their locations. This approach is believed to overestimate the predicted concentrations under inversion breakup fumigation conditions.

Calculation of inversion breakup fumigation impacts is shown in Appendix B, Table B-5.

Shoreline Fumigation Modeling

Shoreline fumigation modeling was conducted to determine the impacts as a result of overwater plume dispersion. Because land surfaces tend to both heat and cool more rapidly than water, shoreline fumigation tends to occur on sunny days when the denser cooler air over water displaces the warmer, lighter air over land. During an inland sea breeze, the unstable air over land gradually increases in depth with inland distance. The boundary between the stable air over the water and the unstable air over the land and the wind speed determine if the plume will loop down before much dispersion of the pollutants has occurred. SCREEN3 can examine sources within 3000 meters of a large body of water, and was used to calculate the maximum shoreline fumigation impact. The model uses a stable onshore flow and a wind speed of 2.5 meters per second; the maximum ground-level shoreline fumigation concentration is assumed by the model to occur where the top of the stable plume intersects the top of the well-mixed thermal inversion boundary layer (TIBL). The model TIBL height was varied in accordance with BAAQMD procedures (between 2 and 6) to determine the highest shoreline fumigation impact. The worst-case (highest) impact was used in determining facility impacts due to shoreline fumigation. Based on the analysis performed for the original CC8 project, shoreline fumigation was assumed to persist for a maximum of 180 minutes, and the impacts on all short-term averaging periods were assessed. Calculation of shoreline fumigation impacts is shown in Appendix B, Table B-6.

Turbine Startup

Facility impacts were also modeled during the startup of one turbine to evaluate short-term impacts under startup conditions. Emission rates during startup were based on an engineering analysis of available data, which included source test data from startups of the GE gas turbines at Los Medanos Energy Center and Moss Landing Power Plant. Turbine exhaust parameters for the minimum operating load point (50%) were used to characterize turbine exhaust during startup. Startup impacts were evaluated for the 1-hour averaging period using AERMOD.[8] Calculation of startup impacts is shown in more detail in Appendix B, Table B-7.

Turbine Commissioning

During commissioning, one or both of the CTGs may operate without emission controls while the CTGs and HRSGs are being tuned and tested. Commissioning impacts were evaluated for both the 1- and 8-hour averaging periods using AERMOD. Calculation of commissioning impacts is shown in more detail in Appendix B, Table B-8.

---

[8] Modeling for CO impacts for the 8-hour averaging period include startup.

3. Results of the Ambient Air Quality Modeling Analysis

The maximum facility impacts modeled for each of the analyses described above are summarized in Table 17 below. Highest 1-hour average NO_2 and CO impacts are expected to occur during the brief periods when the fire pump is being tested.

Table 17
Summary of Results from Refined Modeling Analysis for Permitted Sources

Pollutant	Averaging Time	Modeled Concentration ($\mu g/m^3$)			
		Normal Operation[1]	Inversion Breakup Fumigation[2]	Shoreline Fumigation[2]	Startup
NO_2	1 hour	146.8	6.3	40.3	104.9
	annual	3.4	n/a	n/a	n/a
SO_2	1 hour	9.8	2.4	15.7	n/a
	3 hours	4.8	2.2	14.1	n/a
	24 hours	1.0	1.0	1.6	n/a
	annual	0.12	n/a	n/a	n/a
CO	1 hour	51.4	7.7	49.1	926
	8 hours	292.5	5.4	16.2	n/a[3]
PM_{10}	24 hours	4.0	2.3	3.9	n/a
	annual	1.4	n/a	n/a	n/a

Notes:
1. Includes fire pump. Without fire pump, maximum 1-hour average NO_2 concentration is 68 ug/m^3.
2. Inversion breakup and shoreline fumigation are short-term phenomena and do not affect annual impacts.
3. Included in 8-hour impacts for normal operations.

C. Total Ambient Air Quality Impacts

The maximum facility impacts including the exempt sources are summarized in Table 18 below. To determine the maximum ground-level impacts on ambient air quality for comparison with the applicable state and federal ambient air quality standards, modeled worst-case impacts were added to maximum existing pollutant concentrations in the area. Maximum ground-level impacts for allowable operation of the facility are shown together with the ambient air quality standards in Table 18.

