APPENDIX 8.1B

Operational Dispersion Modeling

This appendix contains the Final Revised Vernon Power Plant Modeling Protocol, as well as the following tables and figures:

- Table 8.1B-1 Screening Modeling Source Description
- Table 8.1B-2 Summary of Modeling Operational Emissions
- Table 8.1B-3 Operation Modeling Outputs and Summary (Facility-wide)
- Table 8.1B-4 Operation Modeling Outputs and Summary (Facility-wide)
- Table 8.1B-5 Commissioning Modeling Input Data
- Table 8.1B-6 Summary of Detailed Modeling Input Data for the Turbines during Operation
- Table 8.1B-7 Summary of Screening Modeling Scenarios and Results - Operation (Part 1)
- Table 8.1B-8 Summary of Onsite Building Dimensions and Stack Heights
- Table 8.1B-9 SCAQMD Significance Thresholds

- Figure 8.1B-1 ISCST3 Modeling Setup

FinalRevised

Vernon Power Plant Modeling Protocol

Prepared for

City of Vernon

Vernon, CA

February 2006

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FinalRevised

Vernon Power Plant Modeling Protocol

Submitted to

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SECTION 1

Introduction

The City of Vernon (Vernon or City) proposes to develop a power plant (Vernon Power Plant, or VPP). The proposed project will be located near the center of the City of Vernon, near the City's Malburg Generating Station on East 50th Street. The general vicinity of the area is presented in Figure 1, at the end of this section. It will be a nominal 610-megawatt (MW) net combined-cycle generating facility configured using two natural-gas-fired combustion turbines and one steam turbine. The new equipment will consist of two Siemens-Westinghouse industrial combustion turbines, rated at 180 MW (nominal); two heat recovery steam generators (HRSGs) equipped with duct burners; a 240-MW (nominal) condensing steam turbine; and a 10-cell cooling tower. Incidental equipment will include a 200 hp emergency diesel fire water pump. Because natural gas is a clean burning fuel, there will be minimal formation of combustion PM_{10} and SO_2. The combustion turbines will be equipped with dry low-NO_x combustors that minimize the formation of NO_x and CO. To further reduce NO_x, CO, and VOC emissions, selective catalytic reduction (SCR) and oxidation catalyst control systems will be utilized. The applicant will submit air quality impact analyses to the South Coast Air Quality Management District (SCAQMD), the California Energy Commission (CEC), and United States Environmental Protection Agency (USEPA), Region IX. The modeling analysis will include pollutants for which emissions exceed the Major Polluting Facility (MPF) significant emissions thresholds of SCAQMD Regulations 1302 (shown in Table 1) for facilities located in the South Coast Air Basin (SOCAB) and the CEC requirements for evaluation of project air quality impacts. The purpose of this document is to establish the procedure for meeting the SCAQMD, CEC, and USEPA air quality modeling requirements for the proposed project.

TABLE 1
SCAQMD MPF Significant Emissions Thresholds

Pollutant	Cumulative Increase (tons/yr)
NO_x/VOC	10
SO_2	100
CO	50
PM_{10}	70

The project is expected to result in emissions that will exceed SCAQMD new source review significance thresholds for oxides of nitrogen (NOx), volatile organic compounds (VOC), carbon monoxide (CO), and fine particulate matter (PM_{10}). Emissions of sulfur dioxide (SO_2) are expected to be in amounts below the significance levels. The project will be required to perform cumulative and construction phase impacts per the California Energy Commission's siting regulations.

Emissions from the proposed project are expected to exceed the SCAQMD thresholds defining a major polluting facility. As part of the major source permit application, an ambient air quality impact analysis and a cumulative impacts analysis will be performed. The results of the analysis

will be presented in detail in the AFC and in the application for a Determination of Compliance (SCAQMD).

This modeling protocol outlines the proposed use of air dispersion modeling techniques which will be used to assess impacts from the proposed project. This protocol also follows modeling guidance provided by the U.S. Environmental Protection Agency (USEPA) in their "Guideline on Air Quality Models" (40 CFR Part 51, Appendix W, April 15, 2003), the National Park Service's "Permit Application Guidance for New Air Pollution Sources" (Bunyak, 1993), the Federal Land Managers' "Air Quality Related Values Workgroup (FLAG) Draft Phase I Report" (October 1999), and the "Interagency Workgroup on Air Quality Modeling (IWAQM) Phase II Recommendations" (1998) as well as SCAQMD modeling guidance.

Impacts from operation of the facility will be compared to the criteria in Table 2.

TABLE 2
Proposed Air Quality Criteria by Pollutant

Air Quality Criteria	**NO_2**	**TSP/PM_{10}**	**CO**	**SO_2**
Ambient Air Quality Standards	√	√[1]	√	√
Class I and Class II Visibility	√	√		√

1 – Compared with Rule 1303 Significance Threshold

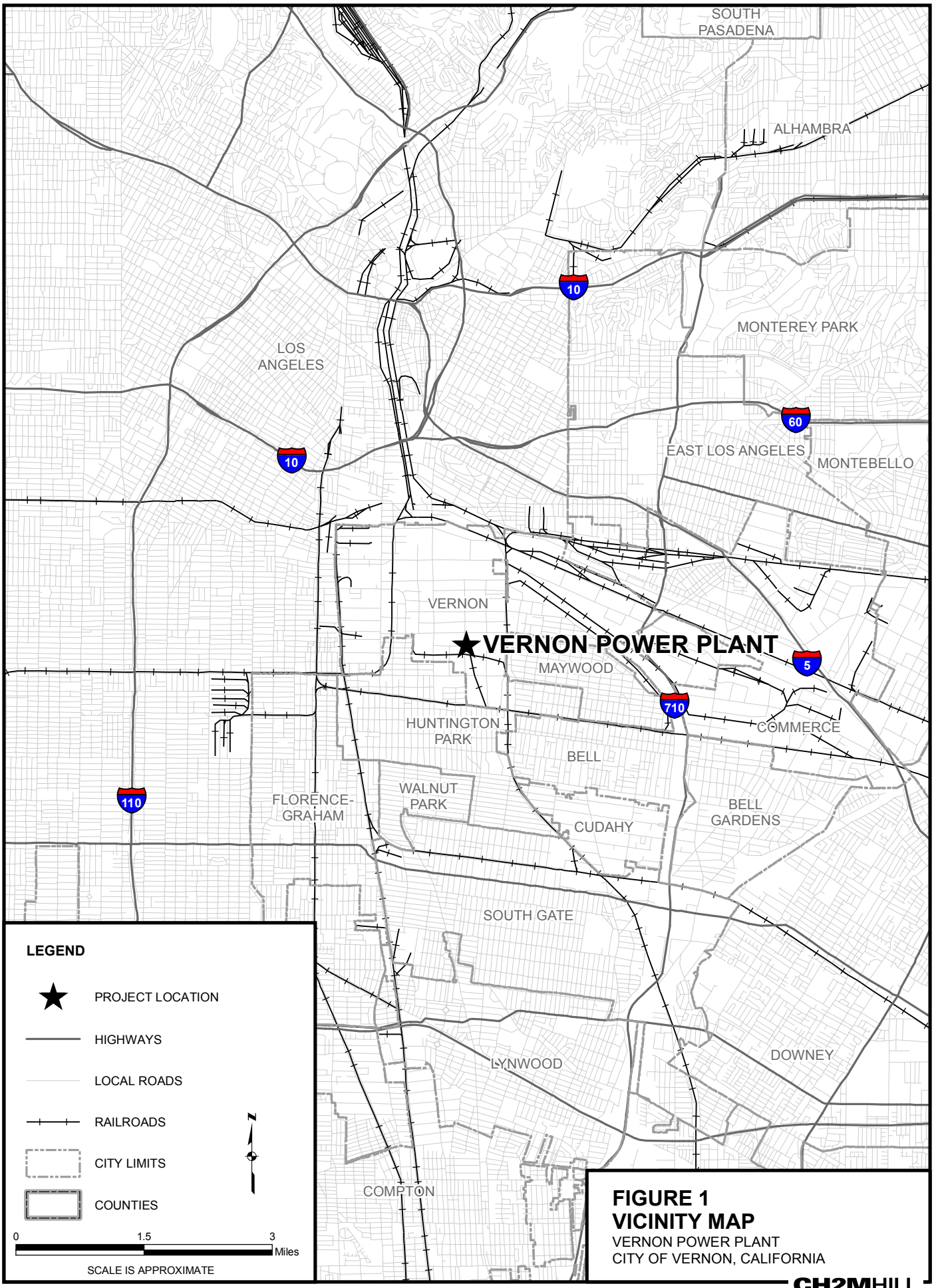

FIGURE 1
VICINITY MAP
VERNON POWER PLANT
CITY OF VERNON, CALIFORNIA

CH2MHILL

RDD \\LOKI\PROJECTS\RDDGIS\VERNON\MXDS\FIG1_VICINITY.MXD 10/11/2005 10:59:01

SECTION 2

Project Location and Emissions Sources

The proposed project will be located near the center of the City of Vernon near the City's Malburg Generating Station on East 50th Street. The City of Vernon is located in south-central Los Angeles County, 3.4 miles from City of Los Angeles and 3.6 miles from East Los Angeles.

The project site is located on relatively flat terrain, at an elevation of approximately 180 feet above sea level.

Proposed Emission Sources

The new equipment will consist of two Siemens-Westinghouse industrial combustion turbines (or equivalent), rated at 180 MW (nominal); two heat recovery steam generators (HRSGs) equipped with duct burners; a 240-MW (nominal) condensing steam turbine; a 10 cell cooling tower. Incidental equipment will include a 200 hp emergency diesel fire water pump. Natural gas will be the only fuel consumed during plant operation. There will be no distillate fuel oil firing except in the fire pump engine.

Natural gas combustion results in the formation of NO_x, SO_2, unburned hydrocarbons (VOC), PM_{10}, and CO. Because natural gas is a clean burning fuel, there will be minimal formation of combustion PM_{10} and SO_2. The combustion turbines will be equipped with dry low-NOx combustors that minimize the formation of NO_x and CO. To further reduce NO_x, CO, and VOC emissions, selective catalytic reduction (SCR) and oxidation catalyst control systems will be utilized.

Ammonia (NH_3), which is used as a reactant by the SCR systems to control NO_x, will be emitted by the VPP.

SECTION 3

Existing Meteorological and Air Quality Data

The SCAQMD Vernon monitoring station for 1981 will be used for the ISCST3 modeling. The 1981 Vernon meteorological data is required by the SCAQMD for dispersion modeling in the area of the proposed plant site.

All ambient air quality data are taken from data published by SCAQMD, ARB (on the ADAM website) and the USEPA (on the AIRS website). Ambient concentrations of ozone, NO_2, CO, PM_{10}, and fine particulates ($PM_{2.5}$) are recorded at the Central Los Angeles County (North Main Street) and South Central Los Angeles County 1 (Lynwood) monitoring stations. Ambient concentrations of SO_2 are recorded only at the Central Los Angeles County station.

The Central Los Angeles County monitoring station is located at 1630 North Main Street in the city of Los Angeles, which is approximately 6.3 miles north of the project site. The South Central Los Angeles County 1 monitoring station is located at 11220 Long Beach Boulevard in the city of Lynwood, which is approximately 5.6 miles south of the project site. The North Main Street monitoring station is located near the heart of downtown Los Angeles. The large buildings and higher concentrations of businesses and people would thus not be representative of the wind characteristics or pollutant concentrations at the VPP since the area surrounding VPP is less crowded. The location of the Lynwood station is more representative of the area-wide ambient conditions; therefore, data from the Lynwood station will be used whenever possible. However, since the Lynwood station does not monitor ambient SO_2 or PM_{10} levels, data for those ambient conditions are from the North Main Street Station, which is the closest site monitoring ambient SO_2 and PM_{10}. Tables 3 and 4 provide data from the Lynwood and North Main Street monitoring stations.

TABLE 3
Ambient Air Concentration Emission Levels at Lynwood Station, Los Angeles, 2003 – 2005

	Averaging Period	2003[(1)]	2004[(1)]	2005[(2)]	Maximum Value
Ozone (ppm)	1-Hour	0.081	0.084	0.11	0.11
Nitrogen Dioxide (ppm)	1-Hour	0.13	0.10	0.089	0.13
Nitrogen Dioxide (ppm)	Annual	0.031	0.030	0.030	0.031
Carbon Monoxide (ppm)	1-Hour	12	10	7.2	12
Carbon Monoxide (ppm)	8-Hour	7.3	6.7	5.87	7.3
$PM_{2.5}$ (ug/m3)	24-Hour	54.8	55.8	53.7	55.8
$PM_{2.5}$ (ug/m3)	Annual Arithmetic Mean (AAM)	20.2	18.5	16.0	20.2

Sources: [(1)]2003 and 2004 Data from SCAQMD historical data website, www.aqmd.gov/smog/historicaldata.html

[(2)]2005 Data from EPA website (Not available on SQACMD or CARB), www.epa.gov/air/data/monvals.html, except for NO2 annual, CO 1hr, and PM2.5 AAM which are from CARB Historical Data website, www.arb.ca.gov/adam/welcome.html

TABLE 4
Ambient Air Concentration Levels at North Main Street Station, Los Angeles, 2003-2005[1]

	Averaging Period	2003	2004	2005	Maximum Value
Sulfur Dioxide (ppm)	1-Hour	0.05	0.08	0.034	0.08
Sulfur Dioxide (ppm)	3-Hour	0.011	0.018	0.016	0.018
Sulfur Dioxide (ppm)	24-Hour	0.006	0.015	0.010	0.015
Sulfur Dioxide (ppm)	Annual	0.002	0.002	0.002	0.002
PM_{10} (ug/m3)	24-Hour	81	72	68.0	81
PM_{10} (ug/m3)	Annual Arithmetic Mean (AAM)	34.6	32.7	27	34.6

Sources: [1] Data from SCAQMD historical data website, www.aqmd.gov/smog/historicaldata.html, excluding the following:

2005 1-hr SO2, PM10 AAM, and 2003 – 2005 data for 3-hr SO2 are from 2005 Data from EPA website, www.epa.gov/air/data/monvals.html

Annual SO2 for 2003 – 2005 and 24-hr PM10 which are from CARB www.arb.ca.gov/adam/welcome.html

SECTION 4

Air Quality Dispersion Models

Several USEPA dispersion models are proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations. The models proposed for use are Building Profile Input Program (BPIP, dated 04112), Industrial Source Complex - Short Term (ISCST3, Version 02035), SCREEN3 (Version dated 96043), and the CALPUFF (Version 5.7). These models, along with options for their use and how they are used, are discussed below. These models will be used for:

- Compliance with State and Federal ambient air quality standards;
- Comparison of impacts to SCAQMD significant impact levels for nonattainment criteria pollutants; and
- Impacts to Air Quality Related Values in Class I and Class II areas.

Simple, Complex, and Intermediate Terrain Impacts

For modeling the project in simple, complex, and intermediate terrain, the ISCST3 model will be used. The ISCST3 model is a steady-state, multiple-source, Gaussian dispersion model designed for use with emission sources situated in terrain where ground elevations can exceed the stack heights of the emission sources. The ISCST3 model requires hourly meteorological data consisting of wind vector, wind speed, temperature, stability class, and mixing height. The model assumes that there is no variability in meteorological parameters over a 1-hour period, hence the term steady-state. The ISCST3 model allows input of multiple sources and source groupings, eliminating the need for multiple model runs. Complex phenomena such as building-induced plume downwash are treated in the ISCST3 model.

The ISCST3 model was selected as it is one of several models that are recommended by the USEPA for such evaluations. The ISCST3 model is capable of calculating pollutant concentrations in intermediate terrain. Intermediate terrain is defined as terrain between stack top and final plume height. In calculating pollutant concentrations in intermediate terrain, the model will select the higher of the simple and complex terrain calculations on an hour-by-hour, source-by-source and receptor-by-receptor basis. In addition, the ISCST3 model is preferred for this application because it incorporates algorithms for the simulation of aerodynamic downwash induced by buildings. These effects are of importance because many of the emission points may be below Good Engineering Practice (GEP) stack height.

The meteorological data from the SCAQMD Vernon monitoring station for 1981 will be used for the ISCST3 modeling to fulfill SCAQMD requirements.

Technical options selected for the ISCST3 model are listed below. Use of these options follows the USEPA's modeling guidance (40 CFR, Appendix W, April 15, 2003), SCAQMD guidance, and/or sound scientific practice. An explanation of these options and the rationale for their selection is provided below:

- Non-regulatory default option (includes final plume rise except for building wake downwash, stack-tip downwash except for Schulman-Scire [SS] downwash, buoyancy-induced dispersion except for SS downwash, default wind profile exponents, default temperature gradients, and no calm processing per SCAQMD policy);
- Anemometer height of 10 meters;
- Urban dispersion parameters; and
- Elevated receptor terrain height option.

The final plume rise option does not consider the possible effects of gradual plume rise on ambient concentrations during the rising phase of the plume downwind transport. Gradual plume rise is recommended by USEPA (40 CFR, Part 51, Appendix W, April 15, 2003) when there is significant terrain close to the stacks. Buoyancy-induced dispersion, which accounts for the buoyant growth of a plume caused by entrainment of ambient air, will be included because of the relatively warm exit temperature and subsequent buoyant nature of the exhaust plumes. Stack-tip downwash, which adjusts the effective stack height downward following the methods of Briggs (1972) for cases where the stack exit velocity is less than 1.5 times the wind speed at stack top, will be selected as per USEPA guidance.

As required by SCAQMD, the ISCST3 model will be run in the urban dispersion mode.

The no-calm control option will be used in the modeling to bypass the calms processing routine as required by SCAQMD. The ISCST3 model could recognize a calm wind condition as a wind speed less than or equal to 1 meter per second (m/sec) and a wind direction equal to that of the previous hour (a wind speed of 0 m/sec is used in the ASCII meteorological data file). Under the no-calm processing option, the ISCST3 model will exclude these hours from the calculation of concentrations.

