frac{P}{4N}\right)$$

Entrained dust estimates calculated using guidance from AP 42, Fifth Edition, Volume I Chapter 13.2.1: Paved Roads

Where:
E = particulate emission factor
Ext = annual or other long-term average emission factor
k = particle size multiplier for particle size range and units of interest
sLa = arterial (major street/highway) road surface silt loading
sLc = collector road surface silt loading
W = average weight (tons) of the vehicles traveling the road
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.
P = number of "wet" days with at least 0.01 in of precipitation during the averaging period
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly)
VMT = vehicle mile traveled

Paved Roads PM_{10} Delivery Trucks

Equation Values			Source
k =	0.016	lb/VMT	AP 42, Table 13.2-1.1: default k value for PM_{10}
sLa =	0.035	g/m^2	Silt loading values based on silt loadings measured by MRI in the South Coast Air Quality Management District
sLc =	0.035	g/m^2	
			Muleski, Greg. Improvement of Specific Emission Factors (BACM Project No. 1), Final Report. Midwest Research Institute. March 29, 1996.
W =	23.25	ton	Average fleet weight is based on the assumption from the average weight of HHDT (EMFAC2007): 46500 lbs
C =	0.00047	lb/VMT	AP 42, Table 13.2-1.2: default C value for PM_{10}
P =	56	wet days	From WRCC Antioch meteorological station
N =	365	days	
Annual VMT arterial highway =	55,440	miles/year	Total annual VMT is calculated based on assumption of 15 miles/one way,14 1-way trips/day at 22days/month
Annual VMT paved road onsite collector =	1,035	miles/year	Total annual VMT is calculated based on assumption of .28 miles/one way,14 1-way trips/day at 22days/month

Road Surface	VMT	E	Base Emissions	Corrected[1]	Ext	Mitigated Emissions	Corrected[1]
	mile/yr	lb/VMT	ton/yr	ton/yr	lb/VMT	ton/yr	ton/yr
Arterial	55,440	0.0244213	0.68	0.68	0.023484575	0.65	0.65
Collector	1,035	0.0244213	0.01	0.01	0.0234846	0.01	0.01
Totals Delivery trucks				**0.69**			**0.66**

Note:

Paved Roads $PM_{2.5}$ Delivery Trucks

Equation Values			Source
k =	0.0024	lb/VMT	AP 42, Table 13.2-1.1: default k value for $PM_{2.5}$
sLa =	0.035	g/m^2	Silt loading values based on silt loadings measured by MRI in the South Coast Air Quality Management District
sLc =	0.035	g/m^2	
			Muleski, Greg. Improvement of Specific Emission Factors (BACM Project No. 1), Final Report. Midwest Research Institute. March 29, 1996.
W =	23.25	ton	Average fleet weight is based on the assumption from the average weight of HHDT (EMFAC2007): 46500 lbs
C =	0.00036	lb/VMT	AP 42, Table 13.2-1.2: default C value for $PM_{2.5}$
P =	56	wet days	From WRCC Antioch meteorological station when >=0.10 in.
N =	365	days	
Annual VMT arterial highway =	55,440	miles/year	Total annual VMT is calculated based on assumption of 15 miles/one way,14 1-way trips/day at 22days/month
Annual VMT paved road onsite collector =	1,035	miles/year	Total annual VMT is calculated based on assumption of .28 miles/one way,14 1-way trips/day at 22days/month

Road Surface	VMT	E	Base Emissions	Corrected[1]	Ext	Mitigated Emissions	Corrected[1]
	mile/yr	lb/VMT	ton/yr	ton/yr	lb/VMT	ton/yr	ton/yr
Arterial	55,440	0.0033737	0.09	0.09	0.00324429	0.09	0.09
Collector	1,035	0.0033737	0.00	0.00	0.0032443	0.00	0.00
Totals				**9.526E-02**			**9.161E-02**

Note:

Paved Roads PM_{10} Passenger Vehicles

Equation Values			Source
k =	0.016	lb/VMT	AP 42, Table 13.2-1.1: default k value for PM_{10}
sLa =	0.035	g/m^2	Silt loading values based on silt loadings measured by MRI in the South Coast Air Quality Management District
sLc =	0.035	g/m^2	
			Muleski, Greg. Improvement of Specific Emission Factors (BACM Project No. 1), Final Report. Midwest Research Institute. March 29, 1996.
W =	2	ton	Assumed average passenger vehicle weight
C =	0.00047	lb/VMT	AP 42, Table 13.2-1.2: default C value for PM_{10}
P =	56	wet days	From WRCC Antioch meteorological station
N =	365	days	
Annual VMT arterial highway =	1,607,760	miles/year	Total annual VMT is calculated based on assumption of 15 miles/one way,406 1-way trips/day at 22days/month
Annual VMT paved road onsite collector =	30,012	miles/year	Total annual VMT is calculated based on assumption of .28 miles/one way,406 1-way trips/day at 22days/month

Road Surface	VMT	E	Base Emissions	Corrected[1]	Ext	Mitigated Emissions	Corrected[1]
	mile/yr	lb/VMT	ton/yr	ton/yr	lb/VMT	ton/yr	ton/yr
Arterial	1,607,760	0.000158	0.13	0.13	0.0001519	0.12	0.12
Collector	30,012	0.000158	0.00	0.00	0.0001519	0.00	0.00
Totals				**0.13**			**0.12**

Note: 1 AP 42, Fifth Edition, Volume I Chapter 13.2.1, page 13.2.1-5. "There may be situations where low silt loading and/or low average weight will yield calculated negative emissions from equation 1. If this occurs, the emissions calculated from equation 1 should be set to zero."

Paved Roads $PM_{2.5}$ Passenger Vehicles

Equation Values			Source
k =	0.0024	lb/VMT	AP 42, Table 13.2-1.1: default k value for $PM_{2.5}$
sLa =	0.035	g/m^2	Silt loading values based on silt loadings measured by MRI in the South Coast Air Quality Management District
sLc =	0.035	g/m^2	
			Muleski, Greg. Improvement of Specific Emission Factors (BACM Project No. 1), Final Report. Midwest Research Institute. March 29, 1996.
W =	2	ton	Assumed average passenger vehicle weight
C =	0.00036	lb/VMT	AP 42, Table 13.2-1.2: default C value for $PM_{2.5}$
P =	56	wet days	From WRCC Antioch meteorological station when >=0.10 in.
N =	365	days	
Annual VMT arterial highway =	1,607,760	miles/year	Total annual VMT is calculated based on assumption of 15 miles/one way,406 1-way trips/day at 22days/month
Annual VMT paved road onsite collector =	30,012	miles/year	Total annual VMT is calculated based on assumption of .28 miles/one way,406 1-way trips/day at 22days/month

Road Surface	VMT	E	Base Emissions	Corrected[1]	Ext	Mitigated Emissions	Corrected[1]
	mile/yr	lb/VMT	ton/yr	ton/yr	lb/VMT	ton/yr	ton/yr
Arterial	1,607,760	-0.000266	-0.21	0	-0.000255605	-0.21	0
Collector	30,012	-0.000266	0.00	0	-0.0002556	0.00	0
Totals				**0.000E+00**			**0.000E+00**

Note: 1 AP 42, Fifth Edition, Volume I Chapter 13.2.1, page 13.2.1-5. "There may be situations where low silt loading and/or low average weight will yield calculated negative emissions from equation 1 If this occurs, the emissions calculated from equation 1 should be set to zero."