Table 18
Modeled Maximum Project Impacts[1]

Pollutant	Averaging Time	Maximum Facility Impact[1] ($\mu g/m^3$)	Background[2] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1 hour	151.8	109	260.8	338[3]	--
	annual	3.4	20.8	24.2	56[3]	100
SO_2	1 hour	16	117	133	655	--
	3 hours	14	65.0	79	--	1300
	24 hours	1.6	26.3	27.9	105	365
	annual	0.1	5.3	5.4	--	80
CO	1 hour	926	5,125	6,051	23,000	40,000
	8 hours	293	2,133	2,426	10,000	10,000
PM_{10}	24 hours	4.0	64.0	68	50	150
	annual	1.4	21.7	22.1	20	--

Notes:
1. See Note 1, Table 15.
2. Background concentrations reflect highest monitored concentrations from Pittsburg and Bethel Island monitoring stations, 2004-2006.
3. The ARB amended the Nitrogen Dioxide ambient air quality standard February 22, 2007, to lower the 1-hr standard to 0.18 ppm and establish a new annual standard of 0.030 ppm. These changes will become effective after regulatory changes are submitted and approved by the Office of Administrative Law.

Appendix A

Emissions Calculations

Table A-1
Gateway Generating Station
Emissions and Operating Parameters for CTGs

Case	Cold Base	Cold Low	Avg. Base	Avg. Low	Avg. Peak	Hot Base	Hot Low	Hot Peak
Turbine Load, MW	192.7		181.4		181.4	181.4		181.4
Ambient Temp, F	30	30	60	60	60	100	100	100
Turbine Load, %								
Chiller On/Off	Off	Off	On	On	On	On	On	On
CTG heat input, MMBtu/hr (HHV	1848.1	1209.0	1848.1	1271.9	1848.1	1848.1	1114.0	1848.1
DB heat input, MMBtu/hr (HHV)	0.0	0.0	0.0	0.0	246.3	0.0	0.0	246.3
Total heat input, MMBtu/hr (HHV	1848.1	1209.0	1848.1	1271.9	2094.4	1848.1	1114.0	2094.4
Stack flow, lb/hr	3,371,393	2,205,562	3,391,353	2,334,098	3,120,398	3,446,840	2,077,733	3,171,163
Stack flow, acfm	928,011	607,104	936,640	644,642	865,245	960,629	579,061	887,192
Stack flow, dscfm	689,649	451,167	689,649	474,650	624,466	689,649	415,716	624,466
Stack temp, F	180	180	180	180	180	180	180	180
Stack exhaust, vol %								
O2 (dry)	13.00%	13.00%	13.00%	13.00%	11.00%	13.00%	13.00%	11.00%
CO2 (dry)	4.52%	4.52%	4.52%	4.52%	5.65%	4.52%	4.52%	5.65%
H2O	8.54%	8.54%	9.38%	9.38%	11.17%	11.64%	11.64%	13.37%
Emissions								
NOx, ppmvd @ 15% O2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NOx, lb/hr	13.40	8.76	13.40	9.22	15.18	13.40	8.08	15.18
NOx, lb/MMBtu	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072
SO2, ppmvd @ 15% O2	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
SO2, lb/hr (short-term)	5.22	3.42	5.22	3.59	5.92	5.22	3.15	5.92
SO2, lb/MMBtu (short-term)	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028
SO2, lb/hr (long-term)	3.92	2.56	3.92	2.69	4.44	3.92	2.36	4.44
SO2, lb/MMBtu (long-term)	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
CO, ppmvd @ 15% O2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
CO, lb/hr	16.31	10.67	16.31	11.23	18.49	16.31	9.83	18.49
CO, lb/MMBtu	0.0088	0.0088	0.0088	0.0088	0.0100	0.0088	0.0088	0.0100
POC, ppmvd @ 15% O2	2.00	2.00	2.00	2.00	1.60	2.00	2.00	2.00
POC, lb/hr	4.67	3.06	4.67	3.22	4.23	4.67	2.82	5.29
POC, lb/MMBtu	0.0025	0.0025	0.0025	0.0025	0.0023	0.0025	0.0025	0.0029
PM10, lb/hr	11.0	11.0	11.0	11.0	12.0	11.0	11.0	12.0
PM10, lb/MMBtu	0.0060	0.0091	0.0060	0.0086	0.0065	0.0060	0.0099	0.0065
PM10, gr/dscf	0.00186	0.00284	0.00186	0.00270	0.00224	0.00186	0.00309	0.00224
NH3, ppmvd@15% O2	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
NH3, lb/hr	24.80	16.22	24.80	17.07	28.10	24.80	14.95	28.10