Ambient Ratio Method and Ozone Limiting Method

Annual NO_2 concentrations will be calculated according to the Guideline on Air Quality Models (40 CFR, Part 51, Appendix W, April 15, 2003). The Guideline allows a nationwide default conversion rate of 75 percent for annual NO_2/NO_X ratios. Hourly NO_2 concentrations will be calculated assuming a 100 percent conversion rate of NO_2 to NO_X.

Should hourly NO_2 concentrations need to be examined in a more rigorous manner, the Ozone (O_3) Limiting Method (OLM) will be used. Concurrent meteorological and ozone concentration data are needed for the OLM. Three years of meteorological data collected at Los Angeles International Airport during 2001 to 2003 (with corresponding San Diego upper air data) will be used in the OLM. Hourly ozone data collected at the Lynnwood monitoring station of 2001 to 2004 will be used in conjunction with the meteorological data in the OLM to calculate hourly NO_2 concentrations from hourly NO_X concentrations. The OLM involves an initial comparison of the estimated maximum NO_X concentration and the ambient O_3 concentration to determine which is the limiting factor to NO_2 formation. If the O_3 concentration is greater than the maximum NO_X concentration, total conversion is assumed. If the NO_X concentration is greater than the O_3 concentration, the formation of NO_2 is limited by the ambient O_3 concentration. In this case, the NO_2 concentration is set equal to the O_3 concentration plus a correction factor which accounts for in-stack and near-stack thermal conversion.

EPA's ISC-OLM model will be used to calculate the NO_2 concentration based upon the OLM method. ISC-OLM will be implemented on a plume-by-plume basis (i.e. individual plume). However, for some receptors, a demonstration of plume merging may be made to allow use of the combined source analysis. Plume merging will be demonstrated as follows. The horizontal dispersion of each individual plume, as a function of downwind distance, will be identified using EPA's SCREEN3 dispersion model at the distance to the receptor of interest, under the appropriate meteorology. This value will be compared with half the distance between sources proposed for plume merging. Should the horizontal dispersion at the distance to the receptor exceed half the distance between the sources proposed for merging, then the plumes are assumed to have merged by the time they are transported to the receptor of interest.

Good Engineering Practice Stack Height and Downwash

ISCST3 can account for building downwash effects. Stack locations, heights, building locations and dimensions will be input to BPIP. The first part of BPIP determines and reports on whether or not a stack follows GEP guidance or is being subjected to wake effects from a structure or structures. The second part calculates direction-dependent "equivalent building dimensions" if a stack is being influenced by structure wake effects. The BPIP output will be used in the ISCST3 modeling.

Receptor Selection

Receptor and source base elevations will be determined from USGS Digital Elevation Model (DEM) data using the 7½-minute format (i.e., 30 meter spacing between grid nodes). All coordinates will be referenced to UTM North American Datum 1927 (NAD27), zone 11. The ISC receptors from the DEM files will be placed exactly on the DEM nodes. Every effort will be made to maintain receptor spacing across DEM file boundaries.

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. A 30-meter resolution receptor grid will be developed and will extend outwards at least 10 kilometers (km) or more as necessary to calculate the significant impact area. The receptor grid will also include sensitive receptors as required by CEC Regulations (Appendix B (g) (9) (D)). The fenceline receptors will be spaced at 30 meter intervals. Concentrations within the facility fenceline will not be calculated.

Modeling Scenarios

Pollutant emissions to the atmosphere from the proposed facility will occur from combustion of natural gas in each of two (2) identical combustion turbines and duct burners. Emission rates will be calculated based on vendor data and additional conservative assumptions of turbine performance. Turbine emissions and stack parameters, such as flow rate and exit temperature, exhibit some variation with ambient temperature and operating load. In order to calculate the worst-case air quality impacts, dispersion modeling will be conducted at base, 70 and 50 percent loads at three ambient temperatures, which represent the design-high, low and annual average ambient temperatures. In addition two scenarios with the turbines operating at base load with the duct burners will be analyzed at the design annual average and high temperatures. Besides

the load/temperature scenarios mentioned above, modeling will also be conducted for start up and shut down scenarios and the various phases of plant commissioning.

Ambient Air Quality Impact Analyses

In evaluating the impacts of the proposed project on ambient air quality, modeling of the ambient impacts for the project will be added to representative background concentrations, and the results compared to the state and federal ambient air quality standards for SO_2, NO_2, and CO. For evaluating PM_{10} impacts, the modeled PM_{10} concentrations will be compared with the significance thresholds established by the SCAQMD in Rule 1303.

For PSD-related modeling, in accordance with EPA guidance (40 CFR part 51, Appendix W, Sections 11.2.3.2 and 11.2.3.3), the highest modeled concentration will be used to demonstrate compliance with annual standards while the highest second-highest modeled concentrations will be used to demonstrate compliance with standards based on averaging periods of 24 hours or less.

For SCAQMD requirements, the highest modeled concentration will be used for all averaging periods.

Class II Increment Analysis

For those pollutants (by averaging time) with concentrations greater than the Significant Impact Levels, an additional analysis will be conducted to determine the PSD increment consumption. As with the AAQS evaluation, only receptors with concentrations equal to or greater than the SIL will be evaluated. It is assumed that the SCAQMD will provide the source information (that is, locations, emissions and stack parameters) for the nearby increment consuming and expanding sources. Note that the South Coast Air Basin is currently designated as nonattainment for CO. As there have been no recorded violations of the CO NAAQS over the required duration, the SCAQMD has initiated a request to have USEPA redesignate the Basin as CO Attainment. Should this redesignation occur before the PSD review is completed, it is possible that in addition to NOx CO could become an additional PSD pollutant.

Additional Impact Analysis

PSD regulations require the impacts to visibility (addressed separately below), vegetation, and soils are evaluated. For the impact to vegetation and soils, the secondary ambient air quality standard will be used. The secondary air quality standards were promulgated to protect public welfare including impacts to non-human health resources.

SECTION 5

Impacts on Air Quality Related Values

As required by the USEPA and CEC, an analysis to determine whether the proposed project will result in emissions that would have an adverse impact on air quality related values (AQRVs), including visibility, acidic deposition, and regional haze, in nearby Class I areas will be prepared. The Federal Land Manager will be contacted with regards to preparing a Class I impact analysis.

SCAQMD Regulation XIII also requires the facility to conduct a modeling analysis for plume visibility if the net emission increase from the new or modified source exceeds 15 tons/year of PM_{10} or 40 tons/year of NO_X; and the location of the source, relative to the closest boundary of a specified Federal Class I area, is within the distance specified as the following:

- Cucamonga: 28 kilometers
- San Gabriel: 29 kilometers

As shown in Table 5, all Class I areas are at distances greater than their threshold values; therefore, this regulation does not apply.

TABLE 5
Class I areas within 100 kilometers

Class I Area	Distance from site (km)
San Gabriel NFW	31
Cucamonga NFW	58

The CALPUFF analysis will include an assessment of visibility, atmospheric deposition, and criteria pollutant impacts at each Class I area. Our analyses will be performed based on guidance found in the following documents: *Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report* (FLAG, 2000), *Federal Land Managers Modeling Criteria* (USDA FS & NPS, 2005a), *General Recommendations of Particle Speciation for Class I Visibility Analyses* (USDA FS & NPS, 2005b), and *Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA, 1998). Background concentrations from the Upland and Fontana monitoring stations will be used to evaluate the criteria pollutant impact to the Class I area, these values are shown in Table 6 below. The Upland monitoring station, located less than 45 km from San Gabriel NFW and less than 20 km from Cucamonga NFW, is the closest monitoring station to the Class I areas between the project site and the Class I areas monitoring CO and NOx. The Fontana station is the closest station to the Class I areas between the project site and Class I areas monitoring SO2 and PM10. The PSD air quality standards applicable to the project are shown in Table 7 below.

TABLE 6
Air Quality Standards Applicable to the Project

Averaging Period/ Pollutant	NAAQS[1]	2003 Background Concentration[2]	2004 Background Concentration[2]	2005 Background Concentration[3]
NO_2 (Annual) (ppm)	0.053	0.035	0.031	0.028
CO (1-hr) (ppm)	9	4	3	2.4
CO (8-hr) (ppm)	35	2.9	2.1	1.7
PM10 (Annual) (ug/m3)	50	47.2	47.7	48
PM10 (24-Hour) (ug/m3)	150	101	106	108
SO2 (Annual) (ppm)[4]	0.030	0.001	0.001	0.002
SO2 (24-Hour) (ppm)	0.14	0.004	0.006	0.004
SO2 (3-Hour) (ppm) [4]	0.5	0.007	0.005	0.006

[1] Proposed by U.S. EPA, Federal Register: July 1996 (Vol. 61, Number 142), Proposed Rules, pg. 38249-344.

[2]2003 and 2004 Data from SCAQMD historical data website, www.aqmd.gov/smog/historicaldata.html

[3]2005 data are from EPA website (Not available on SCAQMD or CARB), www.epa.gov/air/data/monvals.html

[4] SO2 3-hr and annual, 2003 through 2005 Data from EPA website (Not available on SCAQMD or CARB).

TABLE 7
Air Quality Standards Applicable to the Project

Averaging Period/ Pollutant	Class I Modeling Significance Level ($\mu g/m^3$)[a]	Class I PSD Increment ($\mu g/m^3$)
Annual NO_2	0.1	2.5
Annual PM10	0.2	4
24-Hour PM10	0.3	8
Annual SO2	0.1	2
24-Hour SO2	0.2	5
3-Hour SO2	1	25

[a] Proposed by U.S. EPA, Federal Register: July 1996 (Vol. 61, Number 142), Proposed Rules, pg. 38249-344.

Notes:

$\mu g/m^3$ = micrograms per cubic meter

Model Selection

Workgroups that represent the interests of the Federal Land Managers (FLM) in the PSD permitting process (IWAQM, FLAG) recommend that a "far-field analysis" of the effect of a proposed source on air quality and air quality related values (AQRV) be performed for sources

located more than 50 km from affected areas. In addition to modeling Cucamonga, located at 58 - 68 km from the project site, San Gabriel, which is located at 31 – 50 km from the project site will be analyzed. CH2M HILL will use the EPA CALPUFF modeling system, as recommended by the EPA and the FLM for far-field analyses, to obtain predicted impacts. The CALPUFF modeling system includes the CALMET meteorological model, a Gaussian puff dispersion model (CALPUFF) with algorithms for chemical transformation and deposition, and a postprocessor capable of calculating concentrations, visibility impacts, and deposition (CALPOST). The CALPUFF modeling system will be applied in a full, refined mode rather than a screening mode.

CH2M HILL will use the EPA-approved versions of the CALPUFF modeling system preprocessors and models. Specifically, we will use the Beta-test versions that are currently available on the Earth Tech website (http://www.calgrid.net/calpuff/calpuff1.htm). The latest versions of the primary models include:

- CALMET Version 5.53a, Level 040716
- CALPUFF Version 5.711a, Level 040716
- CALPOST Version 5.51, Level 030709

CALMET Methodology

Dimensions of the Modeling Domain

CH2M HILL will use the CALMET model to generate a three-dimensional wind field and other meteorological parameters suitable for use by the CALPUFF model. A modeling domain will be established to encompass higher terrain west of the Class I areas of interest. The domain will cover a region approximately 170 km by 140 km with a grid resolution of 4 km.

Because the modeling domain is less that 200 km in both the north-south and east-west directions, the UTM map projection will be used (USDA FS & NPS, 2005). Figure 2 shows the CALMET/CALPUFF modeling domain.

The default technical options listed in Appendix B of the IWAQM Phase 2 report will be used for CALMET. User-specified model options will be determined by CH2M HILL to produce the most realistic wind field. Vertical resolution of the wind field will include eight layers, with vertical cell face heights as follows (in meters):

- 0, 20, 50, 100, 250, 500, 750, 1000, 3000

The highest cell face height is set to be approximately 500 meters above the highest terrain point within the model domain.

CALMET Input Data

CH2M HILL will run the CALMET model to produce three years of analysis: 2001, 2002 and 2003. For 2001, we will use data at 36-km resolution that were obtained from the contractor (Alpine Geophysics) who developed the nationwide data for the EPA. For 2002, nationwide 36-km MM5 data, developed for the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), were obtained from the same EPA contractor. Data for 2003 were also obtained from Alpine Geophysics. These 2003 data, also at 36-km resolution, were developed by the Wisconsin Department of Natural Resources, the Illinois Environmental Protection Agency, and the Lake Michigan Air Directors Consortium. These three datasets were chosen because

they are current and because they have all been evaluated for quality. The MM5 data will be used as input to CALMET as the "initial guess" wind field. The initial guess field will be adjusted by CALMET for local terrain and land use effects to generate a Step 1 wind field, and then further refined using local surface, precipitation and upper air observations to create a final Step 2 wind field. The MM5 data is generated using 34 vertical layers, from 0 meters to 14,662 meters, which is significantly higher than the terrain features of the domain of interest.

The two closest upper-air stations to the City of Vernon are Vandenberg and San Diego. Upper air sounding data available from the Vandenberg station is less than 50 percent complete for the most recent ten years. The CALMET Meteorological Model User Guide advises against using sounding data with significant gaps. CALMET will fill in missing data by assuming a straight line interpolation between valid vertical levels, which is not an appropriate assumption when at least 50 percent of the data is missing. Additionally, CALMET requires valid data at the surface level and at, or above, the surface level from the upper air station. For the periods when the Vandenberg station data is missing, CALMET will seek data from the next nearest station included in the model run. The other closest upper-air station is located in San Diego, 200 km off the modeling domain. This is a significant distance and may be inappropriate for such substitution on such a large scale given the distance from the project site. A possible solution to the lack of representative upper-air data is presented below.

Since the MM5 data incorporates 3-hourly objective analysis initializations based in part on standard surface and upper air measurements, an appropriate representation of the upper air data is already incorporated into the "initial guess" wind field and incorporating incomplete upper air data will not provide a consistent adjustment to a more realistic Step 2 wind field. As such, the analysis will include observation data from only surface and precipitation stations. Therefore, the NOOBS (No observation) option will be used for the upper-air option only.

Surface and precipitation data for 2001-2003 will be obtained from the National Climatic Data Center (NCDC). CH2M HILL will use all stations within the modeling domain that contain a high percentage of valid data for a given year. Figure 2 shows the locations of the surface stations and precipitation stations within the modeling domain.

Land use and terrain data to construct the GEO.DAT input to CALMET will be obtained from the U.S. Geological Survey (USGS). Land use data will be obtained in Composite Theme Grid (CTG) format from the USGS, and the Level I USGS land use categories will be mapped into the 14 primary CALMET land use categories. Surface properties such as albedo, Bowen ratio, roughness length, and leaf area index will be computed from the land use values. Terrain data will be taken from USGS 1-degree Digital Elevation Model (DEM) data, which are primarily derived from USGS 1:250,000 scale topographic maps. Missing land use data will be filled with a value that is appropriate for the missing area.

Validation of CALMET Wind Field

CH2M HILL will use visualization software to examine the CALMET wind fields to determine if the various "user defined" CALMET technical options were chosen properly. Documentation of the wind field evaluation will be included in the final report for the analysis. A sample CALMET input file is included as Appendix A of this protocol. This input file lists all of the technical CALMET switches that we propose to use for our analyses.

CALPUFF Methodology

CALPUFF Technical Options

CH2M HILL will drive the CALPUFF model with the meteorological output from CALMET over the modeling domain described earlier. To evaluate the impacts from the proposed project, only the emissions from the proposed project will be modeled.

CH2M HILL will use the default CALPUFF technical options that are listed in the IWAQM Phase 2 guidance document. For wet and dry deposition, CH2M HILL will use the CALPUFF default values for particle size parameters and scavenging coefficients for sulfate and nitrate particles.

Monthly ozone data will be input to CALPUFF for chemical transformation. Average monthly concentrations were calculated from all available data, which includes data provided by the NFS for stations located at San Gabriel, San Bernardino, and Joshua Tree. Although the Class I areas of interest are not located within the boundaries of San Bernardino and Joshua Tree these sites are representative of the expected ozone values (McCorison, 2005). The highest monthly average for a given month that is calculated from the available stations will be input to CALPUFF as the value for that month. The calculated monthly values are as follows:

January:	59 ppb
February:	59 ppb
March:	59 ppb
April:	67 ppb
May:	67 ppb
June:	64 ppb
July:	66 ppb
August:	59 ppb
September:	55 ppb
October:	55 ppb
November:	26 ppb
December:	26 ppb

Ammonia background concentration values will be input to CALPUFF for chemical transformation with the MESOPUFF II chemical transformation scheme. Ammonia values were provided by the NFS and are as follows:

January:	8 ppm
February:	8 ppm
March:	8 ppm
April:	8 ppm
May:	8 ppm
June:	9 ppm
July:	9 ppm
August:	9 ppm
September:	9 ppm
October:	8 ppm
November:	8 ppm
December:	8 ppm

Receptor Grids

As recommended by the NFS, receptors will be taken from the NFS database for Class I area modeling (USDA FS & NPS, 2005). The USDA FS and NPS conversion routine will be used to convert all latitude/longitude coordinates to UTM coordinates, including receptors, meteorological stations, and source locations.

CALPOST Methodology

Visibility

The visibility analysis will make use of the concentrations generated by CALPUFF, hourly relative humidity data, and the CALPOST postprocessor to calculate the percent change in extinction attributable to the project emissions as compared to background extinction. Emissions for the visibility analysis will be based on 24-hour rates for the project.

Relative humidity for the consideration of extinction from hygroscopic particles will be calculated on an hourly basis from data in the CALMET files. This approach represents Method 2 in CALPOST, which is the recommended method in the FLAG document for a refined CALPUFF visibility analysis. The cap on relative humidity in CALPOST will be set at 95 percent, as recommended by the Federal Land Managers (FLM) Modeling Guidance Document (USDA FS & NPS, 2005a).

