APPENDIX C
AIR QUALITY ANALYSIS METHODOLOGIES

SOUTHERN CALIFORNIA EDISON
ETIWANDA PEAKER PROJECT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENTS

APPENDIX C

AIR QUALITY ANALYSIS METHODOLOGIES

This appendix provides the methodologies that were used to analyze potential air quality impacts associated with the Southern California Edison (SCE) Etiwanda Peaker Project, described in Section 2 of the Initial Study. This appendix begins with a discussion of the methodologies used to calculate construction and operational emissions. Procedures used for ambient air quality modeling to calculate impacts of increases in operational emissions from the project are then presented, followed by the human health risk assessment procedures. Spreadsheets that provide details of the emissions calculations are attached as well as computer model inputs and outputs from the ambient air quality modeling and the health risk assessments.

C.1 CONSTRUCTION EMISSIONS CALCULATIONS

Construction emissions can be distinguished as either onsite or offsite. Onsite emissions generated during construction principally consist of exhaust emissions (CO, VOC, NO_X, SO_X, PM10 and PM2.5) from construction equipment, fugitive dust (PM10) from grading and excavation, and VOC from painting and asphaltic paving. Offsite emissions during the construction phase normally consist of exhaust emissions and entrained paved road dust from worker commute trips and material delivery trips.

C.1.1 Construction Equipment Exhaust Emission Calculations

The combustion of fuel to provide power for the operation of various construction activities and equipment results in the generation of CO, VOC NO_X, SO_X, PM10 and PM2.5 emissions. The following predictive emission equation was used to calculate exhaust emissions from each type of construction equipment:

$$\text{Exhaust Emissions}_{i,j}\ (\text{lb/day}) = EF_{C,i,j} \times T_{H,j} \qquad \text{(EQ. C-1)}$$

where:

$EF_{C,i,j}$ = Emission factor for specific air contaminant i from construction equipment type j (lb/hr)

$T_{H,j}$ = Daily operating time for equipment of type j (hr/day)

The exhaust emission factors used for the calculations of CO, VOC, NO_x and PM10 are composite horsepower-based off-road emission factors for 2007 developed for the South Coast Air Quality Management District (SCAQMD) by the California Air Resources Board (CARB) from its OFF-ROAD Model. The composite off-road emission factors were derived based on equipment category (tractor, dozer, scraper, etc.), and average equipment age and horsepower rating within horsepower ranges for the year. The emission factors developed by CARB for the SCAQMD for 2007 are listed in **Table C.1.3** of **Attachment C.1** and can also be downloaded from http://www.aqmd.gov/ceqa/hdbk.html/offroadEF05_20.xls.

SO_x emission factors for diesel-fueled construction equipment calculated by the OFF-ROAD model are based on a diesel fuel sulfur content of 2,800 parts per million by weight (ppmw) and were corrected for the actual sulfur content of the diesel fuel of 15 ppmw that will be used during construction of the project. Therefore, the SO_x emission factors from the OFF-ROAD model were multiplied by 15 ppmw / 2,800 ppmw.

PM2.5 emission factors were calculated from PM10 emission factors using the following equation:

$$EF_{C,PM2.5,j}\,(\text{lb/day}) = EF_{C,PM10,j} \times F_{PM2.5,j} \qquad \text{(EQ. C-2)}$$

where:

$EF_{C,PM2.5,,j}$ = PM2.5 emission factor for construction equipment type j (lb/hr)

$EF_{C,PM10,,j}$ = PM10 emission factor for construction equipment type j (lb/hr)

$F_{PM2.5,,j}$ = Mass fraction of PM2.5 emissions in PM10 emissions from equipment of type j (unitless)

The mass fractions of PM2.5 in PM10 emissions from construction equipment exhaust depend on the type of fuel (diesel or gasoline). SCAQMD has compiled PM2.5 fractions in PM10 emissions from several emission source categories in Appendix A of "Final–Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds," SCAQMD, October 2006. These PM2.5 mass fractions are from PM profiles in the California Emission Inventory Data and Reporting System (CEIDARS) developed by CARB.

The types of construction equipment and the maximum daily operating time for each type of equipment during each bi-weekly construction period were estimated by SCE's engineering contractor for the project. Emission factors for CO, VOC, NO_x, SO_x, PM10 and PM2.5 were prepared for the specified equipment and are provided in **Table C.1.2** of **Attachment C.1**.

The anticipated construction equipment usage and maximum daily emissions by bi-weekly period are listed in **Table C.1.1** of **Attachment C.1**.

C.1.2 Motor Vehicle Exhaust Emission Calculations

The combustion of fuel in motor vehicle engines results in the generation of CO, VOC NO_X, SO_X, PM10 and PM2.5 emissions. The following predictive emission equation was used to calculate exhaust emissions from both on-site and off-site motor vehicles:

$$\text{Exhaust Emissions}_{i,j}\ (\text{lb/day}) = EF_{V,i,j} \times N_{V,j} \times D_j \qquad \text{(EQ. C-3)}$$

where:

$EF_{V,i,j}$ = Emission factor for specific air contaminant i from motor vehicle type j (lb/mi)

$N_{V,j}$ = Number of motor vehicles of type j

D_j = Distance traveled each day by motor vehicles of type j (mi/day)

CO, VOC, NO_x, SO_x and PM10 emission factors were compiled by the SCAQMD by running the CARB's EMFAC2002 (version 2.2) Burden Model. A weighted average of vehicle types was used to calculate emission factors for passenger vehicles, and emission factors for heavy-duty diesel trucks were used for delivery trucks. The emission factors account for the emissions from starting, running and idling exhaust. In addition, the VOC emission factors take into account diurnal, hot soak, running and resting emissions, and PM10 emission factors take into account tire and brake wear. PM2.5 emission factors were calculated by multiplying the PM10 emission factors by the mass fraction of PM2.5 emissions in motor vehicle exhaust PM10 emissions. The PM2.5 mass fractions in PM10 emissions from gasoline and diesel-fueled engine exhaust were from Appendix A of "Final–Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds," SCAQMD, October 2006. The motor vehicle exhaust emission factors are listed in **Table C.1.4 A** of **Attachment C.1**.

SCE's engineering contractor estimated the number and length of daily on-site and off-site motor vehicle trips by trucks to deliver materials and supplies, remove construction debris, etc., by bi-weekly construction period. The anticipated number of construction workers during each bi-weekly construction period was used to calculate the number of construction worker commute trips, assuming each worker would drive separately to and from the off-site parking facility each day. This assumption overestimates the number of trips, since it is likely that some workers will carpool.

The anticipated number of motor vehicles and the resulting emissions by bi-weekly period are listed in **Table C.1.1** of **Attachment C.1**.

C.1.3 Motor Vehicle Entrained Paved Road Dust Emission Calculations

Vehicle travel on paved roads generates fugitive PM10 and PM2.5 emissions by entrainment of dust on the roads. It should be noted that all motor vehicle travel during construction of the project will be on paved roads except for one-half mile per day assumed for travel on the undeveloped portion of the property. The following predictive emission equation was used to calculate exhaust emissions from both on-site and off-site motor vehicles:

$$\text{Entrained Dust PM10 Emissions}_j \text{ (lb/day)} = EF_{D,j} \times N_{V,j} \times D_j \qquad \text{(EQ. C-4)}$$

where:

$EF_{D,j}$ = Emission factor for entrained road dust PM10 from motor vehicle type j (lb/mi)

$N_{V,j}$ = Number of motor vehicles of type j

D_j = Distance traveled each day by motor vehicles of type j (mi/day)

The emission factor was calculated from the following equation from CARB Emission Inventory Methodology 7.9, "Entrained Paved Road Dust" (1997):

$$EF_{D,j} \text{ (lb/mi)} = 7.26 / 453.6 \times (sL_j/2)^{0.65} \times (W_j/3)^{1.5} \qquad \text{(EQ. C-5)}$$

where:

7.26 = A constant for PM10 emissions (g/mi)

453.6 = Factor to convert from grams to pounds (g/lb)

sL_j = Silt loading on roads traveled by motor vehicle of type j (g/m^2)

W_j = Average weight of vehicles on roads traveled by vehicles of type j (tons)

The silt loadings were taken from Table 3 of CARB Emission Inventory Methodology 7.9. As indicated in **Table C.1.4 B** of **Attachment C.1**, on-site motor vehicles were assumed to travel on paved roads and areas with silt loadings equivalent to local roads, and off-site motor vehicles were assumed to travel on roads with silt loadings equivalent to collector roads.

Weights of on-site vehicles traveling on paved areas were based on vehicle class. The average weight of vehicles on roads traveled by off-site motor vehicles was assumed to be 2.7 tons, as listed in Table 3 of CARB Emission Inventory Methodology 7.9 for Los Angeles County.