Table A-2
Gateway Generating Station
Calculation of Wet SAC Emissions

Typical Worst-Case Design Parameters	
Water Flow Rate, 10E6 lbm/hr	2.59
Water Flow Rate, gal/min	5,180
Drift Rate, %	0.0030
Drift, lbm water/hr	77.67
PM10 Emissions based on TDS Level	
TDS level, ppm (based on 5 COC)	2500
PM10, lb/hr	0.19
PM10, lb/day	4.7
PM10, tpy	0.85

Based on 8760 hrs/yr

Table A-3
Gateway Generating Station
Emissions for Dewpoint Heater

Fuel Gas Flow, MMBtu/hr (HHV)	6.5
Fuel Gas Flow, scfh	6418
Exhaust Flow Rate, acfm	1964
Stack Gas Temperature, deg F	300
Stack Diameter, inches	7.981
Emissions	
NOx, ppmvd @ 3% O2 (1)	50
NOx, lb/MMBtu (HHV) (1)	0.060
CO, ppmvd @ 3% O2 (1)	40
CO, lb/MMBtu (HHV) (1)	0.029
POC, ppmvd @ 3% O2 (1)	5.5
POC, lb/MMBtu (HHV) (1)	0.0045
PM10, lb/MMBtu (HHV) (1)	0.0074
SO2, lb/MMscf (3)	2.86
NOx, lb/hr (2)	0.392
CO, lb/hr (2)	0.191
POC, lb/hr (2)	0.029
PM10, lb/hr	0.048
SO2, lb/hr	0.018

Notes:
1. Manufacturer specification at rated heater capacity.
2. Manufacturer guarantee
3. Calculated from sulfur content of natural gas (<1 gr/100 scf)

Table A-4
Gateway Generating Station
Diesel Fire Pump Performance and Emissions

Engine		
Fire Pump Mfr		Clarke
Engine Mfr		John Deere
Model		JU6H-UF40
Useable Horsepower	hp	300
Speed	rpm	2100
Fuel		CA Diesel
Specific Gravity		0.825
Fuel Sulfur Content	wt %	0.0015%
Fuel Consumption	gph	14
	Btu/bhp-hr	0
Exhaust Flow	acfm	1740
Stack Velocity	ft/sec	13.4
Exhaust Temperature	deg. F	770
Exhaust Pipe Diameter	in	6.065
Exhaust Stack Height	ft	10.67
Pump		
Speed	rpm	2100
Capacity	gpm	2500
Pump Efficiency	%	74
Brake Horsepower	bhp	300
Operating Profile		
Annual Operation	hrs	50
Emissions		
	g/bhp-hr	lb/hr
NOx	4.36	2.88
CO	0.32	0.21
ROC	0.29	0.19
PM10	0.12	0.08
SO2	--	0.0029

Diesel fuel	7.00	lb/gal
	136,903	Btu/gal

Table A-5
Gateway Generating Station
Detailed Calculations for Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions

Assumptions for Daily and Annual Ops:	Startup/ Shutdown Hours	Duct Firing Hours	Base Load Hours	
NOx, POC, CO	6	18	0	per day
CO	520	4380	324	per year
NOx, POC	365	5840	1825	per year
SOx, PM10	0	24	0	per day
	0	5100	3660	per year