Particulate emissions from the project will be speciated between filterable particulate (fine PM_{10}/soil), primary sulfate (SO4), elemental carbon (EC), and secondary organic aerosol (SOA) according to the *General Recommendations of Particle Speciation for Class I Visibility Analyses*, provided by the FLM (USDA FS & NPS, 2005b) as shown in Table 8. Primary sulfate emissions will consist of ammonium sulfate, sulfuric acid mist, and ammonium bi-sulfate. This speciation allowed for the consideration within the visibility analysis of the different scattering efficiencies of the various species. This apportionment is important because some particulates, especially elemental carbon (EC) particles, have a greater impact on visibility. For example, EC particles have an extinction efficiency of 10 inverse megameters per micrograms per cubic meter ($Mm^{-1}/\mu g/m^3$), while sulfate particles have an extinction efficiency of 3.0 $Mm^{-1}/\mu g/m^3$ times the function of relative humidity.

TABLE 8
PM Speciation for Natural-Gas Fired Combustion Turbine Provided by USDA FS (October, 2005)

Filterable vs. Condensable		Recommended PM Profile				
Filterable	**Condensable (CPM)**	**SO_4 ***	**EC**	**SOA**	**PMF**	**PMC**
0.25	0.75	Site-specific data, or 0.33*SO_2	0.25	CPM-SO_4	0.0	0.0

* SO_4 should be adjusted to account for the molecular weight difference between SO_2 and SO_4 (96/64). SO_4 assumed to be 100% of inorganic CPM unless site-specific data indicates otherwise.

Background extinction (b_{back}) for the areas of concern will be calculated within CALPOST using the equation:

$$b_{back} = b_{hygro} \times f(RH) + b_{NonHygro} + Rayleigh$$

Values for b_{hygro}, $b_{NonHygro}$, and Rayleigh scattering components are provided in Appendix 2.B of the FLAG report. As shown in the FLAG report, the values for b_{hygro} (0.6 Mm^{-1}), $b_{NonHygro}$, (4.5 Mm^{-1}) and Rayleigh scattering (10 Mm^{-1}) are the same for each of the Class I areas of concern. These values are the current FLAG-recommended estimates of "natural background" for all western areas. CH2M HILL will use these values for each of the Class I areas of concern.

A sample CALPOST input file is provided in Appendix B.

The raw visibility results using Method 2 will be derived from a calculation of percentage light extinction that uses "natural" background as the denominator. The FLAG document defines natural conditions as "conditions substantially unaltered by humans or human activities." As applied in the context of visibility, natural conditions include naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast, or coloration." Aerosols that occur naturally in the ambient air affect background visibility under natural conditions. Natural background visibility is also affected by water in various physical states that naturally occur in the ambient air in the form of humidity, clouds, and fog or in the form of precipitation as snow or rain.

Atmospheric Deposition

Atmospheric deposition at the areas of concern will be assessed through an analysis of total sulfur (S) and nitrogen (N) deposition. Annual deposition rates will be determined based on the annual emission rates from the proposed project.

Annual deposition rates (wet and dry) of NO_x, HNO_3, and NO_3^- will be calculated by CALPUFF, then converted to equivalent levels of nitrogen and summed using the POSTUTIL and CALPOST postprocessors. Likewise, deposition rates of SO_2 and SO_4^{-2} will be converted to equivalent levels of nitrogen and sulfur and summed. The CALPUFF deposition fluxes of each of the species of N and S will be adjusted to account for the difference in molecular weights between the species and the elements and will be presented in kg/ha/yr for total N or S. CH2M HILL will use the molecular weight ratios shown in Table 9 within the CALPOST module to perform the adjustment.

Criteria Pollutants

CH2M HILL will also use the CALPUFF modeling system to estimate the impact of the project relative to the Class I PSD increment for NOx. Modeled impacts will be compared to Class I modeling significance levels that have been proposed by the EPA.

TABLE 9
Molecular Weight Ratios for Deposition Calculations in CALPOST

Element	Ratio of Molecular Weights
N from SO_4	0.29167*
N from HNO_3	0.22222
N from NO_3	0.45161**
N from NO_x	0.30435
S from SO_2	0.50000
S from SO_4	0.33333

*Based on two moles of N in $(NH_4)_2SO_4$

**Based on two moles of N in NH_4NO_3

Presentation of Results

The methodology and results of the CALPUFF modeling analyses will be presented in a technical report. Input and output files for the CALMET, CALPUFF, POSTUTIL, and CALPOST modeling, as well as program executables and source code will be provided in electronic format on CD or DVD.

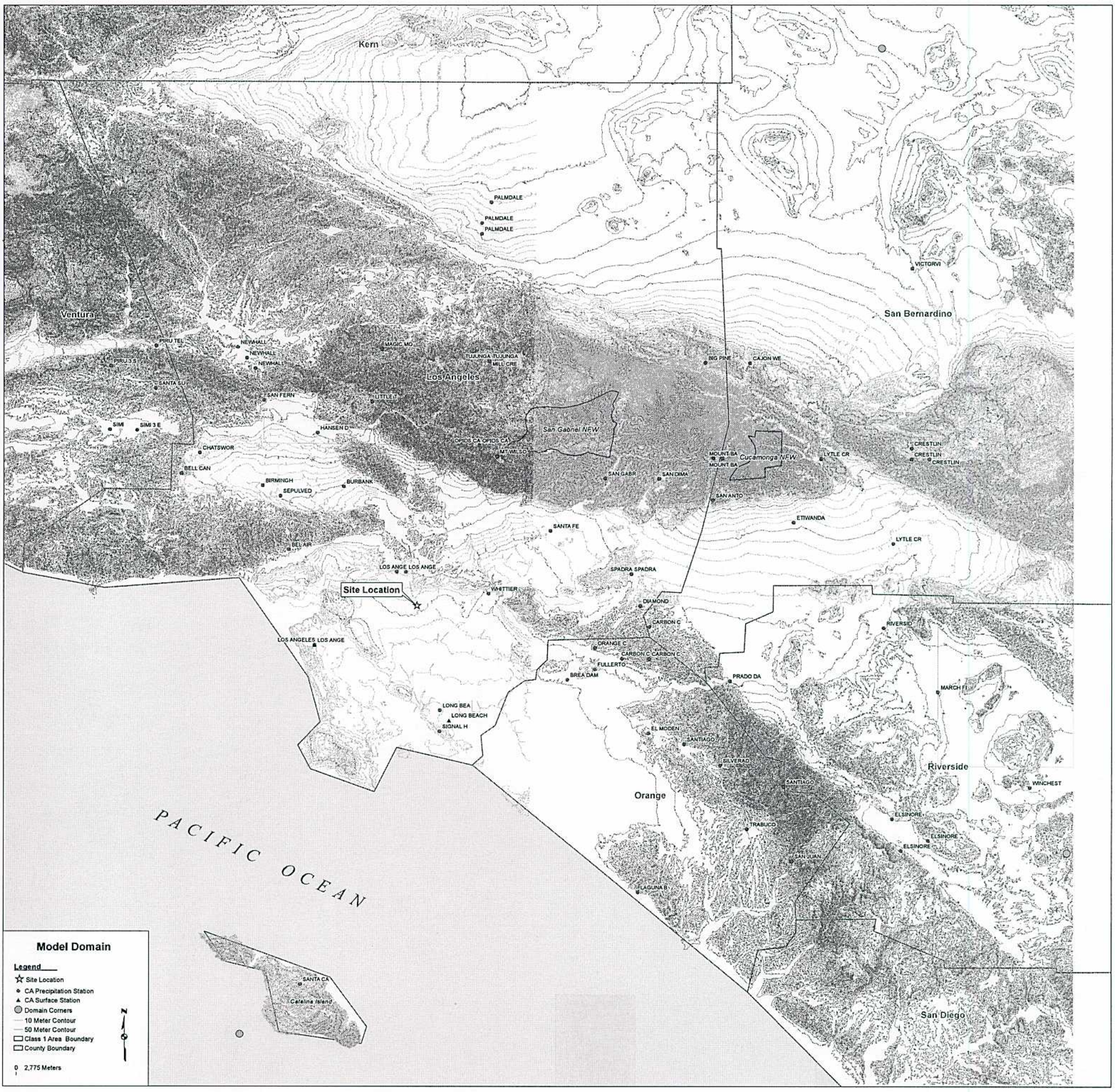

FIGURE 2
CALMET\CALPUFF MODELING DOMAIN
VERNON POWER PLANT
CITY OF VERNON, CALIFORNIA

SECTION 6

Toxic Air Contaminants – Health Risk Assessment

SCAQMD Rule 1401 set forth the health risk threshold for modified and new permit units. Human health risk assessment (HRA) will be performed for the proposed project. The HRA will follow the latest version of Air Toxics Hot Spots Program Risk Assessment Guidelines (Office of Environmental Health Hazard Assessment (OEHHA), August 2003). "Hotspots Analysis Reporting Program" (HARP, version 1.2a, August 26, 2005) released by California Air Resources Board (CARB) will be used to perform air dispersion modeling and to evaluate the carcinogenic and non-carcinogenic health risks for the proposed project. The SCAQMD recently adopted the HARP procedure for assessing risk under Rule 1401. The modeled health risk values will be compared with SCAQMD cancer, chronic, and acute risk thresholds.

SCAQMD Rule 1401 presently requires a "permit unit" based assessment. Impacts of each turbine will be assessed separately. The diesel powering the fire pump is classed as an emergency diesel and emissions from that unit are exempted from Rule 1401 review. Likewise, an SCAQMD permit is not required for the cooling towers and emissions from those units are not included in the Rule 1401 assessment.

Conversely, the assessment required by the CEC requires that emissions from all sources, associated with the project, be aggregated and analyzed for total project impacts. Cooling tower and the diesel-powered fire pump will be included in this assessment.

SECTION 7

Construction Impacts Analysis

Construction Emissions

Construction emissions from the proposed project will be calculated using URBEMIS 2002, the emission factors from SCAQMD CEQA Handbook (1993) or other updated emission, load cycle factors and off-road emissions estimating methodologies from CARB and or USEPA, as appropriate. The potential ambient impacts from air pollutant emissions during the construction of the project will be evaluated through air dispersion modeling that will account for the construction site location and the surrounding topography; the sources of emissions during construction, including vehicle and equipment exhaust emissions; and fugitive dust.

Site Description

The dispersion modeling analyses will include a description of the physical setting of the facility and surrounding terrain. A map showing the plant location, fence lines, and model receptors will be included, as well as a plot plan of the plant site indicating heights of nearby structures above a common reference point.

Types of Emission Sources

The construction impacts analysis will include a schedule for construction operation activities. Site preparation is expected to include site excavation, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations will begin. Once the foundations are finished, the installation and assembly of the mechanical and electrical equipment will begin.

Fugitive dust emissions from the construction of the project result from (1) dust entrained during excavation and grading at the construction site; (2) dust entrained during onsite travel on paved and unpaved roads and across the unpaved construction site; (3) dust entrained during aggregate and soil loading and unloading operations; (4) dust entrained from raw material transfer to and from material stockpiles; and (5) wind erosion of areas disturbed during construction activities. Heavy equipment exhaust emissions result from (1) exhaust from the heavy equipment used for excavation, grading, and construction of onsite structures; (2) exhaust from a water truck used to control construction dust emissions; (3) exhaust from diesel welding machines, gasoline-powered generators, air compressors, and water pumps; and (4) exhaust from gasoline-powered pickup trucks and diesel flatbed trucks used onsite to transport workers and materials around the construction site. Diesel and gasoline truck exhaust emissions will result from transport of mechanical and electrical equipment to the project site and transport of rubble and debris from the site to an appropriate landfill. Diesel exhaust emissions may also result from transport of raw materials to and from stockpiles.

Maximum short term emission rates will be based on the worst case on-site daily emissions averaged over the proposed hours of on-site construction activity per day. Emissions for

estimating the annual construction impacts will be based on the worst case on-site annual emissions for construction

Existing Ambient Levels

Ambient NO_2, SO_2, and CO concentrations monitored at the North Main Street and Lynwood stations will be used. This site is less than 12 km to the project site, and the monitoring data are believed to be representative of the site. The highest concentration of the most recent 3 years of data will be used as the background concentration.

Model Type

The EPA-approved ISCST3 model will be used to estimate ambient impacts from construction emissions. The modeling options described above will be used with the SCAQMD 1981 meteorological data from the Vernon monitoring station for the modeling analysis.

The construction site will be represented as an area source in the modeling analysis. Emissions will be divided into two categories: exhaust emissions and dust emissions. For exhaust emissions, a plume height of 4.6 meters (15 feet) will be used to represent an average release height from the construction equipment. Plume height refers to the distance measured from ground level to the centerline of the emissions plume. For dust emissions, a release height of two meters will be used due to the ambient plume temperatures and negligible plume velocities. If model refinement is required for assessing NO_2 impacts, the localized significance threshold guidance (Chico, Tom and J. Koizumu, 2003) will be used to determine the conversion of NOx to NO_2.

For the construction modeling analysis, the receptor grid will begin at the property boundary and will extend approximately two kilometer in all directions. Receptor spacing will be 30 meters.

SECTION 8

Cumulative Impact Analysis

Cumulative impact analysis will be performed for the project's typical operating mode in combination with other stationary emission sources within a six mile radius which have received construction permits but are not yet operational, or are in the permit process. The cumulative impact analysis will assess whether estimated emission concentrations will cause or contribute to a violation of any ambient air quality standards.

The sources to be included in the cumulative impact analysis will be determined by consulting the SCAQMD and the CEC. The applicant has request source data from the SCAQMD for a six mile radius to identify sources using zip codes for the surrounding area. Once these data are received from the SCAQMD, they will be forwarded to the CEC for review. The applicant will also review Environmental Impact Reports to determine if any new air pollution sources are proposed within the 10 kilometer area surrounding the VPP. The applicant will plot sources for zip codes that intersect the 10 kilometer circle around the VPP in order to identify those sources beyond the 10 kilometer distance.

SECTION 9

Final Modeling Submittal

In accordance with the USEPA, SCAQMD, and CEC guidelines, the final modeling analyses will include the following materials:

- US Geological Survey (USGS) 7½-minute (1:24,000) map(s) showing the facility
- Modeling summaries of maximum impacts for each air quality model showing meteorological conditions and receptor location and elevation; and
- All modeling outputs (including BPIP and meteorological files) on diskette, together with a description of all filenames;
- Plot plan showing emission points, nearby buildings (including dimensions), cross-section lines, property lines, fencelines, roads, and UTM coordinates;
- Table showing the buildings identifiers in the BPIP run(s) and plot plan

SECTION 10

References

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Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Draft Phase I Report. October 1999.

EPA, 1998. *Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts*, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, December 1998.