PM2.5 emission factors were calculated by multiplying the PM10 emission factors by the mass fraction of PM2.5 emissions in PM10 emissions from entrained paved road dust. The PM2.5 mass fractions were from Appendix A of "Final–Methodology to Calculate Particulate Matter (PM)

2.5 and PM 2.5 Significance Thresholds," SCAQMD, October 2006. The calculated PM10 and PM2.5 entrained paved road dust emission factors are in **Table C.1.4 B** of **Attachment C.1**.

Maximum daily motor vehicle ~~un~~paved road dust entrainment emissions are listed for both on-site and off-site motor vehicles by bi-weekly construction period in **Table C.1.1** of **Attachment C.1**.

C.1.4 Excavation Fugitive PM10 and PM2.5 Emission Calculations

Excavation for foundations for new and modified equipment during construction of the project will generate fugitive PM10 and PM2.5 emissions from soil handling (i.e., dropping) and from wind erosion of temporary storage piles. Although fugitive dust emissions from construction activities are temporary, they may have an impact on local air quality. Fugitive dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. The following methodologies provide the predictive emission equations, emission factors, and default values used to calculate fugitive dust emissions for the project.

Construction contractors will comply with SCAQMD Rule 403 – Fugitive Dust, by watering the site two times per day, reducing the uncontrolled on-site fugitive dust emissions by 50 percent.

<u>Emissions from Soil Handling</u>

Fugitive PM10 and PM2.5 emissions are generated during excavation when excavated material is dropped onto the ground at the side of the excavation location or dropped into trucks for removal from the site. The following equation was used to estimate these emissions:

$$\text{Emissions (lb/day)} = EF_S \times V_s \qquad \text{(EQ. C-6)}$$

where:

EF_S = Controlled PM10 emission factor for soil dropping (lb/yd^3)

V_S = Volume of soil handled (yd^3/day)

The controlled emission factor was calculated from:

$$EF_S\ (\text{lb/yd}^3) = 0.0011 \times (U/5)^{1.3} / (M/2)^{1.4} \times D \times N_D \times (1\text{-}CE_{403}/100) \qquad \text{(EQ. C-7)}$$

where:

U = Mean wind speed (mph)

M = Soil moisture content (percent)

D = Soil density (tons/yd^3)

N_D = Number of times soil is dropped

CE_{403} = Control efficiency from complying with SCAQMD Rule 403 (percent)

[Source: Equation 1, Section 13.2.4, US EPA Compilation of Air Pollutant Emission Factors (AP-42), January 1995.]

The mean wind speed was assumed to be the default value of 12 miles per hour (mph), from Table 9-9-G of the SCAQMD CEQA Handbook (1993). The moisture content was assumed to be 15 percent, from "Open Fugitive Dust PM10 Control Strategies Study," Midwest Research Institute, October 12, 1990, for moist conditions. Soil density was assumed to be 1.215 tons per cubic yard, from Table 2.46, Handbook of Solid Waste Management. It was conservatively assumed that soil would be handled (dropped) four times: 1) onto the ground at the side of the excavation; 2) onto a temporary storage pile; 3) into a truck; and 4) out of the truck. The control efficiency from complying with SCAQMD Rule 403 was assumed to be 50 percent.

The PM2.5 emission factor was calculated by multiplying the PM10 emission factor by the mass fraction of PM2.5 emissions in PM10 emissions from construction dust. The PM2.5 mass fraction was taken from Appendix A of "Final–Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds," SCAQMD, October 2006. The emission factors are listed in **Table C.1.5** of **Attachment C.1**.

SCE estimated the excavation volumes for construction of foundations for the equipment. The anticipated schedule for constructing the foundations was used to calculate the amount of soil that will be excavated during each bi-weekly construction period. The maximum daily excavation volume during each construction period was estimated to be one-sixth of the total for the 12 working days during the bi-weekly period.

Maximum daily volumes of soil handled during each bi-weekly construction period and the resulting fugitive PM10 and PM2.5 emissions are listed in **Table C.1.1** of **Attachment C.1**.

Wind Erosion from Temporary Storage Piles

Wind erosion of temporary soil storage piles during excavation generates fugitive PM10 emissions. The following equation was used to estimate these emissions:

$$\text{Emissions (lb/day)} = EF_W \times A \qquad \text{(EQ. C-8)}$$

where:

EF_W = Controlled PM10 emission factor for storage pile wind erosion (lb/acre-day)

A = Temporary storage pile surface area (acres)

The controlled emission factor was calculated from:

EF_W (lb/acre-day) = 0.85 x (s/1.5) x (365-p/235) x (U_{12}/15) x (1-CE_{403}/100) (EQ. C-9)

where:

s = Soil silt content (percent)

p = Number of days per year with precipitation of 0.01 inches or more

U_{12} = Percentage of time unobstructed wind speed exceeds 12 mph

CE_{403} = Control efficiency from complying with SCAQMD Rule 403 (percent)

[Source: US EPA Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, 1992.]

The storage pile silt contents were assumed to be 7.5 percent, as listed in Table A9-9-F-1 of the SCAQMD CEQA Air Quality Handbook for overburden. The number of days with precipitation was conservatively assumed to be zero, and the percentage of the time that the wind speeds exceeds 12 mph was conservatively assumed to be 100 percent. The control efficiency from complying with SCAQMD Rule 403 was assumed to be 50 percent.

The PM2.5 emission factor was calculated by multiplying the PM10 emission factor by the mass fraction of PM2.5 emissions in PM10 emissions from construction dust. The PM2.5 mass fraction was from Appendix A of “Final–Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds,” SCAQMD, October 2006. The emission factors are listed in **Table C.1.5** of **Attachment C.1**.

The maximum daily surface area of temporary storage piles was estimated by assuming that the volume of soil excavated each day would be in storage piles three feet tall, square in shape, and flat on the top.

Maximum daily surface areas of storage piles during each bi-weekly construction period and the resulting fugitive PM10 and PM2.5 emissions are listed in **Table C.1.1** of **Attachment C.1**.

C.1.5 Painting VOC Emission Calculations

The application of architectural surface coatings (painting) generates VOC emissions when organic solvents in the coating evaporate as the coating dries. The following equation was used to estimate VOC emissions from architectural coatings:

Emissions (lb/day) = C x V (EQ. C-10)

where:

C = VOC content of coating (lb/gal)

V = Amount of coating applied (gal/day)

A VOC content of 0.84 lb/gal (100 g/l) was assumed, based on the VOC limit specified in SCAQMD Rule 1113 - Architectural Coatings for an industrial maintenance coating.

SCE anticipates that a maximum of 20 gallons of coating would be used for touchup for each site. A maximum usage of 10 gallons per day was assumed to occur during the bi-weekly period prior to the start of equipment testing and commissioning.

Maximum daily surface coating usage and VOC emissions during each bi-weekly construction period are listed in **Table C.1.1** of **Attachment C.1**.

C.1.6 Asphaltic Paving VOC Emission Calculations

Paving areas with asphalt generates VOC emissions as the asphalt cures. The following equation was used to estimate daily VOC emissions from asphaltic paving:

$$\text{Emissions (lb/day)} = 2.62 \times A \qquad \text{(EQ. C-11)}$$

where:

A = Area paved (acres/day)

[Source: URBEMIS 2002 User's Guide, 2005]

It was assumed that half the 200 foot-by-300 foot area of each site and a maximum of one-quarter mile of a 30-foot wide access road would be paved with asphalt, and that half the paving would be conducted on one day at the end of the construction for each site. The total square footage paved at each site would be (200 feet x 300 feet) / 2 + (1,320 feet x 30 feet) = 69,600 square feet, which is equivalent to 1.6 acres.

Maximum daily paved surface areas and VOC emissions during each bi-weekly construction period are listed in **Table C.1.1** of **Attachment C.1**.

C.1.7 Peak Daily Construction Emission Calculations

Daily emissions from construction equipment exhaust, on-site motor vehicle exhaust and entrained dust, grading and excavation, asphaltic paving, painting, and off-site motor vehicle exhaust and entrained dust during each bi-weekly construction period were calculated using the procedures described in the preceding subsections. Total daily emissions of each criteria pollutant (CO, VOC, NO_x, SO_x, PM10 and PM2.5) during each period were then calculated by summing the daily emissions from the various emission sources. Peak daily emissions of each criteria pollutant were then determined from the daily emissions during each construction period.

Maximum daily emissions during each bi-weekly construction period and peak daily construction emissions for the project are listed in **Table C.1.1** of **Attachment C.1**.