Equipment	max. hour	NOx (lbs/hr)	SOx (lbs/hr) short-term	SOx (lbs/hr) annual avg	CO (lbs/hr)	POC (lbs/hr)	PM10 (lbs/hr)	NH3 (lbs/hr)
Gas Turbine 1, base	0	13.40	5.22	3.92	16.31	4.67	11.00	24.80
Gas Turbine 2, base	0	13.40	5.22	3.92	16.31	4.67	11.00	24.80
Gas Turbine 1, peak	1	15.18	5.92	4.44	18.49	5.29	12.00	28.10
Gas Turbine 2, peak	0	15.18	5.92	4.44	18.49	5.29	12.00	28.10
Gas Turbine 1, startups/shutdowns	0	100.00	5.22	n/a	900.00	16.00	11.00	24.80
Gas Turbine 2, startups/shutdowns	1	100.00	5.22	n/a	900.00	16.00	11.00	24.80
Dewpoint Heater	1	0.39	1.83E-02	1.38E-02	0.19	0.03	0.05	0
WSAC	1	0.00	0.00	n/a	0.00	0.00	0.19	0
Diesel Fire Pump Engine	1	2.88	2.94E-03	n/a	0.21	0.19	0.08	0

Detailed Calculations for Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions

	NOx Emissions			SOx Emissions			CO Emissions			POC Emissions			PM10 Emissions		
Equipment	Max lb/hr	Max lb/day	Total tpy	Max lb/hr	Max lb/day	Total tpy	Max lb/hr	Max lb/day	Total tpy	Max lb/hr	Max lb/day	Total tpy	Max lb/hr	Max lb/day	Total tpy
Gas Turbine 1, base	0.0	0.0	12.2	0.0	0.0	7.2	0.0	0.0	2.6	0.0	0.0	4.3	0.0	0.0	20.1
Gas Turbine 2, base	0.0	0.0	12.2	0.0	0.0	7.2	0.0	0.0	2.6	0.0	0.0	4.3	0.0	0.0	20.1
Gas Turbine 1, peak	15.2	273.3	44.3	5.9	142.0	11.3	18.5	332.8	40.5	5.3	95.3	15.5	12.0	288.0	30.6
Gas Turbine 2, peak	0.0	273.3	44.3	5.9	142.0	11.3	0.0	332.8	40.5	0.0	95.3	15.5	12.0	288.0	30.6
Gas Turbine 1, startups/shutdowns	0.0	600.0	18.3	0.0	0.0	0.0	0.0	5,400.0	234.0	0.0	96.0	2.9	0.0	0.0	0.0
Gas Turbine 2, startups/shutdowns	160.0	600.0	18.3	0.0	0.0	0.0	900.0	5,400.0	234.0	16.0	96.0	2.9	0.0	0.0	0.0
Dewpoint Heater	0.4	9.4	1.7	1.8E-02	0.4	0.1	0.2	4.6	0.8	2.9E-02	0.7	0.1	0.05	1.2	0.2
WSAC	--	--	--	--	--	--	--	--	--	--	--	--	0.2	4.7	0.9
Diesel Fire Pump Engine	2.9	2.9	0.1	2.9E-03	2.9E-03	7.4E-05	0.2	0.2	5.3E-03	0.2	0.2	0.0	0.1	0.1	2.0E-03
Total, CTGs/HRSGs only	175.2 lb/hr	1,746.6 lb/day	149.6 tpy	11.8 lb/hr	284.0 lb/day	36.96 tpy	918.5 lb/hr	11,465.6 lb/day	554.3 tpy	21.3 lb/hr	382.6 lb/day	45.3 tpy	24.0 lb/hr	576.0 lb/day	101.5 tpy
Total Permitted Equipment (excluding WSAC)	178.5 lb/hr	1,758.9 lb/day	151.4 tpy	11.9 lb/hr	284.4 lb/day	37.0 tpy	918.9 lb/hr	11,470.4 lb/day	555.1 tpy	21.5 lb/hr	383.5 lb/day	45.4 tpy	24.1 lb/hr	577.2 lb/day	101.7 tpy
Proposed Permit (excluding WSAC)		1,994.0 lb/day	174.3 tpy		297.0 lb/day	37.8 tpy		11,470.4 lb/day	555.1 tpy		468.0 lb/day	46.6 tpy		624.0 lb/day	101.7 tpy
Existing Permit		1,994.0 lb/day	174.3 tpy		297.0 lb/day	48.5 tpy		3,602.0 lb/day	259.1 tpy		468.0 lb/day	46.6 tpy		624.0 lb/day	112.2 tpy