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APPENDIX A

Sample CALMET Input File

```
VPP 4 Km grid
2001 full year
---------------- Run title (3 lines) ----------------------------------------

                    CALMET MODEL CONTROL FILE
                    -------------------------

--------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names


Subgroup (a)
------------
Default Name  Type          File Name
------------  ----          ---------
GEO.DAT       input    ! GEODAT= GEO\MAKEGEO\\geo4km.dat!
SURF.DAT      input    ! SRFDAT= surf\surf01.dat!
CLOUD.DAT     input    * CLDDAT=            *
PRECIP.DAT    input    ! PRCDAT= precip\precip01.dat !
MM4.DAT       input    ! MM4DAT= mm5\vpp01.mm5 !
WT.DAT        input    * WTDAT=             *

CALMET.LST    output   ! METLST= calmet01.lst !
CALMET.DAT    output   ! METDAT= calmet01.dat  !
PACOUT.DAT    output   * PACDAT=            *

All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = T !
         F = UPPER CASE

NUMBER OF UPPER AIR & OVERWATER STATIONS:

    Number of upper air stations (NUSTA)  No default     ! NUSTA =  1  !
    Number of overwater met stations
                                  (NOWSTA) No default     ! NOWSTA =  2  !

                        !END!

--------------------------------------------------------------------------------
Subgroup (b)
---------------------------------
Upper air files (one per station)

---------------------------------
Default Name  Type       File Name
------------  ----       ---------
UP1.DAT       input     1  ! UPDAT=UPA\UP01.DAT!    !END!

--------------------------------------------------------------------------------
Subgroup (c)
----------------------------------------
Overwater station files (one per station)
----------------------------------------
Default Name  Type       File Name
------------  ----       ---------
SEA1.DAT       input     1  ! SEADAT=SEA\6025.DAT!    !END!
SEA2.DAT       input     1  ! SEADAT=SEA\6053.DAT!    !END!
--------------------------------------------------------------------------------
Subgroup (d)
----------------
Other file names
```

```
----------------

Default Name  Type       File Name
------------  ----       ---------
DIAG.DAT      input      * DIADAT=                  *
PROG.DAT      input      * PRGDAT=                  *

TEST.PRT      output     * TSTPRT=                  *
TEST.OUT      output     * TSTOUT=                  *
TEST.KIN      output     * TSTKIN=                  *
TEST.FRD      output     * TSTFRD=                  *
TEST.SLP      output     * TSTSLP=                  *

--------------------------------------------------------------------------------
NOTES: (1) File/path names can be up to 70 characters in length
       (2) Subgroups (a) and (d) must have ONE 'END' (surround by
           delimiters) at the end of the group
       (3) Subgroups (b) and (c) must have an 'END' (surround by
           delimiters) at the end of EACH LINE

                        !END!


------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Starting date:   Year (IBYR) -- No default       ! IBYR=  2001  !
                     Month (IBMO) -- No default       ! IBMO=  1  !
                       Day (IBDY) -- No default       ! IBDY=  1  !
                      Hour (IBHR) -- No default       ! IBHR=  1  !

     Base time zone        (IBTZ) -- No default       ! IBTZ=  8  !
        PST = 08, MST = 07
        CST = 06, EST = 05

     Length of run (hours) (IRLG) -- No default       ! IRLG=  8760 !

     Run type            (IRTYPE) -- Default: 1       ! IRTYPE=  1  !

        0 = Computes wind fields only
        1 = Computes wind fields and micrometeorological variables
            (u*, w*, L, zi, etc.)
        (IRTYPE must be 1 to run CALPUFF or CALGRID)

     Compute special data fields required
     by CALGRID (i.e., 3-D fields of W wind
     components and temperature)
     in additional to regular            Default: T    ! LCALGRD = T !
     fields ? (LCALGRD)
     (LCALGRD must be T to run CALGRID)

      Flag to stop run after
      SETUP phase (ITEST)             Default: 2       ! ITEST=  2   !
      (Used to allow checking
      of the model inputs, files, etc.)
      ITEST = 1 - STOPS program after SETUP phase
      ITEST = 2 - Continues with execution of
                  COMPUTATIONAL phase after SETUP

!END!
```

```
--------------------------------------------------------------------------------


INPUT GROUP: 2 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                     Default: UTM    ! PMAP = UTM !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
         PS  :  Polar Stereographic
         EM  :  Equatorial Mercator
         LAZA:  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                    Default=0.0     ! FEAST  = 0.0 !
     (FNORTH)                   Default=0.0     ! FNORTH = 0.0 !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                   No Default      ! IUTMZN =  11 !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                   Default: N      ! UTMHEM = N !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                    No Default      ! RLAT0 = 44.0N !
     (RLON0)                    No Default      ! RLON0 = 105.00W !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
                RLAT0 selected for convenience
         EM  :  RLON0 identifies central meridian of projection
                RLAT0 is REPLACED by 0.0N (Equator)
         LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
                RLAT0 identifies latitude of tangent-point of mapping plane

     Matching parallel(s) of latitude (decimal degrees) for projection
     (Used only if PMAP= LCC or PS)
     (XLAT1)                    No Default      ! XLAT1 = 30.0N !
     (XLAT2)                    No Default      ! XLAT2 = 60.0N !

         LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
         PS  :  Projection plane slices through Earth at XLAT1
                (XLAT2 is not used)

     ----------
     Note:  Latitudes and longitudes should be positive, and include a
            letter N,S,E, or W indicating north or south latitude, and
            east or west longitude.  For example,
```

```
       35.9  N Latitude  =  35.9N
       118.7 E Longitude = 118.7E


Datum-Region
------------

The Datum-Region for the coordinates is identified by a character
string.  Many mapping products currently available use the model of the
Earth known as the World Geodetic System 1984 (WGS-G ).  Other local
models may be in use, and their selection in CALMET will make its output
consistent with local mapping products.  The list of Datum-Regions with
official transformation parameters is provided by the National Imagery and
Mapping Agency (NIMA).

NIMA Datum - Regions(Examples)
------------------------------------------------------------------------------
WGS-G     WGS-84 GRS 80 Spheroid, Global coverage (WGS84)
NAS-C     NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
NWS-27    NWS 6370KM Radius, Sphere
NWS-84    NWS 6370KM Radius, Sphere
ESR-S     ESRI REFERENCE 6371KM Radius, Sphere

Datum-region for output coordinates
(DATUM)                    Default: WGS-G     ! DATUM = NAS-C  !



Horizontal grid definition:
---------------------------

Rectangular grid defined for projection PMAP,
with X the Easting and Y the Northing coordinate

       No. X grid cells (NX)      No default     ! NX =  43  !
       No. Y grid cells (NY)      No default     ! NY =  35  !

Grid spacing (DGRIDKM)            No default     ! DGRIDKM = 4. !
                                  Units: km

Reference grid coordinate of
SOUTHWEST corner of grid cell (1,1)

   X coordinate (XORIGKM)         No default     ! XORIGKM = 330.039 !
   Y coordinate (YORIGKM)         No default     ! YORIGKM = 3709.999 !
                                  Units: km

Vertical grid definition:
-------------------------

   No. of vertical layers (NZ)    No default     ! NZ =  8  !

   Cell face heights in arbitrary
   vertical grid (ZFACE(NZ+1))    No defaults
                                  Units: m
   ! ZFACE = 0.,20.,50.,100.,250.,500.,750.,1000.,3000. !


!END!


------------------------------------------------------------------------------
```

```
INPUT GROUP: 3 -- Output Options
--------------


    DISK OUTPUT OPTION

       Save met. fields in an unformatted
       output file ?              (LSAVE)  Default: T     ! LSAVE = T !
       (F = Do not save, T = Save)

       Type of unformatted output file:
       (IFORMO)                            Default: 1    ! IFORMO =  1  !

            1 = CALPUFF/CALGRID type file (CALMET.DAT)
            2 = MESOPUFF-II type file     (PACOUT.DAT)


    LINE PRINTER OUTPUT OPTIONS:

       Print met. fields ?  (LPRINT)       Default: F     ! LPRINT = F !
       (F = Do not print, T = Print)
       (NOTE: parameters below control which
              met. variables are printed)

       Print interval
       (IPRINF) in hours                   Default: 1     ! IPRINF =  24  !
       (Meteorological fields are printed
        every  24  hours)


       Specify which layers of U, V wind component
       to print (IUVOUT(NZ)) -- NOTE: NZ values must be entered
       (0=Do not print, 1=Print)
       (used only if LPRINT=T)        Defaults: NZ*0
       ! IUVOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !
       -----------------------


       Specify which levels of the W wind component to print
       (NOTE: W defined at TOP cell face --  8  values)
       (IWOUT(NZ)) -- NOTE: NZ values must be entered
       (0=Do not print, 1=Print)
       (used only if LPRINT=T & LCALGRD=T)
       -----------------------------------
                                            Defaults: NZ*0
        ! IWOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !


       Specify which levels of the 3-D temperature field to print
       (ITOUT(NZ)) -- NOTE: NZ values must be entered
       (0=Do not print, 1=Print)
       (used only if LPRINT=T & LCALGRD=T)
       -----------------------------------
                                            Defaults: NZ*0
        ! ITOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !

       Specify which meteorological fields
       to print
       (used only if LPRINT=T)             Defaults: 0 (all variables)
       -----------------------


         Variable            Print ?
```

```
                    (0 = do not print,
                     1 = print)
   --------         ------------------

!  STABILITY  =          0           ! - PGT stability class
!  USTAR      =          0           ! - Friction velocity
!  MONIN      =          0           ! - Monin-Obukhov length
!  MIXHT      =          0           ! - Mixing height
!  WSTAR      =          0           ! - Convective velocity scale
!  PRECIP     =          0           ! - Precipitation rate
!  SENSHEAT   =          0           ! - Sensible heat flux
!  CONVZI     =          0           ! - Convective mixing ht.


 Testing and debug print options for micrometeorological module

    Print input meteorological data and
    internal variables (LDB)         Default: F       ! LDB = F !
    (F = Do not print, T = print)
    (NOTE: this option produces large amounts of output)

    First time step for which debug data
    are printed (NN1)                Default: 1       ! NN1 =  1  !

    Last time step for which debug data
    are printed (NN2)                Default: 1       ! NN2 =  1  !


 Testing and debug print options for wind field module
 (all of the following print options control output to
  wind field module's output files: TEST.PRT, TEST.OUT,
  TEST.KIN, TEST.FRD, and TEST.SLP)

    Control variable for writing the test/debug
    wind fields to disk files (IOUTD)
    (0=Do not write, 1=write)        Default: 0       ! IOUTD =  0  !

    Number of levels, starting at the surface,
    to print (NZPRN2)                Default: 1       ! NZPRN2 =  1  !

    Print the INTERPOLATED wind components ?
    (IPR0) (0=no, 1=yes)             Default: 0       !  IPR0 =  0  !

    Print the TERRAIN ADJUSTED surface wind
    components ?
    (IPR1) (0=no, 1=yes)             Default: 0       !  IPR1 =  0  !

    Print the SMOOTHED wind components and
    the INITIAL DIVERGENCE fields ?
    (IPR2) (0=no, 1=yes)             Default: 0       !  IPR2 =  0  !

    Print the FINAL wind speed and direction
    fields ?
    (IPR3) (0=no, 1=yes)             Default: 0       !  IPR3 =  0  !

    Print the FINAL DIVERGENCE fields ?
    (IPR4) (0=no, 1=yes)             Default: 0       !  IPR4 =  0  !

    Print the winds after KINEMATIC effects
    are added ?
    (IPR5) (0=no, 1=yes)             Default: 0       !  IPR5 =  0  !

    Print the winds after the FROUDE NUMBER
```

```
          adjustment is made ?
          (IPR6) (0=no, 1=yes)             Default: 0       !  IPR6 =  0  !

          Print the winds after SLOPE FLOWS
          are added ?
          (IPR7) (0=no, 1=yes)             Default: 0       !  IPR7 =  0  !

          Print the FINAL wind field components ?
          (IPR8) (0=no, 1=yes)             Default: 0       !  IPR8 =  0  !

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 4 -- Meteorological data options
--------------

    NO OBSERVATION MODE             (NOOBS)  Default: 0     ! NOOBS = 1  !
          0 = Use surface, overwater, and upper air stations
          1 = Use surface and overwater stations (no upper air observations)
              Use MM5 for upper air data
          2 = No surface, overwater, or upper air observations
              Use MM5 for surface, overwater, and upper air data

    NUMBER OF SURFACE & PRECIP. METEOROLOGICAL STATIONS

       Number of surface stations   (NSSTA)  No default     ! NSSTA =  2 !

       Number of precipitation stations
       (NPSTA=-1: flag for use of MM5 precip data)
                                    (NPSTA)  No default     ! NPSTA =  31  !

    CLOUD DATA OPTIONS
       Griddid cloud fields:
                                   (ICLOUD)  Default: 0     ! ICLOUD =  0  !
       ICLOUD = 0 - Gridded clouds not used
       ICLOUD = 1 - Gridded CLOUD.DAT generated as OUTPUT
       ICLOUD = 2 - Gridded CLOUD.DAT read as INPUT

    FILE FORMATS

       Surface meteorological data file format
                                   (IFORMS)  Default: 2     ! IFORMS =  2  !
       (1 = unformatted (e.g., SMERGE output))
       (2 = formatted   (free-formatted user input))

       Precipitation data file format
                                   (IFORMP)  Default: 2     ! IFORMP =  2  !
       (1 = unformatted (e.g., PMERGE output))
       (2 = formatted   (free-formatted user input))

       Cloud data file format
                                   (IFORMC)  Default: 2     ! IFORMC =  2  !
       (1 = unformatted - CALMET unformatted output)
       (2 = formatted   - free-formatted CALMET output or user input)

!END!

-------------------------------------------------------------------------------

INPUT GROUP: 5 -- Wind Field Options and Parameters
--------------
```

```
WIND FIELD MODEL OPTIONS
   Model selection variable (IWFCOD)     Default: 1      ! IWFCOD =  1  !
      0 = Objective analysis only
      1 = Diagnostic wind module

   Compute Froude number adjustment
   effects ? (IFRADJ)                    Default: 1      ! IFRADJ =  1  !
   (0 = NO, 1 = YES)

   Compute kinematic effects ? (IKINE)   Default: 1      ! IKINE  =  1  !
   (0 = NO, 1 = YES)

   Use O'Brien procedure for adjustment
   of the vertical velocity ? (IOBR)     Default: 0      ! IOBR =  0  !
   (0 = NO, 1 = YES)

   Compute slope flow effects ? (ISLOPE) Default: 1      ! ISLOPE  =  1  !
   (0 = NO, 1 = YES)

   Extrapolate surface wind observations
   to upper layers ? (IEXTRP)            Default: -4     ! IEXTRP =  2  !
   (1 = no extrapolation is done,
    2 = power law extrapolation used,
    3 = user input multiplicative factors
        for layers 2 - NZ used (see FEXTRP array)
    4 = similarity theory used
    -1, -2, -3, -4 = same as above except layer 1 data
        at upper air stations are ignored

   Extrapolate surface winds even
   if calm? (ICALM)                      Default: 0      ! ICALM  =  0  !
   (0 = NO, 1 = YES)

   Layer-dependent biases modifying the weights of
   surface and upper air stations (BIAS(NZ))
     -1<=BIAS<=1
   Negative BIAS reduces the weight of upper air stations