C.2 OPERATIONAL CRITERIA POLLUTANT EMISSION CALCULATIONS

Estimated criteria pollutant emissions from the project are described in this chapter. Emissions are based on the project description, permit limits, and anticipated operating levels.

C.2.1 LM6000 Turbine

Emissions from the LM6000 turbine are due to the combustion of natural gas fuel. Controlled emission guarantees for NO_X, CO, PM10, VOC, and ammonia (NH_3) slip were obtained from GE for the LM6000 turbine for normal operations. The emission rates for NO_X and CO are 2.5 and 6.0 ppm, respectively, at 15 percent O_2. Ammonia slip will not exceed 5.0 ppm, and VOC will not exceed 2.0 ppm. The emissions for sulfur dioxide (SO_2) are based on USEPA Compilation of Air Pollution Emission Factors (AP-42), Fifth Edition, Section 3.1, Page 8, Supplement A, dated April 2000.

C.2.1.1 Normal Operations

Normal operations consist of periods when the LM6000 turbine is operating at full load under controlled conditions with water injection, SCR, and oxidation catalyst in operation. GE provided guaranteed controlled hourly emission rates, in pounds per hour (lb/hr), for NO_X, CO, PM10, and VOC for two ambient temperature scenarios, 31°F and 102°F, at the Etiwanda project site. The maximum guaranteed emission rates of NO_X, CO, and VOC occur for the 31°F case and are as the permitted, controlled hourly emission rates for these pollutants. The guaranteed hourly rates of SO_2 and PM10 do~~es~~ not vary by ambient temperature.

AP-42 emission factors were used to calculate SO_2 maximum hourly emission rates using the AP-42 emission factor and maximum fuel flow rate. Detailed emission calculations for criteria pollutants during normal operations are shown in **Attachment C.2**.

To ensure PM10 emission rates are not underestimated, SCE assumes that all of the SO_2 will react with excess ammonia (ammonia slip) to form ammonium sulfate, which will exist as fine particulate matter (PM10). Based on the relative masses of ammonium sulfate and SO_2, approximately two pounds of ammonium sulfate is formed for every pound of SO_2 released.

A sample calculation for maximum hourly SO_2 emission rate is provided below:

Maximum lb/hr (SO_2) = maximum hourly fuel flow rate (MMBtu/hr) X emission factor (lb/MMBtu)

Maximum lb/hr (SO_2) = 423.0 (MMBtu/hr) X (0.0006 lb/MMBtu) = 0.25 lb/hr

Table C-1 summarizes the maximum hourly emission rates for all criteria pollutants for the LM6000 turbine during normal operations.

Table C-1. LM6000 Turbine Maximum Hourly Emissions During Normal Operations

Pollutant	Maximum Emission Rate (lb/hr)	Basis
NO_X	4.20	Vendor Guarantee
CO	6.10	Vendor Guarantee
PM10	4.51	Vendor Guarantee
VOC	1.27	Vendor Guarantee
SO_2	0.25	AP-42

C.2.1.2 Startup/Shutdown Operations

SU/SD NO_X and CO emission calculations for the LM6000 turbine were performed using SU and SD curves provided by GE. The total emissions of NO_X and CO emissions during a SU or SD were divided by the duration of each event to obtain the maximum hourly emission rates. SUs will take approximately 12 minutes to achieve full load conditions, with the SCR and oxidation catalyst controlling emissions at their guaranteed control efficiencies. Emission estimates for NO_X and CO were provided by GE for each phase of the 12-minute startup sequence, ranging from uncontrolled to fully controlled emissions. These SU emissions, along with normal operation emission rates, were used to estimate the maximum hourly emission rates of NO_X and CO during a typical SU sequence.

The oxidation catalyst is expected to be functional after about 6.5 minutes into the SU sequence, at which time VOC emissions will be controlled by the oxidation catalyst. Uncontrolled VOC emission rates provided by GE were used for the first 6.5 minutes of the SU sequence, with controlled emission rates occurring during the remaining 5.5 minutes.

Shutdowns will last approximately eight minutes. Emission estimates for NO_X and CO were provided by GE for each phase of the 8-minute SD sequence. These SD emissions, along with normal operation emission rates, were used to estimate the maximum hourly emission rates of NO_X and CO during a typical SD sequence. The oxidation catalyst is expected to be functional for the first 2.5 minutes of the SD sequence, at which time VOC emissions will be controlled by the oxidation catalyst. Uncontrolled VOC emission rates provided by GE were used for the remaining 5.5 minutes of the SD sequence.

Emissions of PM10 and SO_2 during SU/SD are not expected to be any higher than those for normal operations since these pollutant emission rates are strictly a function of the quantity of natural gas burned. Therefore, normal operation emissions are presented during SU/SD conditions for PM10 and SO_2.

Maximum hourly emissions during SU conditions were calculated as follows based on SU curves provided by GE. Sample calculations for NO_X, CO, and VOC are provided below, and spreadsheets with all calculations are provided as **Attachment C.2**.

Maximum lb/hr (NO_X) = total lbs during startup + [maximum normal operations (lb/hr) / 60 min/hr X 48 min at normal operations]

Maximum lb/hr (NO_X) = 4.3 lbs + [4.2 (lb/hr) /60 min/hr X 48 min] = 7.66 lb/hr

Maximum lb/hr (CO) = total lbs during startup + [maximum normal operations (lb/hr) / 60 min/hr X 48 minutes at normal operations]

Maximum lb/hr (CO) = 3.7 lbs + [6.1 (lb/hr) / 60 min/hr X 48 min] = 8.58 lb/hr

Maximum lb/hr (VOC) = {[uncontrolled VOC (lb/hr) / 60 min/hr X 6.5 min] + [maximum normal operations (lb/hr) /60 min/hr X 5.5 min]} + [maximum normal operations (lb/hr) / 60 min/hr X 48 minutes at normal operations]

Maximum lb/hr (VOC) = {[1.90~~3.81~~ (lb/hr) / 60 min/hr X 6.5 min] + [1.27 (lb/hr) / 60 min/hr X 5.5 min]} + [1.27 (lb/hr) / 60 min/hr X 48 minutes at normal operations] = 1.34~~1.55~~ lb/hr

Maximum hourly emissions during shutdown conditions were calculated as follows based on SU curves provided by GE. Sample calculations for NO_X, CO, and VOC are provided below:

Maximum lb/hr (NO_X) = total lbs during shutdown + [maximum normal operations (lb/hr) / 60 min/hr X 52 min]

Maximum lb/hr (NO_X) = 2.8 lbs + [4.2 (lb/hr) / 60 min/hr X 52 min] = 6.44 lb/hr

Maximum lb/hr (CO) = total lbs during shutdown + [maximum normal operations (lb/hr) / 60 min/hr X 52 min]

Maximum lb/hr (CO) = {2.4 lbs + [6.1 (lb/hr) / 60 min/hr X 52 min] = 7.69 lb/hr

Maximum lb/hr (VOC) = {[uncontrolled VOC (lb/hr) / 60 min/hr X 6.5 min] + [maximum normal operations (lb/hr) /60 min/hr X 5.5 min]} + [maximum normal operations (lb/hr) / 60 min/hr X 52 minutes at normal operations]

Maximum lb/hr (VOC) = {[1.903.81 (lb/hr) / 60 min/hr X 5.5 min] + [1.27 (lb/hr) / 60 min/hr X 2.5 min]} + [1.27 (lb/hr) / 60 min/hr X 52 minutes at normal operations] = 1.331.50 lb/hr

Table C-2 summarizes the maximum hourly emission rates for all criteria pollutants for the LM6000 turbine during SU/SD conditions.

Table C-2. LM6000 Turbine Maximum Hourly Emissions During SU/SD Conditions

Pollutant	Maximum SU Emission Rate (lb/hr)	Maximum SD Emission Rate (lb/hr)
NO_X	7.66	6.44
CO	8.58	7.69
PM10	4.51	4.51
VOC	1.341.55	1.331.50
SO_2	0.25	0.25

C.2.1.3 Commissioning

Commissioning of the LML6000 turbine is anticipated to take 25 hours. Emission calculations for uncontrolled and partially controlled emissions of NO_X, CO, and VOC provided by GE were used to calculate peak hourly rates for these pollutants. Emissions of PM10 and SO_2 are not expected to be any higher than those for normal operations since these pollutant emission rates are strictly a function of the quantity of natural gas burned. Therefore, normal operation emissions are presented during commissioning for PM10 and SO_2.

Table C-3 summarizes the uncontrolled and controlled hourly and total emissions during commissioning for the LM6000 turbine. Detailed commissioning emission calculations are provided in **Attachment C.2**.