Table A-6
Gateway Generating Station
Calculation of Noncriteria Pollutant Emissions from Gas Turbines

Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr Each CTG (2)	Maximum Hourly Emissions, lb/hr Total, 2 CTGs	Total Annual Emissions, 2 CTGs (3) lb/yr	Total Annual Emissions, 2 CTGs (3) tpy
Ammonia	(4)	28.10	56.21	468,197.8	234.1
Propylene	7.71E-01	1.60	3.19	26,588.8	13.3
Hazardous Air Pollutants					
Acetaldehyde	4.08E-02	8.44E-02	1.69E-01	1,407.0	0.70
Acrolein	3.69E-03	7.64E-03	1.53E-02	127.3	6.36E-02
Benzene	3.33E-03	6.89E-03	1.38E-02	114.8	5.74E-02
1,3-Butadiene	4.39E-04	9.09E-04	1.82E-03	15.1	7.57E-03
Ethylbenzene	3.26E-02	6.75E-02	1.35E-01	1,124.2	5.62E-01
Formaldehyde	3.67E-01	0.76	1.52	12,656.4	6.33
Hexane	2.59E-01	0.54	1.07	8,931.9	4.47
Naphthalene	1.66E-03	3.44E-03	6.87E-03	57.2	2.86E-02
PAHs (5)	4.57E-05	9.45E-05	1.89E-04	1.6	7.87E-04
Propylene oxide	2.98E-02	6.17E-02	0.12	1,027.7	0.51
Toluene	1.33E-01	2.75E-01	0.55	4,586.7	2.29
Xylene	6.53E-02	1.35E-01	0.27	2,251.9	1.13
Total HAPs			3.88	32,302.0	16.15

Notes:

(1) All factors except PAHs, hexane and propylene from AP-42, Table 3.4-1. Acrolein, benzene and formaldehyde reflect oxidation catalyst. Individual PAHs, hexane and propylene are CATEF mean results as AP-42 does not include factors for these compounds.

(2) Based on maximum hourly turbine fuel use of 2094 MMBtu/hr and fuel HHV of 1012 Btu/scf. 2.07 MMscf/hr

(3) Based on total annual fuel use of 34,900,000 MMBtu/yr and fuel HHV of 1012 Btu/scf 34,486.2 MMscf/yr

(4) Based on 10 ppm ammonia slip from SCR system.

(5) Emission factors for individual PAHs weighted by cancer risk relative to B(a)P and summed to obtain overall B(a)P equivalent emission rate for HRA.

	Mean EF	PEF Equiv.	PEF-Weighted EF
PAHs (as B(a)P)			
Benzo(a)anthracene	2.26E-05	0.1	2.26E-06
Benzo(a)pyrene	1.39E-05	1	1.39E-05
Benzo(b)fluoranthrene	1.13E-05	0.1	1.13E-06
Benzo(k)fluoranthrene	1.10E-05	0.1	1.10E-06
Chrysene	2.52E-05	0.01	2.52E-07
Dibenz(a,h)anthracene	2.35E-05	1.05	2.47E-05
Indeno(1,2,3-cd)pyrene	2.35E-05	0.1	2.35E-06

Table A-7
Gateway Generating Station
Calculation of Noncriteria Pollutant Emissions from Dewpoint Heater