     (e.g. BIAS=-0.1 reduces the weight of upper air stations
   by 10%; BIAS= -1, reduces their weight by 100 %)
   Positive BIAS reduces the weight of surface stations
     (e.g. BIAS= 0.2 reduces the weight of surface stations
   by 20%; BIAS=1 reduces their weight by 100%)
   Zero BIAS leaves weights unchanged (1/R**2 interpolation)
   Default: NZ*0
                          ! BIAS = 0.0, 0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !

   Minimum distance from nearest upper air station
   to surface station for which extrapolation
   of surface winds at surface station will be allowed
   (RMIN2: Set to -1 for IEXTRP = 4 or other situations
    where all surface stations should be extrapolated)
                                          Default: 4.     ! RMIN2 =  4 !

   Use gridded prognostic wind field model
   output fields as input to the diagnostic
   wind field model (IPROG)              Default: 0      ! IPROG =  14  !
   (0 = No, [IWFCOD = 0 or 1]
    1 = Yes, use CSUMM prog. winds as Step 1 field, [IWFCOD = 0]
    2 = Yes, use CSUMM prog. winds as initial guess field [IWFCOD = 1]
    3 = Yes, use MM4 prog. winds as Step 1 field [IWFCOD = 0]
    4 = Yes, use MM4 prog. winds as initial guess field [IWFCOD = 1]
```

```
    5 = Yes, use MM4 prog. winds as observations [IWFCOD = 1]
    13-15 = Yes, use MM5 prog. winds

RADIUS OF INFLUENCE PARAMETERS

   Use varying radius of influence       Default: F      ! LVARY =  F!
   (if no stations are found within RMAX1,RMAX2,
    or RMAX3, then the closest station will be used)

   Maximum radius of influence over land
   in the surface layer (RMAX1)          No default      ! RMAX1 = 20. !
                                         Units: km
   Maximum radius of influence over land
   aloft (RMAX2)                         No default      ! RMAX2 = 50. !
                                         Units: km
   Maximum radius of influence over water
   (RMAX3)                               No default      ! RMAX3 = 500. !
                                         Units: km


OTHER WIND FIELD INPUT PARAMETERS

   Minimum radius of influence used in
   the wind field interpolation (RMIN)   Default: 0.1    ! RMIN = 0.1 !
                                         Units: km
   Radius of influence of terrain
   features (TERRAD)                     No default      ! TERRAD = 10. !

                                         Units: km
   Relative weighting of the first
   guess field and observations in the
   SURFACE layer (R1)                    No default      ! R1 = 10. !
   (R1 is the distance from an           Units: km
   observational station at which the
   observation and first guess field are
   equally weighted)

   Relative weighting of the first
   guess field and observations in the
   layers ALOFT (R2)                     No default      ! R2 = 25. !
   (R2 is applied in the upper layers    Units: km
   in the same manner as R1 is used in
   the surface layer).

   Relative weighting parameter of the
   prognostic wind field data (RPROG)    No default      ! RPROG = 0. !
   (Used only if IPROG = 1)              Units: km
   ------------------------

   Maximum acceptable divergence in the
   divergence minimization procedure
   (DIVLIM)                              Default: 5.E-6  ! DIVLIM= 5.0E-06 !

   Maximum number of iterations in the
   divergence min. procedure (NITER)     Default: 50     ! NITER =  50  !

   Number of passes in the smoothing
   procedure (NSMTH(NZ))
   NOTE: NZ values must be entered
        Default: 2,(mxnz-1)*4 ! NSMTH =   2 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4
!

   Maximum number of stations used in
```

```
   each layer for the interpolation of
   data to a grid point (NINTR2(NZ))
   NOTE: NZ values must be entered       Default: 99.    ! NINTR2 = 99  !

   Critical Froude number (CRITFN)       Default: 1.0    ! CRITFN = 1. !

   Empirical factor controlling the
   influence of kinematic effects
   (ALPHA)                               Default: 0.1    ! ALPHA = 0.1 !

   Multiplicative scaling factor for
   extrapolation of surface observations
   to upper layers (FEXTR2(NZ))          Default: NZ*0.0 ! FEXTR2 = 8*0.0 !
   (Used only if IEXTRP = 3 or -3)


BARRIER INFORMATION

   Number of barriers to interpolation
   of the wind fields (NBAR)             Default: 0      ! NBAR =  0  !

   THE FOLLOWING 4 VARIABLES ARE INCLUDED
   ONLY IF NBAR > 0
   NOTE: NBAR values must be entered     No defaults
         for each variable               Units: km

      X coordinate of BEGINNING
      of each barrier (XBBAR(NBAR))      ! XBBAR = 0. !
      Y coordinate of BEGINNING
      of each barrier (YBBAR(NBAR))      ! YBBAR = 0. !

      X coordinate of ENDING
      of each barrier (XEBAR(NBAR))      ! XEBAR = 0. !
      Y coordinate of ENDING
      of each barrier (YEBAR(NBAR))      ! YEBAR = 0. !


DIAGNOSTIC MODULE DATA INPUT OPTIONS

   Surface temperature (IDIOPT1)         Default: 0      ! IDIOPT1 =  0  !
      0 = Compute internally from
          hourly surface observations
      1 = Read preprocessed values from
          a data file (DIAG.DAT)

      Surface met. station to use for
      the surface temperature (ISURFT)   No default     ! ISURFT =  1 !
      (Must be a value from 1 to NSSTA)
      (Used only if IDIOPT1 = 0)
      --------------------------

   Domain-averaged temperature lapse
   rate (IDIOPT2)                        Default: 0     ! IDIOPT2 =  0  !
      0 = Compute internally from
          twice-daily upper air observations
      1 = Read hourly preprocessed values
          from a data file (DIAG.DAT)

      Upper air station to use for
      the domain-scale lapse rate (IUPT) No default     ! IUPT   =  0  !
      (Must be a value from 1 to NUSTA)
      (Used only if IDIOPT2 = 0)
      --------------------------
```

```
   Depth through which the domain-scale
   lapse rate is computed (ZUPT)      Default: 200.  ! ZUPT = 200. !
   (Used only if IDIOPT2 = 0)         Units: meters
   --------------------------

Domain-averaged wind components
(IDIOPT3)                             Default: 0     ! IDIOPT3 =  0  !
   0 = Compute internally from
       twice-daily upper air observations
   1 = Read hourly preprocessed values
       a data file (DIAG.DAT)

   Upper air station to use for
   the domain-scale winds (IUPWND)    Default: -1    ! IUPWND =  -1 !
   (Must be a value from -1 to NUSTA)
   (Used only if IDIOPT3 = 0)
   --------------------------

   Bottom and top of layer through
   which the domain-scale winds
   are computed
   (ZUPWND(1), ZUPWND(2))        Defaults: 1., 1000. ! ZUPWND= 1., 1000. !
   (Used only if IDIOPT3 = 0)    Units: meters
   --------------------------

Observed surface wind components
for wind field module (IDIOPT4)  Default: 0     ! IDIOPT4 =  0  !
   0 = Read WS, WD from a surface
       data file (SURF.DAT)
   1 = Read hourly preprocessed U, V from
       a data file (DIAG.DAT)

Observed upper air wind components
for wind field module (IDIOPT5)  Default: 0     ! IDIOPT5 =  0  !
   0 = Read WS, WD from an upper
       air data file (UP1.DAT, UP2.DAT, etc.)
   1 = Read hourly preprocessed U, V from
       a data file (DIAG.DAT)

LAKE BREEZE INFORMATION

   Use Lake Breeze Module  (LLBREZE)
                                     Default: F      ! LLBREZE = F !

    Number of lake breeze regions (NBOX)            ! NBOX =  0  !

 X Grid line 1 defining the region of interest
                                                     ! XG1 = 0. !
 X Grid line 2 defining the region of interest
                                                     ! XG2 = 0. !
 Y Grid line 1 defining the region of interest
                                                     ! YG1 = 0. !
 Y Grid line 2 defining the region of interest
                                                     ! YG2 = 0. !

  X Point defining the coastline (Straight line)
            (XBCST)  (KM)   Default: none    ! XBCST = 0. !

  Y Point defining the coastline (Straight line)
            (YBCST)  (KM)   Default: none    ! YBCST = 0. !

  X Point defining the coastline (Straight line)
```

```
                    (XECST)  (KM)   Default: none    ! XECST = 0. !

         Y Point defining the coastline (Straight line)
                    (YECST)  (KM)   Default: none    ! YECST = 0. !


       Number of stations in the region     Default: none  NLB = *1 *
       (Surface stations + upper air stations)

       Station ID's  in the region   (METBXID(NLB))
       (Surface stations first, then upper air stations)
          METBXID = *0 *

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 6 -- Mixing Height, Temperature and Precipitation Parameters
--------------

    EMPIRICAL MIXING HEIGHT CONSTANTS

       Neutral, mechanical equation
       (CONSTB)                             Default: 1.41   ! CONSTB = 1.41 !
       Convective mixing ht. equation
       (CONSTE)                             Default: 0.15   ! CONSTE = 0.15 !
       Stable mixing ht. equation
       (CONSTN)                             Default: 2400.  ! CONSTN = 2400.!
       Overwater mixing ht. equation
       (CONSTW)                             Default: 0.16   ! CONSTW = 0.16 !
       Absolute value of Coriolis
       parameter (FCORIOL)                  Default: 1.E-4  ! FCORIOL = 1.0E-04!
                                            Units: (1/s)

    SPATIAL AVERAGING OF MIXING HEIGHTS

       Conduct spatial averaging
       (IAVEZI)  (0=no, 1=yes)              Default: 1      ! IAVEZI =  1  !

       Max. search radius in averaging
       process (MNMDAV)                     Default: 1      ! MNMDAV =  1  !
                                            Units: Grid
                                                   cells
       Half-angle of upwind looking cone
       for averaging (HAFANG)               Default: 30.    ! HAFANG = 30. !
                                            Units: deg.
       Layer of winds used in upwind
       averaging (ILEVZI)                   Default: 1      ! ILEVZI =  1  !
       (must be between 1 and NZ)

    OTHER MIXING HEIGHT VARIABLES

       Minimum potential temperature lapse
       rate in the stable layer above the
       current convective mixing ht.        Default: 0.001  ! DPTMIN = 0.001 !
       (DPTMIN)                             Units: deg. K/m
       Depth of layer above current conv.
       mixing height through which lapse    Default: 200.   ! DZZI = 200. !
       rate is computed (DZZI)              Units: meters

       Minimum overland mixing height       Default:  50.   ! ZIMIN = 50. !
       (ZIMIN)                              Units: meters
```

```
      Maximum overland mixing height        Default: 3000.  ! ZIMAX = 3000. !
      (ZIMAX)                               Units: meters
      Minimum overwater mixing height       Default:   50.  ! ZIMINW = 50. !
      (ZIMINW) -- (Not used if observed     Units: meters
      overwater mixing hts. are used)
      Maximum overwater mixing height       Default: 3000.  ! ZIMAXW = 3000. !
      (ZIMAXW) -- (Not used if observed     Units: meters
      overwater mixing hts. are used)


   TEMPERATURE PARAMETERS

      3D temperature from observations or
      from prognostic data? (ITPROG)        Default:0         !ITPROG = 1 !

         0 = Use Surface and upper air stations
             (only if NOOBS = 0)
         1 = Use Surface stations (no upper air observations)
             Use MM5 for upper air data
             (only if NOOBS = 0,1)
         2 = No surface or upper air observations
             Use MM5 for surface and upper air data
             (only if NOOBS = 0,1,2)

      Interpolation type
      (1 = 1/R ; 2 = 1/R**2)                Default:1         ! IRAD =  1  !

      Radius of influence for temperature
      interpolation (TRADKM)                Default: 500.     ! TRADKM = 500. !
                                            Units: km

      Maximum Number of stations to include
      in temperature interpolation (NUMTS)  Default: 5        ! NUMTS = 5  !

      Conduct spatial averaging of temp-
      eratures (IAVET)  (0=no, 1=yes)         Default: 1     ! IAVET =  1  !
      (will use mixing ht MNMDAV,HAFANG
       so make sure they are correct)

      Default temperature gradient        Default: -.0098 ! TGDEFB = -0.0098 !
      below the mixing height over
      water (K/m) (TGDEFB)

      Default temperature gradient        Default: -.0045 ! TGDEFA = -0.0045 !
      above the mixing height over
      water (K/m) (TGDEFA)

      Beginning (JWAT1) and ending (JWAT2)
      land use categories for temperature                   ! JWAT1 =  999  !
      interpolation over water -- Make                      ! JWAT2 =  999  !
      bigger than largest land use to disable

   PRECIP INTERPOLATION PARAMETERS

      Method of interpolation (NFLAGP)      Default = 2    ! NFLAGP =  2  !
       (1=1/R,2=1/R**2,3=EXP/R**2)
      Radius of Influence (km) (SIGMAP)     Default = 100.0  ! SIGMAP = 100. !
       (0.0 => use half dist. btwn
        nearest stns w & w/out
        precip when NFLAGP = 3)
      Minimum Precip. Rate Cutoff (mm/hr)   Default = 0.01  ! CUTP = 0.01 !
       (values < CUTP = 0.0 mm/hr)
!END!
```

```
-------------------------------------------------------------------------------

INPUT GROUP: 7 -- Surface meteorological station parameters
--------------

     SURFACE STATION VARIABLES
     (One record per station --  5  records in all)


            1     2
         Name   ID            X coord.   Y coord.   Time   Anem.
                               (km)       (km)      zone   Ht.(m)
       -------------------------------------------------------

! SS1  ='ncdc'    23174      372.448     3755.028    8    10  !
! SS1  ='ncdc'    23129      407.454     3742.454    8    10  !
-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Five digit integer for station ID

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 8 -- Upper air meteorological station parameters
--------------

     UPPER AIR STATION VARIABLES
     (One record per station --  2  records in all)

            1     2
         Name    ID      X coord.   Y coord.  Time zone
                           (km)       (km)
        ---------------------------------------------

-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Five digit integer for station ID

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 9 -- Precipitation station parameters
--------------

     PRECIPITATION STATION VARIABLES
     (One record per station --  4  records in all)
     (NOT INCLUDED IF NPSTA = 0)

            1          2
```

```
          Name   Station    X coord.  Y coord.
                   Code       (km)      (km)
          ------------------------------------
! PS1  = 'CA01'   041057    413.718  3749.381   !
! PS2     CA02'   041194    375.591  3783.075   !
! PS3  = 'CA03'   041272    444.840  3804.591   !
! PS4  = 'CA04'   041518    427.619  3753.035   !
! PS5  = 'CA05'   041682    351.072  3788.978   !
! PS6  = 'CA06'   042164    472.371  3787.837   !
! PS7  = 'CA07'   042805    469.128  3725.091   !
! PS8  = 'CA08'   042895    452.329  3776.829   !
! PS9  = 'CA09'   043285    418.358  3751.225   !
! PS10 = 'CA10'   043751    371.111  3792.452   !
! PS11 = 'CA11'   044650    425.732  3712.356   !
! PS12 = 'CA12'   045085    392.014  3744.058   !
! PS13 = 'CA13'   045114    370.604  3755.416   !
! PS14 = 'CA14'   045115    386.196  3768.191   !
! PS15 = 'CA15'   045218    456.991  3787.894   !
! PS16 = 'CA16'   045637    400.434  3804.959   !
! PS17 = 'CA17'   046162    359.060  3805.493   !
! PS18 = 'CA18'   046473    418.390  3754.884   !
! PS19 = 'CA19'   046624    399.112  3827.154   !
! PS20 = 'CA20'   046942    343.736  3807.623   !
! PS21 = 'CA21'   047123    441.462  3749.170   !
! PS22 = 'CA22'   047473    467.665  3758.358   !
! PS23 = 'CA23'   047762    361.986  3798.128   !
! PS24 = 'CA24'   047837    452.032  3717.733   !
! PS25 = 'CA25'   047926    410.819  3775.356   !
! PS26 = 'CA26'   047987    433.617  3738.133   !
! PS27 = 'CA27'   047993    450.615  3730.712   !
! PS28 = 'CA28'   048092    364.783  3781.450   !
! PS29 = 'CA29'   048243    439.797  3734.433   !
! PS30 = 'CA30'   048992    444.363  3723.318   !
! PS31 = 'CA31'   049325    472.469  3821.101   !

-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Six digit station code composed of state
        code (first 2 digits) and station ID (last
        4 digits)

!END!
```