Table C-3. LM6000 Turbine Commissioning Emission Rates

Pollutant	Uncontrolled Emissions (lb/hr)	Controlled Emissions [1] (lb/hr)	Total Commissioning Emissions (lb)
NO_X	101.75	41.7	1,342.74
CO	62.20	62.20	1,555.00
PM10	4.51	4.51	112.69
VOC	1.90~~3.81~~	1.90~~3.81~~	47.60~~95.35~~
SO_2	0.25	0.25	6.35

[1] Only NO_X emissions will be partially controlled during a portion of commissioning.

C.2.1.4 Annual Emission Rates

Annualized emission rates were calculated for two annual periods: 1) during the first year of operation that includes commissioning, and 2) during subsequent years following commissioning. The first year of operation will consist of 25 hours of uncontrolled commissioning emissions, 60 (1/2 of 120 annual events) SU/SD cycles, and 1,336 hours at normal operations. Annual emission estimates for the first year used these hour estimates, along with estimated commissioning, SU/SD, and normal operation emissions, to calculate annual emission rates.

Subsequent year annual emissions were calculated assuming 120 hours per year of SU/SD operations and 1,454 hours per year of normal operations. Detailed emission calculations are provided in **Attachment C.2**.

Table C-4 summarizes the annual average emission rates for LM6000 turbine for the first year and subsequent years.

Table C-4. LM6000 Annual Emissions for First Year and Subsequent Years of Operation

Pollutant	First Year with Commissioning Tons/year	Subsequent Year Tons/year
NO_X	3.9	3.9
CO	5.3	5.4
PM10	3.3	3.8
VOC	1.0	1.1
SO_2	0.2	0.2

C.2.2 Black Start Generator

The black start Waukesha ICE will operate only during black start conditions, and for routine testing and maintenance. Black starts are anticipated to occur two times per year. Routine testing and maintenance will occur on a monthly basis. The Waukesha ICE will operate 30 minutes during each black start or maintenance event, 14 events per year, for a total of 7 hours per year of operation. For the purposes of these calculations the operations are characterized as 14 hours per year of operation, with each hour of operating consisting of one-half hour of operation and one-half hour of non-operation.

Controlled emission guarantees for the Waukesha black start ICE were obtained from Waukesha for NO_X and CO. Guaranteed emission rates of total hydrocarbon were obtained from Waukesha and are assumed to be 100 percent VOC. AP-42 Fifth Edition, Section 3.2, dated August 2000, emission factors were used to calculate SO_2 and PM10 emission rates.

The maximum fuel flow rate to the Waukesha ICE is 6.43 MMBtu per hour for standby power, using heat exchanger cooling. The fuel flow rate was converted to standard cubic feet (scf) per hour using a heat content of 1,050 Btu/scf (6,124 scf/hr).

C.2.2.1 Maximum Hourly Emission Calculations

A sample calculation for maximum hourly NO_X emission rates are provided below. CO and VOC emission calculations are identical with the exception of the emission factors.

Maximum Hourly (NO_X) = guaranteed NO_X rate (g/bhp-hr) X engine rating (bhp) / 453.6 g/lb X 30/60 minutes

Maximum Hourly (NO_X) = 1.25 (g/bhp-hr) X 865 (bhp) / 453.6 g/lb X 30/60 minutes = <u>1.19 lb/hr</u>

A sample calculation of maximum hourly SO_2 emissions for the Waukesha ICE is provided below.

Maximum Hourly (SO_2) = emission factor (lb/MMBtu) X engine rating (MMBtu/hr) X 30/60 minutes

Maximum Hourly (SO_2) = 5.88×10^{-4} (lb/MMBtu) X 6.43 (MMBtu/hr) X 30/60 minutes = <u>1.89×10^{-3} lb/hr</u>

Table C-5 summarizes the maximum hourly emission rates of criteria pollutants for the Waukesha ICE.

Table C-5. Waukesha Black Start ICE Maximum Hourly Emissions

Pollutant	Emission Factor	Maximum Emission Rate (lb/hr)	Basis
NO_X	1.25 g/bhp-hr	1.19	Vendor Guarantee
CO	1.59 g/bhp-hr	1.52	Vendor Guarantee
PM10	9.91×10^{-3} lb/MMBtu	3.19×10^{-2}	AP-42
VOC	0.45 g/bhp-hr	0.43	Vendor Guarantee
SO_2	5.88×10^{-4} lb/MMBtu	1.89×10^{-3}	AP-42

C.2.2.2 Annual Emission Rates

Annual emissions from the Waukesha ICE were calculated assuming 14 one-half hour operating events per year. A sample calculation of annual NO_X emissions is provided below. The calculations of emissions for the remaining criteria pollutants are identical with the exception of the hourly emission rate.

Annual tpy (NO_X) = hourly emission rate (lb/hr) X 14 hr/yr / 2,000 lb/ton

Annual tpy (NO_X) = 1.19 (lb/hr) X 14 hr/yr / 2,000 lb/ton = $\underline{8.34 \times 10^{-3} \text{ tpy}}$

Table C-6 summarizes the annual average emission rates of criteria pollutants for the Waukesha ICE.

Table C-6. Waukesha Black Start ICE Annual Emissions

Pollutant	Emissions Tons/year
NO_X	8.34×10^{-3}
CO	1.06×10^{-2}
PM10	2.23×10^{-4}
VOC	3.00×10^{-3}
SO_2	1.32×10^{-5}

C.2.3 Direct Operational Criteria Pollutant Emissions

Tables C-7 and **C-8** summarize the facility-wide emission rates for the project during normal operations.

Table C-7. Facility-Wide Criteria Pollutant Short-Term Emissions ~~During Normal Operations~~

Pollutant	AHU Lbs/Hr	AHC Lbs/Hr	MHU Lbs/Hr	MHC Lbs/Hr	MDU Lbs/Day	MDC Lbs/Day	30-DA Lbs/Day
NO_X	102.94	8.85~~5.39~~	102.94	8.85~~5.39~~	1120.42	53.09~~47.39~~	23.87~~21.25~~
CO	63.72	10.10~~7.62~~	63.72	10.10~~7.62~~	685.72	72.68~~68.62~~	32.72~~30.86~~
PM10	4.54	4.54	4.54	4.54	49.62	49.62	22.73
VOC	2.33~~4.24~~	1.77~~1.70~~	2.33~~4.24~~	1.77~~1.70~~	21.37~~42.38~~	14.53~~14.40~~	6.49~~6.43~~
SO_2	0.26	0.26	0.26	0.26	2.79	2.79	1.28

AHU = Average Hourly Uncontrolled Emissions
AHC = Average Hourly Controlled Emissions
MHU = Maximum Hourly Uncontrolled Emissions
MHC = Maximum Hourly Controlled Emissions
MDU = Maximum Daily Uncontrolled Emissions
MDC = Maximum Daily Controlled Emission
AA = Annual Average Emission
30-DA = 30-day Average Emissions

Table C-8. Facility-Wide Criteria Pollutant Annual Emissions During Normal Operations

Pollutant	AA[1] Lbs/Yr	AA[1] Tons/Yr	AA[2] Lbs/Yr	AA[2] Tons/Yr
NO_X	7,816.68	3.91	7,816.68	3.91
CO	10,701.91	5.35	10,844.37	5.42
PM10	6,676.27	3.34	7,637.61	3.82
VOC	1,910.35~~1,981.02~~	0.96~~0.99~~	2,172.97~~2,218.8~~	1.09~~1.11~~
SO_2	375.91	0.19	430.04	0.22

[1] Includes commissioning.
[2] Subsequent years following commissioning.

C.2.4 Indirect Operational Emission Calculations

The use of aqueous ammonia in the SCR system will require periodic deliveries (maximum of four per year; no more than one per day) of aqueous ammonia to the project site by tanker truck.

Aqueous ammonia will be delivered to the site from a local supplier in the Los Angeles area; the one-way travel distance to the site from the supplier's site is assumed to be 30 miles. Truck exhaust emission factors and entrained paved road PM10 emission factors were developed based on EMFAC for Los Angeles County. Emissions are calculated based on these emission factors and the travel distance.

The project may generate wastewater that would be stored onsite in a storage tank and hauled away periodically, up to once per day. Haul trucks would collect the wastewater and deliver to a local wastewater treatment plant for disposal. The one-way travel distance from the site to the treatment plant is assumed to be 10 miles. Truck exhaust emission factors and entrained paved road PM10 emission factors were developed based on EMFAC for Los Angeles County. Emissions are calculated based on these emission factors and the travel distance.

In addition, the project may also require up to one maintenance worker trip to the site per day. The one-way travel distance to the site for this worker is assumed to be 30 miles. Exhaust emissions from these vehicle trips were developed based on EMFAC for Los Angeles County. Emissions are calculated based on these emission factors and the travel distance.