Compound	Emission Factor, lb/MMscf (1)	Hourly Emissions, lb/hr (2)	Total Annual Emissions (3) lb/yr	tpy
Propylene	7.30E-01	4.69E-03	41.0	2.05E-02
Hazardous Air Pollutants				
Acetaldehyde	4.30E-03	2.76E-05	0.2	1.21E-04
Acrolein	2.70E-03	1.73E-05	0.2	7.59E-05
Benzene	8.00E-03	5.13E-05	0.4	2.25E-04
1,3-Butadiene	n/a	--	--	--
Ethylbenzene	9.50E-03	6.10E-05	0.5	2.67E-04
Formaldehyde	1.70E-02	1.09E-04	1.0	4.78E-04
Hexane	6.30E-03	4.04E-05	0.4	1.77E-04
Naphthalene	3.00E-04	1.93E-06	1.7E-02	8.43E-06
PAHs (excluding naphthalene)	1.00E-04	6.42E-07	5.6E-03	2.81E-06
Propylene oxide	n/a	--	--	--
Toluene	3.66E-02	2.35E-04	2.1	1.03E-03
Xylene	2.72E-02	1.75E-04	1.5	7.65E-04
Total HAPs			6.3	3.15E-03

Notes:
(1) All factors from Ventura County APCD, "AB2588 Combustion Emission Factors," Natural Gas Fired External Combustion Equipment <10 MMBtu/hr. Available at http://www.vcapcd.org/pubs/Engineering/AirToxics/combem.pdf
(2) Based on maximum hourly heat input of 6418 scf/hr
(3) Based on total annual fuel use of 56.2 MMscf/yr

Appendix B

Modeling Parameters

Table B-1
Gateway Generating Station
Building Dimensions Used for Modeling

Structure	Dimensions (meters)		
	Height	**Length (y)**	**Width (x)**
Onsite Structures			
Combustion Turbines (each)	17.4	10.0	79.0
HRSGs (each)	28.0	10.0	24.0
Air-Cooled Condenser	39.0	86.0	76.0
Wet Surface Air Cooler	5.8	4.0	17.0
Dewpoint Heater	1.8	8.0	1.0
Firepump Engine Encl.	3.3	21.0	12.0
Tank 88	5.2	15.0	
Tank 89	5.2	10.0	
Tank 144	6.4	9.0	
Tank 149	5.2	7.0	
Offsite Structures			
Units 6&7	44.7	35.0	94.0
Steam Turbine Bldg	20.6	44.0	113.0
Units 1-3	42.1	46.0	60.0
Units 4&5	20.6	26.0	87.0
Tanks 1-5	22.0	43.0	
Tanks 6-8	29.3	98.0	

Table B-2
Gateway Generating Station
Emissions and Stack Parameters for Screening Modeling

Turbine Case		Ambient		Stack	Stack Ht	Exhaust Temp	Exhaust Velocity	NOx, g/s	SO2, g/s	CO, g/s	PM10, g/s
Number	Condition	Temp	Load	Diam (m)	(m)	(deg K)	(m/s)	per turbine	per turbine	per turbine	per turbine
1	Cold Base	30.0	100%	5.11	59.436	355.222	21.369	1.688	6.578E-01	2.056	1.386
2	Cold Low	30.0	50%	5.11	59.436	355.222	13.979	1.104	4.303E-01	1.345	1.386
3	Avg. Base	60.0	100%	5.11	59.436	355.222	21.567	1.688	6.578E-01	2.056	1.386
4	Avg. Low	60.0	50%	5.11	59.436	355.222	14.844	1.162	4.527E-01	1.415	1.386
5	Avg. Peak	60.0	100%	5.11	59.436	355.222	19.923	1.913	7.455E-01	2.330	1.512
6	Hot Base	100.0	100%	5.11	59.436	355.222	22.120	1.688	6.578E-01	2.056	1.386
7	Hot Low	100.0	50%	5.11	59.436	355.222	13.334	1.018	3.965E-01	1.239	1.386
8	Hot Peak	100.0	100%	5.11	59.436	355.222	20.429	1.913	7.455E-01	2.330	1.512