APPENDIX B

Sample CALPOST Input File

CALPOST_VIS.INP

```
VPP Visibility
---------------- Run title (3 lines) ----------------------------------------

                    CALPOST MODEL CONTROL FILE
                    --------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

Input Files
-----------

File                       Default File Name
----                       -----------------
Conc/Dep Flux File         MODEL.DAT          ! MODDAT =PMC.DAT   !
Relative Humidity File     VISB.DAT           * VISDAT =   *
Background Data File       BACK.DAT           * BACKDAT =   *
Transmissometer or         VSRN.DAT           * VSRDAT =   *
Nephelometer Data File      or
DATSAV Weather Data File    or
Prognostic Weather  File

Output Files
------------

File                       Default File Name
----                       -----------------
List File                  CALPOST.LST        ! PSTLST =VPPvis.LST   !

Pathname for Timeseries Files   (blank)      * TSPATH =   *
(activate with exclamation points only if
providing NON-BLANK character string)

Pathname for Plot Files   (blank)            * PLPATH =   *
(activate with exclamation points only if
 providing NON-BLANK character string)

User Character String (U) to augment default filenames
(activate with exclamation points only if
 providing NON-BLANK character string)

Timeseries          TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT

                                             * TSUNAM =   *

Top Nth Rank Plot   RANK(ALL)_ASPEC_ttHR_CONC_TUNAM.DAT
                 or RANK(ii)_ASPEC_ttHR_CONC_TUNAM.GRD

                                             * TUNAM =   *

Exceedance Plot      EXCEED_ASPEC_ttHR_CONC_XUNAM.DAT
                  or EXCEED_ASPEC_ttHR_CONC_XUNAM.GRD

                                             * XUNAM =   *

Echo Plot
(Specific Days)
            yyyy_Mmm_Ddd_hh00(UTCszzzz)_L00_ASPEC_ttHR_CONC.DAT
     or     yyyy_Mmm_Ddd_hh00(UTCszzzz)_L00_ASPEC_ttHR_CONC.GRD
```

```
Visibility Plot      DAILY_VISIB_VUNAM.DAT   * VUNAM =   *
(Daily Peak Summary)

-------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case               ! LCFILES = F !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 132 characters in length
NOTE: (2) Filenames for ALL PLOT and TIMESERIES FILES are constructed
          using a template that includes a pathname, user-supplied
          character(s), and context-specific strings, where
             ASPEC = Species Name
              CONC = CONC Or WFLX Or DFLX Or TFLX
                tt = Averaging Period (e.g. 03)
                ii = Rank (e.g. 02)
                hh = Hour(ending) in LST
             szzzz = LST time zone shift (EST is -0500)
              yyyy = Year(LST)
                mm = Month(LST)
                dd = day of month (LST)
          are determined internally based on selections made below.
          If a path or user-supplied character(s) are supplied, each
          must contain at least 1 non-blank character.

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Option to run all periods found
     in the met. file(s)  (METRUN)        Default: 0   ! METRUN =   0  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in CALPUFF data file(s)

     Starting date:    Year  (ISYR) --    No default   ! ISYR  =  2001   !
     (used only if     Month (ISMO) --    No default   ! ISMO  =  1   !
      METRUN = 0)      Day   (ISDY) --    No default   ! ISDY  =  1   !
                       Hour  (ISHR) --    No default   ! ISHR  =  1   !

     Number of hours to process (NHRS) -- No default   ! NHRS  =  8760  !

     Process every hour of data?(NREP) -- Default: 1   ! NREP  =  1  !
      (1 = every hour processed,
       2 = every 2nd hour processed,
       5 = every 5th hour processed, etc.)

Species & Concentration/Deposition Information
----------------------------------------------

      Species to process (ASPEC)       -- No default   ! ASPEC = VISIB  !
      (ASPEC = VISIB for visibility processing)

      Layer/deposition code (ILAYER)   -- Default: 1   ! ILAYER =  1  !
        '1'  for CALPUFF concentrations,
        '-1' for dry deposition fluxes,
        '-2' for wet deposition fluxes,
        '-3' for wet+dry deposition fluxes.

      Scaling factors of the form:     -- Defaults:    ! A =  0.0    !
            X(new) = X(old) * A + B         A = 0.0    ! B =  0.0    !
```

```
        (NOT applied if A = B = 0.0)        B = 0.0

      Add Hourly Background Concentrations/Fluxes?
                              (LBACK)  -- Default: F   ! LBACK =  F !

Source information
------------------

  Option to process source contributions:
         0 =  Process only total reported contributions
         1 =  Sum all individual source contributions and process
         2 =  Run in TRACEBACK mode to identify source
              contributions at a SINGLE receptor
                            (MSOURCE) -- Default: 0   ! MSOURCE =  0  !

Receptor information
--------------------

  Gridded receptors processed?    (LG) -- Default: F   ! LG  = F  !
  Discrete receptors processed?   (LD) -- Default: F   ! LD  = T  !
  CTSG Complex terrain receptors processed?
                                 (LCT) -- Default: F   ! LCT = F  !

--Report results by DISCRETE receptor RING?
  (only used when LD = T)     (LDRING) -- Default: F   ! LDRING = F  !

--Select range of DISCRETE receptors (only used when LD = T):

  Select ALL DISCRETE receptors by setting NDRECP flag to -1;
                                OR
  Select SPECIFIC DISCRETE receptors by entering a flag (0,1) for each
     0 = discrete receptor not processed
     1 = discrete receptor processed
  using repeated value notation to select blocks of receptors:

  Flag for all receptors after the last one assigned is set to 0
  (NDRECP) -- Default: -1
                                                ! NDRECP =  -1  !


--Select range of GRIDDED receptors (only used when LG = T):

       X index of LL corner (IBGRID) -- Default: -1     ! IBGRID = -1  !
           (-1 OR 1 <= IBGRID <= NX)

       Y index of LL corner (JBGRID) -- Default: -1     ! JBGRID = -1  !
           (-1 OR 1 <= JBGRID <= NY)

       X index of UR corner (IEGRID) -- Default: -1     ! IEGRID = -1  !
           (-1 OR 1 <= IEGRID <= NX)

       Y index of UR corner (JEGRID) -- Default: -1     ! JEGRID = -1  !
           (-1 OR 1 <= JEGRID <= NY)

  Note: Entire grid is processed if IBGRID=JBGRID=IEGRID=JEGRID=-1


--Specific gridded receptors can also be excluded from CALPOST
  processing by filling a processing grid array with 0s and 1s.  If the
  processing flag for receptor index (i,j) is 1 (ON), that receptor
  will be processed if it lies within the range delineated by IBGRID,
  JBGRID,IEGRID,JEGRID and if LG=T. If it is 0 (OFF), it will not be
  processed in the run.  By default, all array values are set to 1 (ON).
```

```
  Number of gridded receptor rows provided in Subgroup (1a) to
  identify specific gridded receptors to process
                          (NGONOFF) -- Default: 0      ! NGONOFF =  0  !

!END!


--------------
Subgroup (1a) -- Specific gridded receptors included/excluded
--------------

    Specific gridded receptors are excluded from CALPOST processing
    by filling a processing grid array with 0s and 1s.  A total of
    NGONOFF lines are read here.  Each line corresponds to one 'row'
    in the sampling grid, starting with the NORTHERNMOST row that
    contains receptors that you wish to exclude, and finishing with
    row 1 to the SOUTH (no intervening rows may be skipped).  Within
    a row, each receptor position is assigned either a 0 or 1,
    starting with the westernmost receptor.
       0 = gridded receptor not processed
       1 = gridded receptor processed

    Repeated value notation may be used to select blocks of receptors:
       23*1, 15*0, 12*1

    Because all values are initially set to 1, any receptors north of
    the first row entered, or east of the last value provided in a row,
    remain ON.

    (NGXRECP) -- Default: 1


-------------------------------------------------------------------------------

INPUT GROUP: 2 -- Visibility Parameters (ASPEC = VISIB)
--------------

    Identify the Base Time Zone for the CALPUFF simulation
                             (BTZONE) -- No default   * BTZONE =  0.*

    Particle growth curve f(RH) for hygroscopic species
                               (MFRH) -- Default: 2   ! MFRH   =  2  !

         1 =  IWAQM (1998) f(RH) curve (originally used with MVISBK=1)
         2 =  FLAG (2000) f(RH) tabulation
         3 =  EPA (2003) f(RH) tabulation

    Maximum relative humidity (%) used in particle growth curve
                              (RHMAX) -- Default: 98  ! RHMAX  = 95.0 !

    Modeled species to be included in computing the light extinction
     Include SULFATE?          (LVSO4) -- Default: T   ! LVSO4  = T  !
     Include NITRATE?          (LVNO3) -- Default: T   ! LVNO3  = T  !
     Include ORGANIC CARBON?   (LVOC)  -- Default: T   ! LVOC   = T  !
     Include COARSE PARTICLES? (LVPMC) -- Default: T   ! LVPMC  = F  !
     Include FINE PARTICLES?   (LVPMF) -- Default: T   ! LVPMF  = T  !
     Include ELEMENTAL CARBON? (LVEC)  -- Default: T   ! LVEC   = T  !

    And, when ranking for TOP-N, TOP-50, and Exceedance tables,
     Include BACKGROUND?       (LVBK)  -- Default: T   ! LVBK   = T  !

    Species name used for particulates in MODEL.DAT file
```

```
                  COARSE    (SPECPMC) -- Default: PMC ! SPECPMC = PMC !
                  FINE      (SPECPMF) -- Default: PMF ! SPECPMF = PM10 !

Extinction Efficiency (1/Mm per ug/m**3)
----------------------------------------
    MODELED particulate species:
               PM  COARSE      (EEPMC) -- Default: 0.6 ! EEPMC  = 0.6 !
               PM  FINE        (EEPMF) -- Default: 1.0 ! EEPMF  = 1.0 !
    BACKGROUND particulate species:
               PM  COARSE    (EEPMCBK) -- Default: 0.6 ! EEPMCBK = 0.6 !
    Other species:
              AMMONIUM SULFATE (EESO4) -- Default: 3.0 ! EESO4  = 3.0 !
              AMMONIUM NITRATE (EENO3) -- Default: 3.0 ! EENO3  = 3.0 !
              ORGANIC CARBON   (EEOC)  -- Default: 4.0 ! EEOC   = 4.0 !
              SOIL             (EESOIL)-- Default: 1.0 ! EESOIL = 1.0 !
              ELEMENTAL CARBON (EEEC)  -- Default: 10. ! EEEC   = 10.0 !

Background Extinction Computation
---------------------------------

    Method used for the 24h-average of percent change of light extinction:
    Hourly ratio of source light extinction / background light extinction
    is averaged?               (LAVER) -- Default: F   ! LAVER = F  !


    Method used for background light extinction
                             (MVISBK) -- Default: 2   ! MVISBK =  2  !

         1 =  Supply single light extinction and hygroscopic fraction
              - Hourly F(RH) adjustment applied to hygroscopic background
                and modeled sulfate and nitrate
         2 =  Compute extinction from speciated PM measurements (A)
              - Hourly F(RH) adjustment applied to observed and modeled sulfate
                and nitrate
              - F(RH) factor is capped at F(RHMAX)
         3 =  Compute extinction from speciated PM measurements (B)
              - Hourly F(RH) adjustment applied to observed and modeled sulfate
                and nitrate
              - Receptor-hour excluded if RH>RHMAX
              - Receptor-day excluded if fewer than 6 valid receptor-hours
         4 =  Read hourly transmissometer background extinction measurements
              - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
              - Hour excluded if measurement invalid (missing, interference,
                or large RH)
              - Receptor-hour excluded if RH>RHMAX
              - Receptor-day excluded if fewer than 6 valid receptor-hours
         5 =  Read hourly nephelometer background extinction measurements
              - Rayleigh extinction value (BEXTRAY) added to measurement
              - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
              - Hour excluded if measurement invalid (missing, interference,
                or large RH)
              - Receptor-hour excluded if RH>RHMAX
              - Receptor-day excluded if fewer than 6 valid receptor-hours
         6 =  Compute extinction from speciated PM measurements
              - FLAG monthly RH adjustment factor applied to observed and
                modeled sulfate and nitrate
         7 =  Use observed weather or prognostic weather information for
              background extinction during weather events; otherwise, use Method 2
              - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
              - F(RH) factor is capped at F(RHMAX)
              - During observed weather events, compute Bext from visual range
                if using an observed weather data file, or
              - During prognostic weather events, use Bext from the prognostic
```

```
            weather file
          - Use Method 2 for hours without a weather event

Additional inputs used for MVISBK = 1:
--------------------------------------
 Background light extinction (1/Mm)
                          (BEXTBK) -- No default   ! BEXTBK = 0.0 !
 Percentage of particles affected by relative humidity
                          (RHFRAC) -- No default   ! RHFRAC = 0.0 !

Additional inputs used for MVISBK = 6:
--------------------------------------
 Extinction coefficients for hygroscopic species (modeled and
 background) are computed using a monthly RH adjustment factor
 in place of an hourly RH factor (VISB.DAT file is NOT needed).
 Enter the 12 monthly factors here (RHFAC).  Month 1 is January.

 (RHFAC)  -- No default     ! RHFAC = 3.1, 3.1, 3.1, 3.1,
                                      3.1, 3.1, 3.1, 3.1,
                                      3.1, 3.1, 3.1, 3.1 !

Additional inputs used for MVISBK = 7:
--------------------------------------
 The weather data file (DATSAV abbreviated space-delimited) that
 is identified as VSRN.DAT may contain data for more than one
 station.  Identify the stations that are needed in the order in
 which they will be used to obtain valid weather and visual range.
 The first station that contains valid data for an hour will be
 used.  Enter up to MXWSTA (set in PARAMS file) integer station IDs
 of up to 6 digits each as variable IDWSTA, and enter the corresponding
 time zone for each, as variable TZONE (= UTC-LST).

 A prognostic weather data file with Bext for weather events may be used
 in place of the observed weather file.  Identify this as the VSRN.DAT
 file and use a station ID of IDWSTA = 999999, and TZONE = 0.

 NOTE:  TZONE identifies the time zone used in the dataset.  The
        DATSAV abbreviated space-delimited data usually are prepared
        with UTC time rather than local time, so TZONE is typically
        set to zero.

 (IDWSTA)   -- No default
! IDWSTA = 999999 !
 (TZONE)    -- No default
! TZONE  = 0.0 !

Additional inputs used for MVISBK = 2,3,6,7:
--------------------------------------------
 Background extinction coefficients are computed from monthly
 CONCENTRATIONS of ammonium sulfate (BKSO4), ammonium nitrate (BKNO3),
 coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL), and
 elemental carbon (BKEC).  Month 1 is January.
 (ug/m**3)

 (BKSO4)  -- No default     ! BKSO4 = 0.2, 0.2, 0.2, 0.2,
                                      0.2, 0.2, 0.2, 0.2,
                                      0.2, 0.2, 0.2, 0.2 !
 (BKNO3)  -- No default     ! BKNO3 = 0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0 !
 (BKPMC)  -- No default     ! BKPMC = 4.5, 4.5, 4.5, 4.5,
                                      4.5, 4.5, 4.5, 4.5,
                                      4.5, 4.5, 4.5, 4.5 !
```

```
     (BKOC)   -- No default     ! BKOC  = 0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0 !
     (BKSOIL) -- No default     ! BKSOIL= 0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0 !
     (BKEC)   -- No default     ! BKEC  = 0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0 !

    Additional inputs used for MVISBK = 2,3,5,6,7:
    ----------------------------------------------
     Extinction due to Rayleigh scattering is added (1/Mm)
                            (BEXTRAY) -- Default: 10.0 ! BEXTRAY = 10.0 !

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output options
--------------

Documentation
-------------

    Documentation records contained in the header of the
    CALPUFF output file may be written to the list file.
    Print documentation image?
                               (LDOC) -- Default: F   !  LDOC = F !

Output Units
------------
    Units for All Output       (IPRTU) -- Default: 1   ! IPRTU =  1   !
                     for            for
                Concentration    Deposition
       1 =         g/m**3         g/m**2/s
       2 =        mg/m**3        mg/m**2/s
       3 =        ug/m**3        ug/m**2/s
       4 =        ng/m**3        ng/m**2/s
       5 =      Odour Units

    Visibility: extinction expressed in 1/Mega-meters (IPRTU is ignored)


Averaging time(s) reported
--------------------------

    1-hr averages           (L1HR) -- Default: T   !   L1HR = F  !

    3-hr averages           (L3HR) -- Default: T   !   L3HR = F  !

    24-hr averages         (L24HR) -- Default: T   !  L24HR = T  !

    Run-length averages    (LRUNL) -- Default: T   !  LRUNL = F  !

    User-specified averaging time in hours - results for
    an averaging time of NAVG hours are reported for
    NAVG greater than 0:
                            (NAVG) -- Default: 0   !   NAVG =  0  !


Types of tabulations reported
-----------------------------
```

```
1) Visibility: daily visibility tabulations are always reported
               for the selected receptors when ASPEC = VISIB.
               In addition, any of the other tabulations listed
               below may be chosen to characterize the light
               extinction coefficients.
               [List file or Plot/Analysis File]


2) Top 50 table for each averaging time selected
   [List file only]
                        (LT50) -- Default: T   !   LT50 = F  !

3) Top 'N' table for each averaging time selected
   [List file or Plot file]
                       (LTOPN) -- Default: F   !  LTOPN = F  !

     -- Number of 'Top-N' values at each receptor
        selected (NTOP must be <= 4)
                         (NTOP) -- Default: 4   ! NTOP =  4   !

     -- Specific ranks of 'Top-N' values reported
        (NTOP values must be entered)
                (ITOP(4) array) -- Default:     ! ITOP =  1,2,3,4   !
                                   1,2,3,4


4) Threshold exceedance counts for each receptor and each averaging
   time selected
   [List file or Plot file]
                       (LEXCD) -- Default: F   !  LEXCD = F  !

     -- Identify the threshold for each averaging time by assigning a
        non-negative value (output units).

                                -- Default: -1.0
        Threshold for  1-hr averages   (THRESH1) !  THRESH1 = -1.0  !
        Threshold for  3-hr averages   (THRESH3) !  THRESH3 = -1.0  !
        Threshold for 24-hr averages  (THRESH24) ! THRESH24 = 1.000E00 !
        Threshold for NAVG-hr averages (THRESHN) !  THRESHN = 1.000E00 !


     -- Counts for the shortest averaging period selected can be
        tallied daily, and receptors that experience more than NCOUNT
        counts over any NDAY period will be reported.  This type of
        exceedance violation output is triggered only if NDAY > 0.

        Accumulation period(Days)
                         (NDAY) -- Default: 0   !    NDAY =  0  !
        Number of exceedances allowed
                       (NCOUNT) -- Default: 1   !  NCOUNT =  1  !


5) Selected day table(s)

   Echo Option -- Many records are written each averaging period
   selected and output is grouped by day
   [List file or Plot file]
                       (LECHO) -- Default: F   !  LECHO = F  !

   Timeseries Option -- Averages at all selected receptors for
   each selected averaging period are written to timeseries files.
   Each file contains one averaging period, and all receptors are
   written to a single record each averaging time.
```

```
      [TSttUUUU.DAT files]
                          (LTIME) -- Default: F   !  LTIME = F  !

        -- Days selected for output
                      (IECHO(366)) -- Default: 366*0
           ! IECHO  = 366*0  !
           (366 values must be entered)
```

Plot output options

Plot files can be created for the Top-N, Exceedance, and Echo tables selected above. Two formats for these files are available, DATA and GRID. In the DATA format, results at all receptors are listed along with the receptor location [x,y,val1,val2,...]. In the GRID format, results at only gridded receptors are written, using a compact representation. The gridded values are written in rows (x varies), starting with the most southern row of the grid. The GRID format is given the .GRD extension, and includes headers compatible with the SURFER(R) plotting software.

A plotting and analysis file can also be created for the daily peak visibility summary output, in DATA format only.

```
     Generate Plot file output in addition to writing tables
     to List file?
                                (LPLT) -- Default: F   ! LPLT  = F !

     Use GRID format rather than DATA format,
     when available?
                                (LGRD) -- Default: F   ! LGRD  = F !
```

Additional Debug Output

```
   Output selected information to List file
    for debugging?
                               (LDEBUG) -- Default: F  ! LDEBUG  = F !

   Output hourly extinction information to REPORT.HRV?
    (Visibility Method 7)
                              (LVEXTHR) -- Default: F  ! LVEXTHR = F !

!END!
```

TABLE 8.1B-1
Screening Modeling Source Description

	Source ID	Source Description	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)	Pollutant (g/s)
35_75_off_Base	1	Gas Turbine A	56.7	54.864	367.5944444	19.04334978	6.10	1.00
35_75_off_Base	2	Gas Turbine B	56.7	54.864	367.5944444	19.04334978	6.10	1.00
35_75_off_70	1	Gas Turbine A	56.7	54.864	360.37222	14.79358887	6.10	1.00
35_75_off_70	2	Gas Turbine B	56.7	54.864	360.37222	14.79358887	6.10	1.00
35_75_off_60	1	Gas Turbine A	56.7	54.864	358.15000	13.48798817	6.10	1.00
35_75_off_60	2	Gas Turbine B	56.7	54.864	358.15000	13.48798817	6.10	1.00
35_75_off_50	1	Gas Turbine A	56.7	54.864	359.26111	12.38220031	6.10	1.00
35_75_off_50	2	Gas Turbine B	56.7	54.864	359.26111	12.38220031	6.10	1.00
65_60_85_Base_DB	1	Gas Turbine A	56.7	54.864	364.81667	18.16660928	6.10	1.00
65_60_85_Base_DB	2	Gas Turbine B	56.7	54.864	364.81667	18.16660928	6.10	1.00
65_60_off_Base	1	Gas Turbine A	56.7	54.864	367.59444	17.94753831	6.10	1
65_60_off_Base	2	Gas Turbine B	56.7	54.864	367.59444	17.94753831	6.10	1
65_60_off_70	1	Gas Turbine A	56.7	54.864	362.03889	14.03638738	6.10	1
65_60_off_70	2	Gas Turbine B	56.7	54.864	362.03889	14.03638738	6.10	1
65_60_off_60	1	Gas Turbine A	56.7	54.864	359.81667	12.83309912	6.10	1
65_60_off_60	2	Gas Turbine B	56.7	54.864	359.81667	12.83309912	6.10	1
65_60_off_50	1	Gas Turbine A	56.7	54.864	362.59444	11.87994998	6.10	1
65_60_off_50	2	Gas Turbine B	56.7	54.864	362.59444	11.87994998	6.10	1
93_32_85_base	1	Gas Turbine A	56.7	54.864	368.15000	17.56178509	6.10	1.00
93_32_85_base	2	Gas Turbine B	56.7	54.864	368.15000	17.56178509	6.10	1.00
93_32_off_70	1	Gas Turbine A	56.7	54.864	359.26111	13.0187013	6.10	1.00
93_32_off_70	2	Gas Turbine B	56.7	54.864	359.26111	13.0187013	6.10	1.00
93_32_off_60	1	Gas Turbine A	56.7	54.864	358.15000	11.99737492	6.10	1.00
93_32_off_60	2	Gas Turbine B	56.7	54.864	358.15000	11.99737492	6.10	1.00
93_32_off_50	1	Gas Turbine A	56.7	54.864	362.03889	10.94753443	6.10	1.00
93_32_off_50	2	Gas Turbine B	56.7	54.864	362.03889	10.94753443	6.10	1.00
93_32_85_base_DB	1	Gas Turbine A	56.7	54.864	364.26111	17.43407866	6.10	1.00
93_32_85_base_DB	2	Gas Turbine B	56.7	54.864	364.26111	17.43	6.10	1.00