Exhaust emissions from these additional vehicle trips were calculated using Equation C-3, and fugitive PM10 emissions from entrained road dust were calculated using Equation C-4. Vehicle exhaust emission factors and entrained paved road PM10 emission factors are provided in **Table C.2.20** of **Attachment C.2**.

C.2.5 Peak Daily Operational Emissions

Peak daily operational criteria pollutant emissions for the project are summarized in **Table C-9.**

Table C-9. Summary of Peak Daily Operational Emissions

Source	CO (lb/day)	VOC (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)
Peak Daily Direct Operational Emissions	72.68~~68.62~~	14.53~~14.40~~	53.09~~47.39~~	2.79	49.62
Peak Daily Indirect Operational Emissions	2.93	0.00	0.18	0.06	0.14
Total Peak Daily Emissions	**75.61~~71.55~~**	**14.53~~14.4~~**	**53.27~~47.57~~**	**2.85**	**49.76**

C.3 OPERATIONAL TOXIC AIR CONTAMINANT EMISSION CALCULATIONS

Emissions of toxic Air Contaminants (TAC) for the LM6000 turbine and Waukesha ICE were calculated using AP-42 Fifth Edition, Section 3.1 and the California Air Toxic Emission Factor (CATEF) database, respectively.

C.3.1 Methodology

AP-42 emission factors and the maximum hourly and annual fuel consumption rates were used to calculate peak hourly and annual TAC emission rates for the LM6000 turbine. The maximum fuel consumption rate for the LM6000 turbine is 423.0 MMBtu per hour based on the higher heating value (HHV). Maximum annual fuel consumption was used to calculate annual average emissions. A control efficiency of 0 percent was assumed for the oxidation catalyst in accordance with SCAQMD guidance.

For the Waukesha ICE, CATEF emission factors, the maximum hourly consumption rate, duration of operation for any given hour, and number of annual operating hours were used to calculate peak hourly and annual average TAC emission rates. The maximum fuel consumption rate for the black start ICE is 6.43 MMBtu per hour, the actual duration of operation is 30 minutes per hour of operation, and the maximum annual operating hours is 14 hours per year.

C.3.2 TAC Calculations for LM6000 Turbine

The following sets of sample emission calculations are provided for benzene. The remaining TAC emission calculations are identical, with the exception of the emission factor. Ammonia slip emissions were provided by GE for various operating conditions. The maximum hourly NH_3 emission rate of 3.1 pounds per hour was used, along with the annual fuel limit of 716,562 MMBtu ~~$6.83x10^8$ Scf~~ per year after the first year of operation, to calculate annual NH_3 emission rates. Detailed TAC emission calculations are provided in **Attachment C.2**.

C.3.2.1 Maximum Hourly Emissions

The maximum hourly emissions were calculated using the appropriate AP-42 emission factor~~,~~ and maximum hourly fuel flow rate~~, and control efficiency~~ as follows:

Maximum lb/hr (benzene) = maximum hourly fuel flow rate (MMBtu/hr) X emission factor (lb/MMBtu)

Maximum lb/hr (benzene) = 423.0 (MMBtu/hr) X $1.50X10^{-5}$ (lb/MMBtu) = $6.35X10^{-3}$ lb/hr

C.3.2.2 Annual Emissions

The annual average emissions were calculated using the appropriate AP-42 emission factor, and annual fuel flow rate, and control efficiency as described below. The annual fuel flow was calculated using the maximum fuel flow rate multiplied by the annual operating hours.

Annual lb/yr (benzene) = annual fuel flow rate (MMBtu/yr) X emission factor (lb/MMBtu)

Annual lb/yr (benzene) = 716,562 (MMBtu/yr) X 1.50X10^{-5} (lb/MMBtu) = 10.70 lb/yr

C.3.3 TAC Calculations for Waukesha ICE

The following sample emission calculations are provided for benzene. The remaining TAC emission calculations are identical, with the exception of the emission factor. Detailed TAC emission calculations are provided in Attachment C.2.

C.3.3.1 Maximum Hourly Emissions

The maximum hourly emissions were calculated using the appropriate CATEF emission factor, maximum hourly fuel flow rate, and duration of each black start as follows:

Maximum lb/hr (benzene) = maximum hourly fuel flow rate (MMBtu/hr) / 1,050 MMBtu/MMscf X emission factor (lb/MMscf) X 30/60 minutes

Maximum lb/hr (benzene) = 6.43 (MMBtu/hr) / 1,050 MMbtu/MMscf X 2.18X10^{-1} (lb/MMscf) X 30/60 minutes= 6.646.47X10^{-4} lb/hr

C.3.3.2 Annual Emissions

The annual average emissions were calculated using the maximum hourly emission rate and number of operating hours per year, as follows:

Annual lb/yr (benzene) = hourly emission rate (lb/hr) X annual operating hours (hr)

Annual lb/yr (benzene) = 6.646.47X10^{-4} (lb/hr) X 14 (hr/yr) = 9.34X10^{-3} lb/yr

C.3.4 Direct Operational Toxic Air Contaminant Emissions

Table C-10 summarizes the facility-wide emission rates for the project during normal operations.

Table C-10. Facility-Wide TAC Emissions During Normal Operations

Pollutant	Maximum Hourly Emission Rate (lb/hr)	Annual Emission Rate (lb/yr)	Annual Emissions [1] (ton/yr)
1,3-Butadiene	1.31E-03	3.24E-01	1.62E-04
Acetaldehyde	1.85E-02	2.87E+01	1.43E-02
Acrolein	2.89E-03	4.59E+00	2.29E-03
Ammonia	3.10E+00	5.25E+03	2.63E+00
Benzene	7.01E-03	1.08E+01	5.38E-03
Benzo(a)pyrene	8.27E-09	1.16E-07	5.79E-11
Benzo(b)fluoranthene	1.25E-07	1.75E-06	8.77E-10
Benzo(g,h,i)perylene	2.31E-08	3.23E-07	1.62E-10
Benzo(k)fluoranthene	2.40E-08	3.36E-07	1.68E-10
Chrysene	4.38E-08	6.13E-07	3.06E-10
Dibenz(a,h)anthracene	8.27E-09	1.16E-07	5.79E-11
Ethylbenzene	1.38E-02	2.29E+01	1.15E-02
Formaldehyde	3.15E-01	5.09E+02	2.54E-01
Indeno(1,2,3-cd)pyrene	2.20E-08	3.07E-07	1.54E-10
Naphthalene	6.27E-04	9.33E-01	4.66E-04
PAH [as benzo(a)pyrene]	9.31E-04	1.58E+00	7.88E-04
Propylene	1.65E-02	2.31E-01	1.15E-04
Propylene Oxide	1.23E-02	2.08E+01	1.04E-02
Toluene	5.57E-02	9.32E+01	4.66E-02
Xylene	2.90E-02	4.59E+01	2.29E-02
Total HAP [2]		**738.8**	**0.4**

Note LM6000 PAHs are listed as composite PAHs (as benzo[a]pyrene) in emission factor list; Black start generator PAHs are speciated in emission factor database

[1] Subsequent years following commissioning represent worst-case TAC annual emissions.

[2] Ammonia is not a hazardous air pollutant (HAP) and is not included in the HAP Total.

C.4 AMBIENT AIR QUALITY IMPACTS MODELING

C.4.1 Introduction

Dispersion modeling was conducted in accord with the recommendations on the CARB modeling guidelines (http://www.arb.ca.gov/html/soft.htm#modeling) and U.S. Environmental Protection Agency's (USEPA's) *Guideline on Air Quality Models.* Criteria pollutant modeling was performed for all operating conditions for comparison against the California and National Ambient Air Quality Standards (AAQS).

C.4.2 Modeling Methods

The USEPA Industrial Source Complex – PRIME (ISC-PRIME, version 04269) dispersion model was used for this analysis. This analysis was prepared during the one-year phase-out period of the ISCST3 model. Based on recent discussions with SCAQMD regarding AERMOD implementation, the ISCST3 dispersion would be acceptable during the phase-out period. However, due to significant downwash from the black start ICE, the ISC-PRME was used to refine the analysis. The ISC-PRIME model contains the same building downwash algorithm as the USEPA-approved AERMOD dispersion model. The model was run using the regulatory default options except that the NOCALM option was used pursuant to SCAQMD requirements. ISC-PRIME was run in URBAN mode.

C.4.3 Source description and downwash

Sources and receptors were digitized in United States Geological Survey UTM coordinates in NAD27. **Figure C-1** provides a simplified digitization of the facility boundary, buildings, and source locations. The USEPA Building Profile Input Program with PRIME (BPIP-PRIME version 04274) was used to calculate direction-specific downwash parameters based on the digitization in **Figure C-1** for each source.

Modeled stack parameters represent the worst-case stack parameters for the LM6000 turbine over several load conditions (startup, commissioning, and normal operations). Worst-case stack parameters are defined as the lowest exhaust temperature and velocity over all possible operating conditions. The black start ICE stack parameters represent 100 percent load conditions. The digital modeling files are available from Mr. Michael Krause at the SCAQMD at (909) 396-2706.

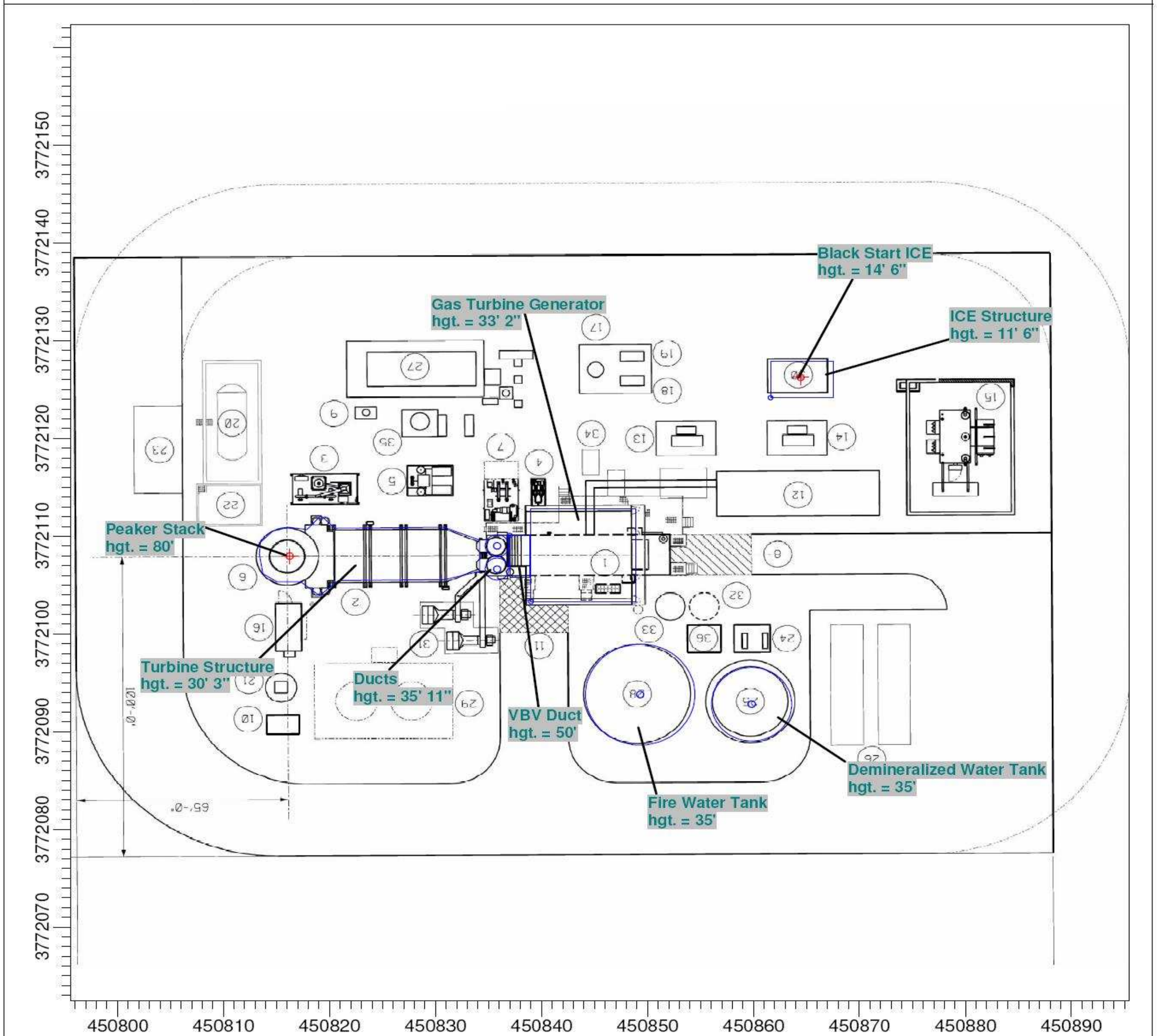
The highest short-term emission rates for all operating conditions were modeled for the LM6000 and black start ICE for the short-term averaging periods (i.e., one- to 24-hour). Annual emission rates were used to calculate annual average emission rates from both sources. The black start ICE was assumed to run a maximum of one hour per day. Emissions for the black start ICE were scaled accordingly for short term periods longer than one hour. **Tables C-11** through **C-13** provide the modeled emission rates for each analysis. Modeled stack parameters are provided in **Table**

C-14. Emissions of SO_2 and PM10 during startup and commissioning are not expected to be any higher than during normal operations; therefore, only NO_X and CO were modeled during startup and commissioning. The black start ICE was assumed not to operate during the commissioning period.

Figure C-1. Simplified Plot Plan

PROJECT TITLE:

Buildings Used in GEP Analysis for SCE Etiwanda Peaker Site
Rancho Cucamonga, CA



COMMENTS:	SOURCES:	COMPANY NAME:	
	2	ENSR	
	RECEPTORS: 528	MODELER: Richard Hamel	SOUTHERN CALIFORNIA EDISON An EDISON INTERNATIONAL Company
		SCALE: 1:609 0 — 0.02 km	
		DATE: 10/26/2006	PROJECT NO.:

ISC-AERMOD View - Lakes Environmental Software

J:\AQES\Projects\SCE Peakers 06200\Etiwanda Site\Lakes\Etiwanda.isc

Table C-11. Modeled Emission Rates During Normal Operations

Pollutant	Averaging Period	LM6000 Emission Rate (g/s)	Black Start ICE Emission Rate (g/s)
NO_2	1-hour	0.529	0.150
	Annual	0.112	2.40E-04
CO	1-hour	0.769	0.191
	8-hour	0.769	0.024
SO_2	1-hour	0.032	2.38E-04
	3-hour	0.032	7.94E-05
	24-hour	0.015	9.92E-06
	Annual	6.00E-03	3.81E-07
PM10	24-hour	0.260	1.67E-04
	Annual	0.110	6.42E-06

Table C-12. Modeled Emission Rates During Startup

Pollutant	Averaging Period	LM6000 Emission Rate (g/s)	Black Start ICE Emission Rate (g/s)
NO_2	1-hour	0.965	0.150
CO	1-hour	1.081	0.191
	8-hour	0.808	0.024

Table C-13. Modeled Emission Rates During Commissioning

Pollutant	Averaging Period	LM6000 Emission Rate (g/s)
NO_2	1-hour	12.820
CO	1-hour	7.837
	8-hour	7.837

Table C-14. Modeled Stack Parameters

Source ID	UTM E (m)	UTM N (m)	Base Elev. (m)	Stack Height (m)	Stack Temp. (K)	Stack Velocity [1] (m/s)	Stack Diameter (m)
LM6000	450816.3	3772108.0	4.4	24.38	624.8	18.3 / 17.1 / 9.1	3.96
BSGEN	450864.4	3772126.2	4.4	4.42	723.7	43.6	0.25

[1] LM6000 stack velocities given for normal operations / startup / commissioning, respectively.

C.4.4 Receptors

A network of receptors was generated for the analysis that consist of the following:

- Fenceline receptors placed every 30 meters (m); and
- 100-m spacing from the fenceline to one kilometer (km) from the fenceline.

Receptor elevations were determined using 7.5-minute Digital Elevation Model data processed by Lakes Environmental's ISC-AERMOD View software (version 5.4.0). Receptors were generated in NAD27. **Figure C-2** provides the receptor locations used in the analysis.

C.4.5 Meteorological data

SCAQMD-provided ISCST3 pre-processed meteorological were obtained from the SCAQMD website for input to the ISC-PRIME model. The data used was collected at Fontana, California, for calendar year 1981. **Figure C-3** presents a wind rose for the Fontana meteorological dataset.

C.4.6 Modeling Results

The following sections discuss the results of the various modeling analyses performed. Modeling results are shown in **Tables C-15** through **C-17**. For all analyses, it was assumed that 100 percent of the model-predicted NO_X converts to NO_2.