TABLE 8.1B-2

Summary of Modeling Operational Emissions

	Temp/RH	Scenario	NOx (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM10 (lb/hr)	SO2 (lb/hr)	Velocity (m/s)	Velocity (ft/s)	Temperature (F)	Temperature (K)
Annual	65 / 60	BASE_DB_85%EVAP	16.3752	11.7683	5.8815	11.9739	1.2525	18.1666	59.60	197	364.8167
24-hr	35 / 75	BASE	16.7989	23.6489	4.3300	10.0000	1.2225	19.0433	62.48	202	367.5944
	35 / 75	70	13.4072	21.5406	3.7800	8.0417	0.9308	14.7936	48.54	189	360.3722
	35 / 75	60	12.3072	20.8989	5.2467	8.0417	0.8380	13.4880	44.25	185	358.1500
	35 / 75	50	11.2072	22.8239	4.8800	8.0417	0.7480	12.3822	40.62	187	359.2611
	65 / 60	BASE_DB_85%EVAP	17.5322	24.1072	7.0800	12.0000	1.2560	18.1666	59.60	197	364.8167
	65 / 60	BASE	16.0656	23.1906	4.2383	10.0000	1.1368	17.9475	58.88	202	367.5944
	65 / 60	70	12.8572	21.2656	3.6883	8.0417	0.8706	14.0364	46.05	192	362.0389
	65 / 60	60	11.8489	20.6239	5.0633	8.0417	0.7858	12.8331	42.10	188	359.8167
	65 / 60	50	10.8406	22.4572	4.6967	8.0417	0.7038	11.8799	38.98	193	362.5944
	93 / 32	BASE_DB_85%EVAP	15.7906	23.0072	4.1467	9.0000	1.1104	17.5618	57.62	203	368.1500
	93 / 32	70	12.0322	20.7156	3.5050	8.0417	0.8050	13.0187	42.71	187	359.2611
	93 / 32	60	11.1156	20.1656	4.7883	8.0417	0.7297	11.9974	39.36	185	358.1500
	93 / 32	50	10.1989	21.9072	4.5133	8.0417	0.6383	10.9475	35.92	192	362.0389
	93 / 32	BASE_85%EVAP	16.9822	23.7406	6.8967	11.0000	1.2111	17.4341	57.20	196	364.2611
8-Hour	35 / 75	BASE	*	52.1467	*	*	*	19.0433	62.48	202	367.5944
	35 / 75	70	*	50.4217	*	*	*	14.7936	48.54	189	360.3722
	35 / 75	60	*	49.8967	*	*	*	13.4880	44.25	185	358.1500
	35 / 75	50	*	51.4717	*	*	*	12.3822	40.62	187	359.2611
	65 / 60	BASE_DB_85%EVAP	*	52.5217	*	*	*	18.1666	59.60	197	364.8167
	65 / 60	BASE	*	51.7717	*	*	*	17.9475	58.88	202	367.5944
	65 / 60	70	*	50.1967	*	*	*	14.0364	46.05	192	362.0389
	65 / 60	60	*	49.6717	*	*	*	12.8331	42.10	188	359.8167
	65 / 60	50	*	51.1717	*	*	*	11.8799	38.98	193	362.5944
	93 / 32	BASE_DB_85%EVAP	*	51.6217	*	*	*	17.5618	57.62	203	368.1500
	93 / 32	70	*	49.7467	*	*	*	13.0187	42.71	187	359.2611
	93 / 32	60	*	49.2967	*	*	*	11.9974	39.36	185	358.1500
	93 / 32	50	*	50.7217	*	*	*	10.9475	35.92	192	362.0389
	93 / 32	BASE_85%EVAP	*	52.2217	*	*	*	17.4341	57.20	196	364.2611
3-Hour	35 / 75	BASE	*	*	*	*	1.2225	19.0433	62.48	202	367.5944
	35 / 75	70	*	*	*	*	0.9737	14.7936	48.54	189	360.3722
	35 / 75	60	*	*	*	*	0.9091	13.4880	44.25	185	358.1500
	35 / 75	50	*	*	*	*	0.8466	12.3822	40.62	187	359.2611
	65 / 60	BASE_DB_85%EVAP	*	*	*	*	1.2560	18.1666	59.60	197	364.8167
	65 / 60	BASE	*	*	*	*	1.1368	17.9475	58.88	202	367.5944
	65 / 60	70	*	*	*	*	0.9319	14.0364	46.05	192	362.0389
	65 / 60	60	*	*	*	*	0.8728	12.8331	42.10	188	359.8167
	65 / 60	50	*	*	*	*	0.8158	11.8799	38.98	193	362.5944
	93 / 32	BASE_DB_85%EVAP	*	*	*	*	1.1104	17.5618	57.62	203	368.1500
	93 / 32	70	*	*	*	*	0.8862	13.0187	42.71	187	359.2611
	93 / 32	60	*	*	*	*	0.8338	11.9974	39.36	185	358.1500
	93 / 32	50	*	*	*	*	0.7702	10.9475	35.92	192	362.0389
	93 / 32	BASE_85%EVAP	*	*	*	*	1.2111	17.4341	57.20	196	364.2611
1-Hour		Warm Start Up	34.9300	269.2300	*	*	0.8041	11.6497	38.22	196	364.2611
		Shut Down	29.4433	91.5433	*	*	1.0718	12.3822	40.62	202	367.5944
	35 / 75	BASE	15.4000	9.4000	*	*	1.2225	19.0433	62.48	202	367.5944
	35 / 75	70	11.7000	7.1000	*	*	0.9247	14.7936	48.54	189	360.3722
	35 / 75	60	10.5000	6.4000	*	*	0.8278	13.4880	44.25	185	358.1500
	35 / 75	50	9.3000	8.5000	*	*	0.7340	12.3822	40.62	187	359.2611
	65 / 60	BASE_DB_85%EVAP	16.2000	9.9000	*	*	1.2560	18.1666	59.60	197	364.8167
	65 / 60	BASE	14.6000	8.9000	*	*	1.1368	17.9475	58.88	202	367.5944
	65 / 60	70	11.1000	6.8000	*	*	0.8619	14.0364	46.05	192	362.0389
	65 / 60	60	10.0000	6.1000	*	*	0.7733	12.8331	42.10	188	359.8167
	65 / 60	50	8.9000	8.1000	*	*	0.6878	11.8799	38.98	193	362.5944
	93 / 32	BASE_DB_85%EVAP	14.3000	8.7000	*	*	1.1104	17.5618	57.62	203	368.1500
	93 / 32	70	10.2000	6.2000	*	*	0.7933	13.0187	42.71	187	359.2611
	93 / 32	60	9.2000	5.6000	*	*	0.7148	11.9974	39.36	185	358.1500
	93 / 32	50	8.2000	7.5000	*	*	0.6194	10.9475	35.92	192	362.0389
	93 / 32	BASE_85%EVAP	15.6000	9.5000	*	*	1.2111	17.4341	57.20	196	364.2611

* Information not required

Annual velocity and temperature parameters are from steady state scenarios

24-Hr velocity and temperature parameters are from steady state scenarios.

8-Hour velocity and temperature parameters are from steady state scenarios. The only 8-hr threshold is for CO

3-Hour velocity and temperature are from steady state values, since the highest level of SO2 emissions occur during the steady state conditions

1-Hour velocity and temperature are from the lowest velocity and lowest temperature during the transient conditions and 1 hour of steady state scenarios

TABLE 8.1B-3

Operation Modeling Outputs and Summary (Facility-wide)

Compare to PSD Threshold (unit: ug/m^3)

	Modeled Concentration (net increase)	PSD Significant level	Significant?
1-hour NO_2	90.13	-	-
1-hour CO	287.24	2000	No
8-hour CO	38.65	500	No
1-hour SO_2	1.08	-	-
3-hour SO_2	0.70	25	No
24-hour SO_2	0.11	5	No
24-hour PM_{10}	0.98	5	No

Note:

1. 2nd highest modeled concentrations were used for 1-hour, 3-hour, 8-hour, and 24-hour concentrations.

Facility-wide Impacts: Compare to NAAQS and CAAAQS (unit: ug/m^3)

	Modeled Concentration (net increase), for comparisons with CAAQS	Modeled Concentration (net increase), for comparisons with NAAQS	MGS impact	Background	Total Ground-level Concentration (to be compared with CAAQS)	Ambient Air Quality Standard (CAAAQS)	Total Ground-level Concentration (to be compared with NAAQS)	Ambient Air Quality Standard (NAAQS)	Significant?
1-hour NO_2	90.57	90.13	21.82	244.58	**357.0**	470	356.54	NA	No
1-hour CO	288.63	287.24	40.46	13742.33	**14071.4**	23000	14070.03	40,000	No
8-hour CO	39.27	38.65	1.21	8359.92	**8400.4**	10000	8399.77	10,000	No
1-hour SO_2	1.09	1.08	0.33	209.41	**210.8**	655	210.82	-	No
3-hour SO_2	0.81	0.70	NA	47.12	**47.9**	-	47.82	1300 (secondary)	No
24-hour SO_2	0.12	0.11	0.06	39.26	**39.45**	105	39.44	365	No
24-hour PM_{10}	1.11	0.980	1.94	81.00	**84.1**	50	83.92	150	Yes (CA) No (Federal)
24-hour PM2.5	1.11	0.980	1.94	55.80	**58.9**	-	58.72	65	No

Note:

1. For comparisons with CAAQS, the 1st highest modeled concentrations were used for all averaging periods. For comparisons with NAAQMS, the 2nd highest modeled concentrations were used for 1-hour, 3-hour, 8-hour, and 24-hour concentrations.
2. All exceedance are due to the high background concentrations which already exceeded the ambient air quality standard.
3. Background concentrations were the highest concentrations monitored during 2003 - 2005.
4. Maximum impacts from MGS operation were from Table AIR QUALITY Table 16 of MGS FSA.If the maximum MAGS impacts was unknown for a pollutant or an averaging time period, it was assumed that the impact is zero.
5. It is assumed that the PM2.5 impacts are the same as the PM10 impacts

TABLE 8.1B-4
Operation Modeling Outputs and Summary (Facility-wide

Compare to PSD Threshold (unit: ug/m^3)

	Modeled Concentration (net increase)	PSD Significant level	Significant?
1-hour NO_2	184.92	-	-
Annual NO_2	0.41	1	No
1-hour CO	211.56	2000	No
8-hour CO	12.33	500	No
1-hour SO_2	0.82	-	-
3-hour SO_2	0.54	25	No
24-hour SO_2	0.11	5	No
annual SO_2	0.04	1	No
24-hour PM_{10}	1.26	5	No
annual PM_{10}	0.44	1	No

Note:

1. 1st highest modeled concentrations were used for annual average concentrations. 2nd highest modeled concentrations were used for 1-hour, 3-hour, 8-hour, and 24-hour concentrations.
2. Annual NO_2 concentration was obtained by using a factor of 75% to convert NOx to NO_2, according to the Guideline on Air Quality Models (40 CFR, Part 51, Appendix W, April 15, 2003)

Facility-wide Impacts: Compare to NAAQS and CAAAQS (unit: ug/m^3)

	Modeled Concentration (net increase), for comparisons with CAAQS	Modeled Concentration (net increase), for comparisons with NAAQS	MGS impact	Background	Total Ground-level Concentration (to be compared with CAAQS)	Ambient Air Quality Standard (CAAAQS)	Total Ground-level Concentration (to be compared with NAAQS)	Ambient Air Quality Standard (NAAQS)	Significant?
1-hour NO_2	187.77	184.92	21.82	244.58	**454.2**	470	451	NA	No
Annual NO_2	0.41	0.41	0.39	58.32	**59.1**	100	59	100	No
1-hour CO	212.86	211.56	40.46	13742.33	**13995.7**	23000	13994	40,000	No
8-hour CO	12.43	12.33	1.21	8359.92	**8373.5**	10000	8373	10,000	No
1-hour SO_2	0.83	0.82	0.33	209.41	**210.6**	655	211	-	No
3-hour SO_2	0.59	0.54	NA	47.12	**47.7**	-	48	1300 (secondary)	No
24-hour SO_2	0.13	0.11	0.06	39.26	**39.5**	105	39	365	No
annual SO_2	0.039	0.039	0.02	5.24	**5.3**	-	5	80	No
24-hour PM_{10}	1.43	1.26	1.94	81.00	**84.4**	50	84	150	Yes (CA) No (Federal)
annual PM_{10}	0.44	0.44	0.47	34.60	**35.5**	20	36	50	Yes (CA) No (Federal)
24-hour PM2.5	1.43	1.26	1.94	55.80	**59.2**	-	59	65	No
annual PM2.5	0.44	0.44	0.47	20.20	**21.1**	12	21	15	Yes

Note:

1. For comparisons with CAAQS, the 1st highest modeled concentrations were used for all averaging periods. For comparisons with NAAQMS, the 1st highest modeled concentrations were used for annual average concentrations, and the 2nd highest modeled concentrations were used for 1-hour, 3-hour, 8-hour, and 24-hour concentrations.
2. Annual NO_2 concentration was obtained by using a factor of 75% to convert NOx to NO_2, according to the Guideline on Air Quality Models (40 CFR, Part 51, Appendix W, April 15, 2003)
3. All exceedance are due to the high background concentrations which already exceeded the ambient air quality standard.
4. Background concentrations were the highest concentrations monitored during 2003 - 2005.
5. Maximum impacts from MGS operation were from Table AIR QUALITY Table 16 of MGS FSA. If the maximum MAGS impacts was unknown for a pollutant or an averaging time period, it was assumed that the impact is zero.
6. It is assumed that the PM2.5 impacts are the same as the PM10 impacts

TABLE 8.1B-5

Commissioning Modeling Input Data

	Pollutant	Scenario	Maximum number of stacks in testing	NOx (lb/hr)	CO (lb/hr)	SO2 (lb/hr)	PM10 (lb/hr)	Velocity (m/s)	Temperature (K)	Note	NOx (g/s)	CO (g/s)	SO2 (g/s)	PM10 (g/s)
24-Hr	SO2, PM10	G	2	-	-	1.21	10.83	18.1613	364.8167	Worst case for both facility-wide and per stack testing			0.15260314	1.36440262
8-Hr	CO	A	1	-	287.76	-	-	9.4295	359.2611	Worst case for both facility-wide and per stack testing		36.2580741		
3-Hr	SO2	C	2	-	-	1.25	-	9.5794	359.2611	Worst case for both facility-wide and per stack testing			0.15733834	
1-Hr	SO2, NO2, CO	C	2	103.74	330.60	1.25	-	9.5794	359.2611	Worst case for both facility-wide and per stack testing for SO2	13.0712098	41.6550131	0.15733834	
1-Hr	NO2	H	1	142.13	-	-	-	9.4865	359.2611	Worst case for per stack testing	17.9088865			
1-Hr	CO	A	1	-	385.87	-	-	9.4295	359.2611	Worst case for per stack testing		48.6199384		

TABLE 8.1B-6
Summary of Detailed Modeling Input Data for the Turbines during Operation

Average Time	Modeled Scenario	Exit Velocity (m/s)	Exhaust Temperature (K)	Emission Rate per Turbine							
				NOx		CO		SO_2		PM_{10}	
				(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)
Annual NOx, SO2, and PM10	100% load with duct burner at 65ºF, evaporative cooler	18.17	364.8	18.88	2.38	-	-	1.33	0.17	12.80	1.61
24-hr SO2 and PM10	100% load with duct burner at 65ºF, evaporative cooler	18.17	364.8	-	-	-	-	1.26	0.16	12.00	1.51
8-Hour CO	50% load at 93ºF, no evaporative cooler	10.95	362.0	-	-	50.72	6.3908	-	-	-	-
3-Hour SO2	100% load with duct burner at 65ºF, evaporative cooler	18.17	364.8	-	-	-	-	1.26	0.16	-	-
1-Hour NOx and CO	start	11.65	364.3	34.93	4.40	269.23	33.92	-	-	-	-
1-Hour SO2	100% load with duct burner at 65ºF, evaporative cooler	18.17	364.8	-	-		-	1.26	0.16	-	-

TABLE 8.1B-7

Summary of Screening Modeling Scenarios and Results - Operation (Part 1)