Figure C-2. Modeled Receptors

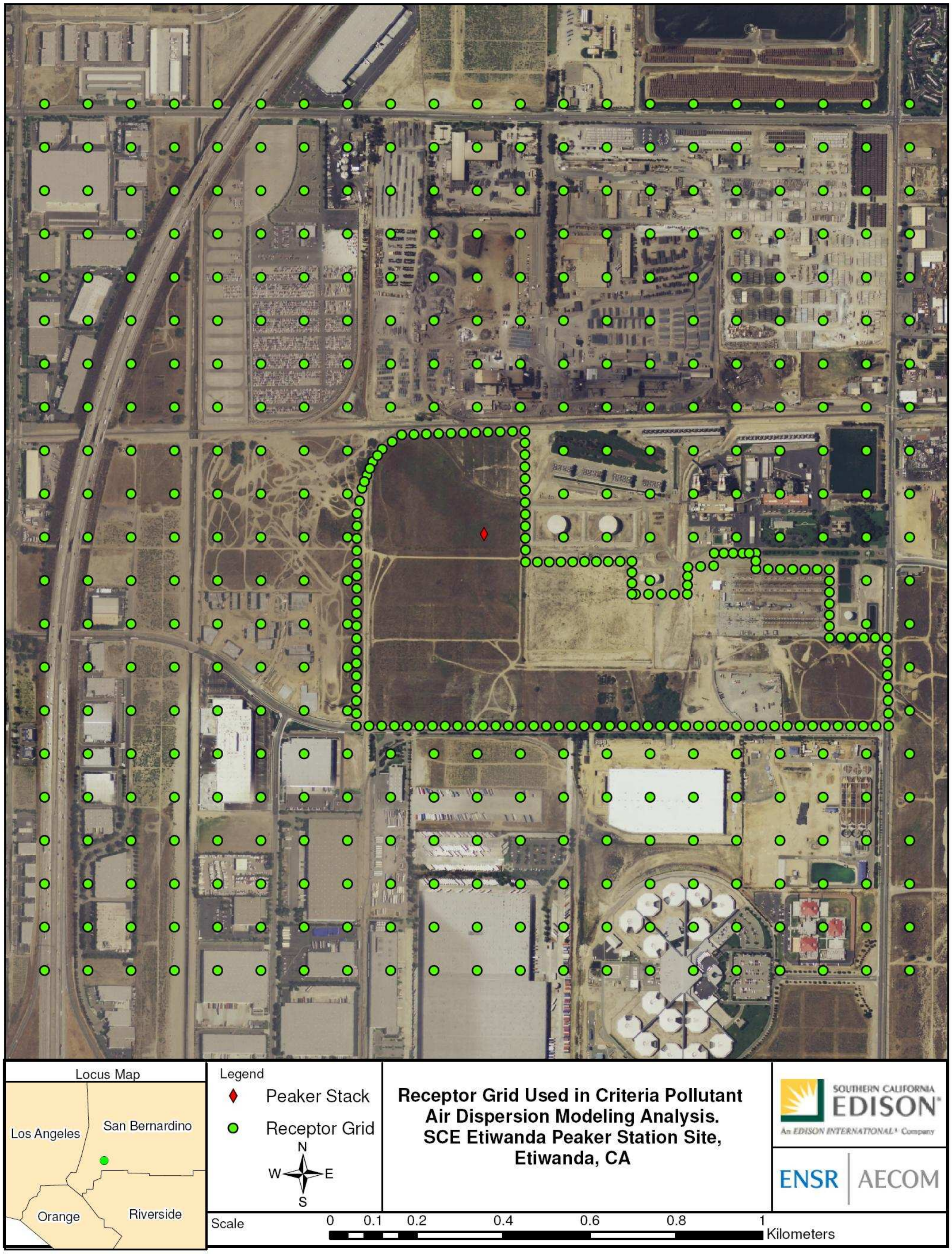
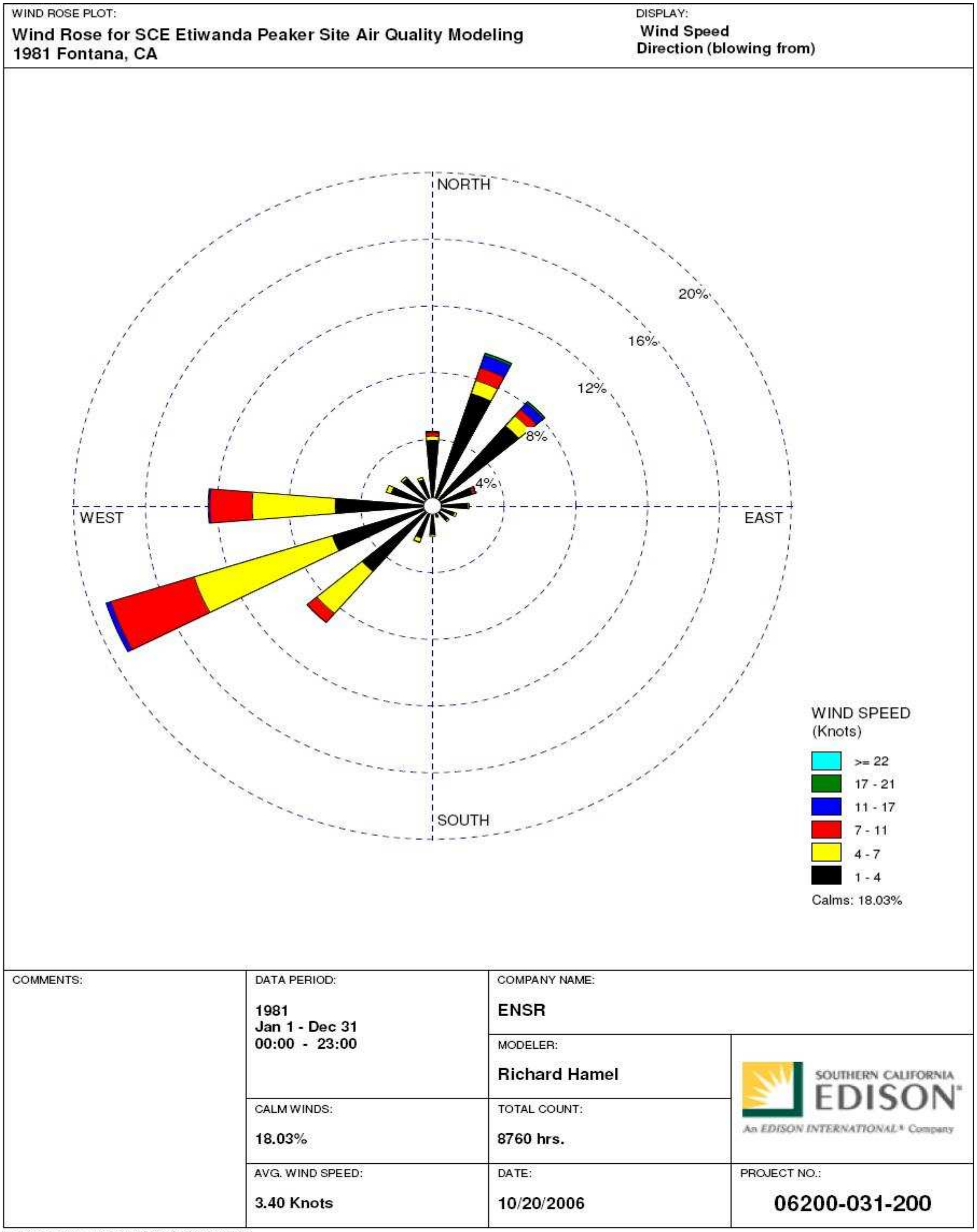


Figure C-3. Composite Wind Rose



WRPLOT View - Lakes Environmental Software

Maximum predicted impacts due to facility operations were added to background concentrations obtained from either the Fontana or Upland air quality monitoring stations for comparison against the California AAQS. As shown in **Table C-15**, the modeled impacts from normal operations are less than the applicable AAQS for NO_2, CO, and SO_2.

Because background PM10 concentrations exceed the most stringent AAQS, a different approach was used to determine significance. Modeled PM10 concentrations are considered to be significant if the project's emissions cause an ambient air concentration equal to or greater than 2.5 $\mu g/m^3$. As shown in **Table C-15**, the modeled PM10 emissions do not exceed the operational modeling significance threshold of 2.5 $\mu g/m^3$.

Digital modeling files are available from Mr. Michael Krause at the SCAQMD at (909) 396-2706.

Table C-15. Normal Operations Modeling Results

Pollutant	Averaging Period	Maximum Predicted Impact ($\mu g/m^3$)	Background Conc. [1] ($\mu g/m^3$)	Total Conc. ($\mu g/m^3$)	AAQS ($\mu g/m^3$)
NO_2	1-hour	43.98	220.1	264.08	470
	Annual	0.02	58.3	58.32	100
CO	1-hour	56.07	4,255.0	4,311.07	23,000
	8-hour	4.60	3,105.0	3,109.60	10,000
SO_2	1-hour	0.17	23.6	23.77	655
	3-hour	0.12	15.7	15.82	1300
	24-hour	0.01	10.5	10.51	105
	Annual	1.12E-03	5.2	5.20	80
PM10 [2]	24-hour	0.21	108.0	108.21	50
	Annual	0.02	51.0	51.02	20

[1] Background concentrations obtained from the Fontana station for all pollutants except CO, which was obtained from the Upland station.
[2] Background PM10 concentrations exceed the California AAQS and increments. Project impacts do not exceed the modeling significance threshold of 2.5 $\mu g/m^3$.

Table C-16. Startup Modeling Results

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)	Background Conc. [1] (μg/m^3)	Total Conc. (μg/m^3)	AAQS (μg/m^3)	Percent of AAQS
NO_2	1-hour	44.42	220.1	264.52	470	56%
CO	1-hour	56.43	4,255.0	4,311.43	23,000	19%
	8-hour	4.64	3,105.0	3,109.64	10,000	31%

[1] NO_2 background concentration obtained from the Fontana station and CO obtained from the Upland station.

Table C-17. Commissioning Modeling Results

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)	Background Conc. [1] (μg/m^3)	Total Conc. (μg/m^3)	AAQS (μg/m^3)	Percent of AAQS
NO_2	1-hour	106.43	220.1	326.53	470	69%
CO	1-hour	65.06	4,255.0	4,320.06	23,000	19%
	8-hour	28.70	3,105.0	3,133.70	10,000	31%

[1] NO_2 background concentration obtained from the Fontana station and CO obtained from the Upland station.

For operational emissions, as shown in **Table C-15**, the maximum predicted impact from PM10 is 0.21 μg/m^3 (24-hour) and 0.02 μg/m^3 (annual). Since all of the operational PM10 emissions are due to natural gas combustion, and most (approximately 99 percent) of PM10 from combustion is PM2.5 (SCAQMD 2006), the modeled impacts are representative of expected PM2.5 impacts. The maximum predicted impacts are well below the Localized Significance Threshold (LST) of 2.5 μg/m^3; therefore, the project is expected to have less than significant impacts.

C.5 LOCALIZED AIR QUALITY ANALYSIS - CONSTRUCTION

To evaluate localized air quality impacts from construction emissions for NOx and CO, construction emissions of 50.5 pounds per day NOx and 29.3 pounds per day CO are compared to emission thresholds in the 2001-2003 look-up tables. For a 1.61-acre site (a project size of one acre was used in the evaluation which is a conservative analysis) and a receptor distance of 200 meters, 495 pounds per day of NOx emissions and 5,210 pounds per day of CO emission would create significant adverse localized air quality impacts. Peak daily construction emissions of NOx and CO do not exceed the allowable threshold and, therefore, are not expected to have significant impacts. Peak daily PM10 and PM2.5 emissions of 4.0 pounds per day and 3.2 pounds per day, respectively, are compared to the look up tables for these pollutants. For the 1.61 acre site and a receptor distance of 200 m, the threshold for PM10 is 29571 pounds per day and for PM2.5, 32 pounds per day. Project emissions do not exceed these thresholds and, therefore, are not expected to have a significant impact.

C.6 HEALTH RISK ASSESSMENT

This section presents the methodology and results of a refined health risk assessment (HRA) performed to assess potential impacts and public exposure associated with emissions of TACs from the SCE Etiwanda Peaker project. This HRA was performed during normal operations of the facility. TAC emissions during periods of startup/shutdown and commissioning are not expected to result in adverse health risks. At the requested permit limits in this application, the corresponding predicted cancer risk, and chronic non-carcinogenic and acute hazard indices will not exceed 10 in one million (10×10^{-6}) and 1.0, respectively, at any off-site receptor.

C.6.1 Health Risk Assessment Procedures

The methods used to assess potential human health risks are consistent with the *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* published by the California Office of Health Hazard Assessment (OEHHA) at the nearest off-site receptors. The latest OEHHA cancer inhalation potency factor, and chronic and acute reference exposure levels (RELs) for each TAC were used. The CARB Hot Spots Analysis and Reporting Program (HARP, Version 1.3) software was used to perform the analysis. The HARP software contains the USEPA ISCST3 dispersion model and the latest OEHHA toxicity values.

The health risk assessment was conducted in three steps. First, emissions of TACs from the equipment were estimated. Second, exposure calculations were performed using the ISCST3 dispersion model. Third, results of the exposure calculations along with the cancer potency factor, and chronic non-carcinogenic and acute RELs for each TAC were used to perform the risk characterization to quantify individual health risks.

C.6.2 Emission Characterization

Maximum hourly and annual average emissions discussed in **Section C.3** and are presented in **Table C-9** of this appendix.

C.6.3 Risk Assessment Dispersion Modeling Methodology

The ISCST3 dispersion model provided in HARP was used along with one year (1981) of pre-processed meteorological data collected at the SCAQMD Fontana station. **Figure C-3** presents a wind rose for the Fontana meteorological dataset. ISCST3 was run in urban mode with the NOCALM option.

Modeled stack parameters are provided in **Table C-18**. Stack parameters represent 100 percent load conditions. The coordinates are in Universe Transverse Mercator (UTM), Zone 11, referenced in United States Geological Survey (USGS) North American Datum 1927 (NAD27). **Figure C-1** is a simplified site plan with the source and building locations.

Table C-18. Modeled Stack Parameters

Source ID	UTM E (m)	UTM N (m)	Base Elev. (m)	Stack Height (m)	Stack Temp. (K)	Stack Velocity (m/s)	Stack Diameter (m)
LM6000	450816.3	3772108.0	340.0200.0	24.38	624.8	18.3	3.96
BS ICE	450864.4xx	3772126.2xx	340.2xx	4.42xx	723.7xx	43.6xx	0.25xx

Building downwash for the peaker facility structures was calculated internally by HARP. The tanks and cooling towers at the adjacent power plant, as well as the tall structure across the railroad tracks to the north, were reviewed for potential downwash but these structures were sufficiently distant to not cause downwash from the SCE peaker project plumes.

A network of receptors was generated for the analysis that consist of the following:

- Fenceline receptors placed every 30 m; and
- Cartesian grid at 100-m spacing out to one km from the facility.

The nearest sensitive receptor (Marsha's Manor Nursing Home) is located over 1.55 miles (8,184 feet) from the facility. The fenceline and Cartesian grids used in this analysis show insignificant risks; therefore, sensitive receptors were not analyzed explicitly. Receptor elevations were determined by HARP using 7.5-minute Digital Elevation Model dataReceptors were generated in NAD27, Zone 11. Flat terrain was assumed. **Figure C-2** shows the receptor locations used in the analysis.

C.6.4 Risk Characterization

Carcinogenic risks and chronic non-carcinogenic and acute health effects were assessed using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. The HARP software performs the necessary risk calculations following the OEHHA risk assessment guidelines and CARB Interim Risk Management Policy for risk management decisions. These guidelines recommend that the following risk analysis methods be employed:

- Cancer Risk: Derived (Adjusted) Method;

- Chronic Hazard Index: Derived (OEHHA) Method; and
- Acute Hazard Index: Acute HI Simple (Concurrent Max.).

Exposure pathways included inhalation, homegrown produce (using urban default ingestion fractions), and dermal, soil, and mother's milk absorption. Off-site worker exposure used an adjustment factor of 2.18 to represent 11 hours per day of facility operation, in accordance with OEHHA Risk Assessment Guidelines. Long-term risks (i.e., cancer risk and chronic non-carcinogenic hazard index) and short-term risk (acute HI) was calculated at the fenceline, as well as the grid receptors.

C.6.5 Health Risk Assessment Results

Table C-19 presents the risk assessment results for both residential and off-site worker exposure. The calculated cancer risks were below 10 in one million, and the calculated chronic non-carcinogenic and acute hazard indices were less than 1.0. All predicted risks are below the established health risk assessment significance thresholds. Digital modeling files are provided in **Attachment C.3** on CD-ROM.

Table C-19. Maximum Predicted Risks

Receptor/Exposure	Cancer Risk (Per Million)	Chronic Hazard Index	Acute Hazard Index
Residential/Sensitive	~~0.16~~0.07	~~4.20~~3.30E-04	~~0.22~~0.21
Off-Site Worker	~~0.02~~0.01	~~9.15~~7.19E-04	~~0.22~~0.21
Significance Thresholds	**10.0**	**1.0**	**1.0**

ATTACHMENT C.1
Construction Emission Calculation Spreadsheets

ATTACHMENT C.2
Operational Emission Calculation Spreadsheets