Average Time	Modeled Scenario: Scenario Name in Screening Modeling	Ambient Temperature/ Relative Humidity	Evaporative Cooler Status/Effectiveness	Load	Exit Velocity (m/s)	Exhaust Temperature (K)	Emission Rate: NOx (lb/hr)	CO (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)	Dispersion Factors (ug/m^3)/(g/s): North Stack	South Stack
Annual	65_60_85_base_DB	65 / 60	85%	Baseload plus duct burner	18.17	364.8	18.88	24.93	1.33	12.80	0.1158	0.1157
24-hr	35_75_off_Base	35 / 75	Off	Base load	19.04	367.6	16.80	23.65	1.22	10.00	0.3934	0.3927
24-hr	35_75_off_70	35 / 75	Off	70%	14.79	360.4	13.41	21.54	0.93	8.04	0.4670	0.4648
24-hr	35_75_off_60	35 / 75	Off	60%	13.49	358.2	12.31	20.90	0.84	8.04	0.5208	0.5146
24-hr	35_75_off_50	35 / 75	Off	50%	12.38	359.3	11.21	22.82	0.75	8.04	0.5388	0.5358
24-hr	65_60_85_Base_DB	65 / 60	85%	Base load plus duct burner	18.17	364.8	17.53	24.11	1.26	12.00	0.4093	0.4088
24-hr	65_60_off_Base	65 / 60	Off	Base load	17.95	367.6	16.07	23.19	1.14	10.00	0.4056	0.4050
24-hr	65_60_off_70	65 / 60	Off	70%	14.04	362.0	12.86	21.27	0.87	8.04	0.4751	0.4722
24-hr	65_60_off_60	65 / 60	Off	60%	12.83	359.8	11.85	20.62	0.79	8.04	0.5281	0.5232
24-hr	65_60_off_50	65 / 60	Off	50%	11.88	362.6	10.84	22.46	0.70	8.04	0.5393	0.5364
24-hr	93_32_85_base_DB	93 / 32	85%	Base load plus duct burner	17.56	368.2	15.79	23.01	1.11	9.00	0.4193	0.4190
24-hr	93_32_off_70	93 / 32	Off	70%	13.02	359.3	12.03	20.72	0.80	8.04	0.5262	0.5210
24-hr	93_32_off_60	93 / 32	Off	60%	12.00	358.2	11.12	20.17	0.73	8.04	0.5502	0.5497
24-hr	93_32_off_50	93 / 32	Off	50%	10.95	362.0	10.20	21.91	0.64	8.04	0.5620	0.5637
24-hr	93_32_85_base	93 / 32	85%	Base load	17.43	364.3	16.98	23.74	1.21	11.00	0.4089	0.4084
8-Hour	35_75_off_Base	35 / 75	Off	Base load	19.04	367.6	*	52.15	*	*	0.6940	0.6812
8-Hour	35_75_off_70	35 / 75	Off	70%	14.79	360.4	*	50.42	*	*	0.8254	0.8254
8-Hour	35_75_off_60	35 / 75	Off	60%	13.49	358.2	*	49.90	*	*	0.8849	0.8850
8-Hour	35_75_off_50	35 / 75	Off	50%	12.38	359.3	*	51.47	*	*	0.9239	0.9240
8-Hour	65_60_85_Base_DB	65 / 60	85%	Base load plus duct burner	18.17	364.8	*	52.52	*	*	0.7212	0.7094
8-Hour	65_60_off_Base	65 / 60	Off	Base load	17.95	367.6	*	51.77	*	*	0.7153	0.7041
8-Hour	65_60_off_70	65 / 60	Off	70%	14.04	362.0	*	50.20	*	*	0.8438	0.8438
8-Hour	65_60_off_60	65 / 60	Off	60%	12.83	359.8	*	49.67	*	*	0.9020	0.9020
8-Hour	65_60_off_50	65 / 60	Off	50%	11.88	362.6	*	51.17	*	*	0.9282	0.9282
8-Hour	93_32_85_base_DB	93 / 32	85%	Base load plus duct burner	17.56	368.2	*	51.62	*	*	0.7383	0.7278
8-Hour	93_32_off_70	93 / 32	Off	70%	13.02	359.3	*	49.75	*	*	0.8974	0.8975
8-Hour	93_32_off_60	93 / 32	Off	60%	12.00	358.2	*	49.30	*	*	0.9469	0.9469
8-Hour	93_32_off_50	93 / 32	Off	50%	10.95	362.0	*	50.72	*	*	0.9747	0.9748
8-Hour	93_32_85_base	93 / 32	85%	Base load	17.43	364.3	*	52.22	*	*	0.7212	0.7107
3-Hour	35_75_off_Base	35 / 75	Off	Base load	19.04	367.6	*	*	1.22	*	1.8105	1.7999
3-Hour	35_75_off_70	35 / 75	Off	70%	14.79	360.4	*	*	0.97	*	2.1067	2.0925
3-Hour	35_75_off_60	35 / 75	Off	60%	13.49	358.2	*	*	0.91	*	2.2308	2.2164
3-Hour	35_75_off_50	35 / 75	Off	50%	12.38	359.3	*	*	0.85	*	2.3064	2.2905
3-Hour	65_60_85_Base_DB	65 / 60	85%	Base load plus duct burner	18.17	364.8	*	*	1.26	*	1.8794	1.8675
3-Hour	65_60_off_Base	65 / 60	Off	Base load	17.95	367.6	*	*	1.14	*	1.8630	1.8514
3-Hour	65_60_off_70	65 / 60	Off	70%	14.04	362.0	*	*	0.93	*	2.1383	2.1260
3-Hour	65_60_off_60	65 / 60	Off	60%	12.83	359.8	*	*	0.87	*	2.2613	2.2462
3-Hour	65_60_off_50	65 / 60	Off	50%	11.88	362.6	*	*	0.82	*	2.3075	2.2916
3-Hour	93_32_85_base_DB	93 / 32	85%	Base load plus duct burner	17.56	368.2	*	*	1.11	*	1.9215	1.9090
3-Hour	93_32_off_70	93 / 32	Off	70%	13.02	359.3	*	*	0.89	*	2.2534	2.2385
3-Hour	93_32_off_60	93 / 32	Off	60%	12.00	358.2	*	*	0.83	*	2.3549	2.3379
3-Hour	93_32_off_50	93 / 32	Off	50%	10.95	362.0	*	*	0.77	*	2.4014	2.3833
3-Hour	93_32_85_base	93 / 32	85%	Base load	17.43	364.3	*	*	1.21	*	1.8769	1.8650
1-Hour	Start	NA	NA	Start	11.65	364.3	34.93	269.23	0.80	*	3.1522	3.1212
1-Hour	Stop	NA	NA	Stop	12.38	367.6	29.44	91.54	1.07	*	3.0359	3.0076
1-Hour	35_75_off_Base	35 / 75	Off	Base load	19.04	367.6	15.40	9.40	1.22	*	2.5445	2.5261
1-Hour	35_75_off_70	35 / 75	Off	70%	14.79	360.4	11.70	7.10	0.92	*	2.9313	2.9006
1-Hour	35_75_off_60	35 / 75	Off	60%	13.49	358.2	10.50	6.40	0.83	*	3.0658	3.0356
1-Hour	35_75_off_50	35 / 75	Off	50%	12.38	359.3	9.30	8.50	0.73	*	3.1500	3.1208
1-Hour	65_60_85_Base_DB	65 / 60	85%	Base load plus duct burner	18.17	364.8	16.20	9.90	1.26	*	2.6354	2.6143
1-Hour	65_60_off_Base	65 / 60	Off	Base load	17.95	367.6	14.60	8.90	1.14	*	2.6133	2.5928
1-Hour	65_60_off_70	65 / 60	Off	70%	14.04	362.0	11.10	6.80	0.86	*	2.9673	2.9354
1-Hour	65_60_off_60	65 / 60	Off	60%	12.83	359.8	10.00	6.10	0.77	*	3.0993	3.0695
1-Hour	65_60_off_50	65 / 60	Off	50%	11.88	362.6	8.90	8.10	0.69	*	3.1518	3.1211
1-Hour	93_32_85_base_DB	93 / 32	85%	Base load plus duct burner	17.56	368.2	14.30	8.70	1.11	*	2.6905	2.6680
1-Hour	93_32_off_70	93 / 32	Off	70%	13.02	359.3	10.20	6.20	0.79	*	3.0903	3.0607
1-Hour	93_32_off_60	93 / 32	Off	60%	12.00	358.2	9.20	5.60	0.71	*	3.2056	3.1800
1-Hour	93_32_off_50	93 / 32	Off	50%	10.95	362.0	8.20	7.50	0.62	*	3.2619	3.2349
1-Hour	93_32_85_base	93 / 32	85%	Base load	17.43	364.3	15.60	9.50	1.21	*	2.6313	2.6104

TABLE 8.1B-7

Summary of Screening Modeling Scenarios and Results - Operation (Part 2)

Average Time	Calculated Ground Level Concentrations (ug/m^3): NOx North Stack	NOx South Stack	CO North Stack	CO South Stack	SO_2 North Stack	SO_2 South Stack	PM_{10} North Stack	PM_{10} South Stack
Annual	0.2066	0.2064	-	-	0.0195	0.0194	0.1867	0.1866
24-hr	-	-	-	-	0.0606	0.0605	0.4956	0.4948
24-hr	-	-	-	-	0.0548	0.0545	0.4732	0.4710
24-hr	-	-	-	-	0.0550	0.0543	0.5277	0.5215
24-hr	-	-	-	-	0.0508	0.0505	0.5459	0.5429
24-hr	-	-	-	-	0.0648	0.0647	0.6188	0.6181
24-hr	-	-	-	-	0.0581	0.0580	0.5110	0.5103
24-hr	-	-	-	-	0.0521	0.0518	0.4813	0.4784
24-hr	-	-	-	-	0.0523	0.0518	0.5351	0.5301
24-hr	-	-	-	-	0.0478	0.0476	0.5464	0.5435
24-hr	-	-	-	-	0.0587	0.0586	0.4755	0.4752
24-hr	-	-	-	-	0.0534	0.0528	0.5332	0.5279
24-hr	-	-	-	-	0.0506	0.0505	0.5575	0.5570
24-hr	-	-	-	-	0.0452	0.0453	0.5694	0.5712
24-hr	-	-	-	-	0.0624	0.0623	0.5667	0.5660
8-Hour	-	-	4.5598	4.4759	-	-	-	-
8-Hour	-	-	5.2436	5.2439	-	-	-	-
8-Hour	-	-	5.5635	5.5638	-	-	-	-
8-Hour	-	-	5.9920	5.9923	-	-	-	-
8-Hour	-	-	4.7729	4.6944	-	-	-	-
8-Hour	-	-	4.6663	4.5930	-	-	-	-
8-Hour	-	-	5.3367	5.3370	-	-	-	-
8-Hour	-	-	5.6452	5.6455	-	-	-	-
8-Hour	-	-	5.9845	5.9848	-	-	-	-
8-Hour	-	-	4.8021	4.7340	-	-	-	-
8-Hour	-	-	5.6252	5.6255	-	-	-	-
8-Hour	-	-	5.8812	5.8815	-	-	-	-
8-Hour	-	-	6.2295	6.2298	-	-	-	-
8-Hour	-	-	4.7452	4.6762	-	-	-	-
3-Hour	-	-	-	-	0.2789	0.2772	-	-
3-Hour	-	-	-	-	0.2585	0.2567	-	-
3-Hour	-	-	-	-	0.2555	0.2539	-	-
3-Hour	-	-	-	-	0.2460	0.2443	-	-
3-Hour	-	-	-	-	0.2974	0.2955	-	-
3-Hour	-	-	-	-	0.2669	0.2652	-	-
3-Hour	-	-	-	-	0.2511	0.2496	-	-
3-Hour	-	-	-	-	0.2487	0.2470	-	-
3-Hour	-	-	-	-	0.2372	0.2356	-	-
3-Hour	-	-	-	-	0.2688	0.2671	-	-
3-Hour	-	-	-	-	0.2516	0.2499	-	-
3-Hour	-	-	-	-	0.2474	0.2456	-	-
3-Hour	-	-	-	-	0.2331	0.2313	-	-
3-Hour	-	-	-	-	0.2864	0.2846	-	-
1-Hour	13.8735	13.7367	106.9327	105.8787	0.3194	0.3162	-	-
1-Hour	11.2628	11.1577	35.0175	34.6907	0.4100	0.4062	-	-
1-Hour	4.9373	4.9016	3.0137	2.9919	0.3919	0.3891	-	-
1-Hour	4.3213	4.2761	2.6223	2.5949	0.3415	0.3379	-	-
1-Hour	4.0560	4.0161	2.4722	2.4479	0.3198	0.3166	-	-
1-Hour	3.6911	3.6569	3.3736	3.3423	0.2913	0.2886	-	-
1-Hour	5.3794	5.3363	3.2874	3.2611	0.4171	0.4137	-	-
1-Hour	4.8074	4.7698	2.9305	2.9076	0.3743	0.3714	-	-
1-Hour	4.1500	4.1054	2.5423	2.5150	0.3222	0.3188	-	-
1-Hour	3.9051	3.8676	2.3821	2.3592	0.3020	0.2991	-	-
1-Hour	3.5344	3.5000	3.2167	3.1854	0.2732	0.2705	-	-
1-Hour	4.8478	4.8071	2.9493	2.9246	0.3764	0.3733	-	-
1-Hour	3.9717	3.9337	2.4142	2.3911	0.3089	0.3060	-	-
1-Hour	3.7159	3.6863	2.2619	2.2438	0.2887	0.2864	-	-
1-Hour	3.3702	3.3423	3.0825	3.0570	0.2546	0.2525	-	-
1-Hour	5.1722	5.1309	3.1497	3.1246	0.4015	0.3983	-	-

Note:

The screening modeling used 1g/s for all pollutants. The ground level concentrations from each stack were calculated by multiplying the unit dispersion factor (ug/m^3)/(g/s) by the actural emission rates (g/s).

TABLE 8.1B-7

Summary of Screening Modeling Scenarios and Results - Operation(Part 3)

Average Time	Worst Case Ground Level Concentrations (ug/m^3)								Worst Case Operation Scenarios
	NOx		CO		SO_2		PM_{10}		
	North Stack	South Stack	North Stack	South Stack	North Stack	South Stack	North Stack	South Stack	
Annual	0.2066	0.2064	-	-	0.0195	0.0194	0.187	0.187	65_60_85_base_DB
24-HR	-	-	-	-	0.0648	0.0647	0.619	0.618	65_60_85_Base_DB
8-HR	-	-	6.2295	6.2298	-	-	-	-	93_32_off_50
3-HR	-	-	-	-	0.2974	0.2955	-	-	65_60_85_Base_DB
1-HR	13.8735	13.7367	106.9327	105.8787	0.4171	0.4137	-	-	NO2 and CO: Startup SO2: 65_60_85_Base_DB

TABLE 8.1B-8

Summary of Onsite Building Dimensions and Stack Heights

Building/Equipment	Length (m) (Diameter for Tanks)	Width (m)	Building Height (m)	Actual Stack Height (m)	GEP Stack Height (m)
HRSG (each), Tier 1	49.0	15.0	13.7	NA	NA
HRSG (each), Tier 2	31.0	15.0	21.3	NA	NA
HRSG (each), Tier 3	20.7	15.0	27.4	NA	NA
Air filter and turbine enclosure (each), Tier 1	35.0	13.5	9.1	NA	NA
Air filter and turbine enclosure (each), Tier 2	13.5	13.5	15.2	NA	NA
Air filter and turbine enclosure (each), Tier 3	13.5	7.0	21.9	NA	NA
Reclaimed Water storage tank	21.3	NA	15.2	NA	NA
Fire Pump House	4.3	3.0	2.4	NA	NA
Cooling Tower	82.3	30.5	14.6	NA	NA
Water Treatment/Admin/Chemical Treatment/Control Room	30.5	18.3	9.1	NA	NA
MGS main building (Tier 1)	73.6	53.4	6.1	NA	NA
MGS main building (Tier 2)	73.6	48.5	7.6	NA	NA
MGS main building (Tier 3)	73.6	35.1	19.7	NA	NA
MGS cooling tower 1	37.3	27.7	12.2	NA	NA
MGS cooling tower 2 (Tier 1)	27.7	13.3	3.1	NA	NA
MGS cooling tower 2 (Tier 2)	24.4	13.3	9.1	NA	NA
MGS SCR (each)	7.6	6.4	18.3	NA	NA
MGS tank	15.2	NA	7.3	NA	NA
Cooling Tower (each stack)	NA	NA	NA	17.7	65
Fire Pump Stack	NA	NA	NA	10.7	65
Turbine Stack (each Stack)	NA	NA	NA	54.9	65.8

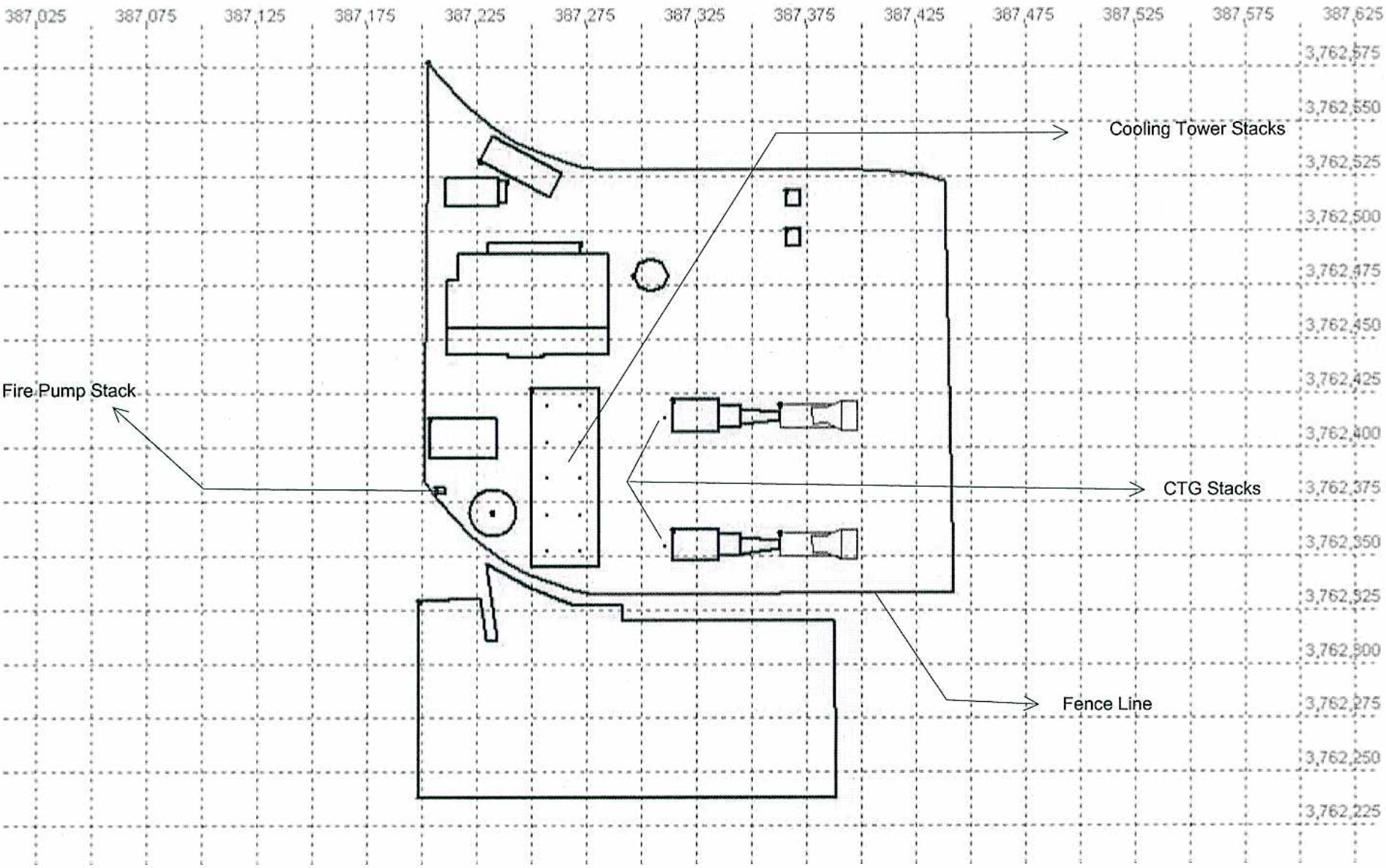

Figure 8.1B.1 : ISCST3 Modeling Setup