Table B-3
Gateway Generating Station
Results of the CTG Screening Analysis

Case	Max. Impact, ug/m3 per 1.0 g/s				
	1-hr	3-hr	8-hr	24-hr	annual
	2004 Met Data				
1	10.698	6.188	2.996	1.022	0.145
2	13.185	6.859	3.989	1.454	0.211
3	10.646	6.163	2.973	1.014	0.144
4	12.533	6.732	3.833	1.363	0.200
5	11.048	6.364	3.154	1.077	0.155
6	10.494	6.092	2.913	0.994	0.141
7	13.609	6.979	4.112	1.527	0.219
8	10.933	6.304	3.096	1.057	0.152
	2005 Met Data				
1	12.629	4.762	2.076	1.249	0.167
2	14.740	6.646	3.074	1.902	0.241
3	12.599	4.723	2.055	1.239	0.165
4	14.171	6.357	2.922	1.803	0.229
5	12.774	5.062	2.231	1.330	0.178
6	12.504	4.617	2.001	1.214	0.161
7	15.136	6.874	3.195	1.980	0.250
8	12.737	4.952	2.175	1.299	0.174
	2006 Met Data				
1	11.574	5.657	3.217	1.291	0.157
2	14.091	7.289	3.811	1.887	0.225
3	11.506	5.650	3.197	1.283	0.156
4	13.583	7.050	3.694	1.780	0.215
5	12.063	5.809	3.355	1.356	0.168
6	11.314	5.629	3.142	1.261	0.152
7	14.465	7.449	3.912	1.965	0.234
8	11.884	5.697	3.307	1.332	0.164

Table B-3 (cont'd)

Emission Rates for Screening Modeling (lb/hr)										
Turbine	NOx		SO2				CO		PM10	
Case	1-hr	annual avg	1-hr	3-hr	24-hr	annual avg	1-hr	8-hr	24-hr	annual avg
1	14.11	19.69	5.498	5.498	5.498	4.31	17.18	17.18	11.0	11.59
2	7.93	19.69	3.089	3.089	3.089	4.31	9.65	9.65	11.0	11.59
3	13.40	19.69	5.221	5.221	5.221	4.31	16.31	16.31	11.0	11.59
4	9.22	19.69	3.593	3.593	3.593	4.31	11.23	11.23	11.0	11.59
5	15.18	19.69	5.917	5.917	5.917	4.31	18.49	18.49	12.0	11.59
6	13.40	19.69	5.221	5.221	5.221	4.31	16.31	16.31	11.0	11.59
7	8.39	19.69	3.269	3.269	3.269	4.31	10.21	10.21	11.0	11.59
8	15.18	19.69	5.917	5.917	5.917	4.31	18.49	18.49	12.0	11.59

Turbine Emission Rates for Screening Modeling (g/s)										
Turbine	NOx		SO2				CO		PM10	
Case	1-hr	annual avg	1-hr	3-hr	24-hr	annual avg	1-hr	8-hr	24-hr	annual avg
1	1.778	2.481	0.693	0.693	0.693	0.543	2.165	2.165	1.386	1.460
2	0.999	2.481	0.389	0.389	0.389	0.543	1.216	1.216	1.386	1.460
3	1.688	2.481	0.658	0.658	0.658	0.543	2.056	2.056	1.386	1.460
4	1.162	2.481	0.453	0.453	0.453	0.543	1.415	1.415	1.386	1.460
5	1.913	2.481	0.745	0.745	0.745	0.543	2.330	2.330	1.512	1.460
6	1.688	2.481	0.658	0.658	0.658	0.543	2.056	2.056	1.386	1.460
7	1.057	2.481	0.412	0.412	0.412	0.543	1.287	1.287	1.386	1.460
8	1.913	2.481	0.745	0.745	0.745	0.543	2.330	2.330	1.512	1.460

Turbine	Load/ Ambient	Modeled Impacts, ug/m3, by Pollutant and Averaging Period									
		NOx		SO2				CO		PM10	
Case	Temp	1-hr	Annual	1-hr	3-hr	24-hr	Annual	1-hr	8-hr	24-hr	Annual
1	Cold Base	22.450	0.414	8.7482	4.287	0.8947	0.0906	27.338	6.963	1.79	0.244
2	Cold Low	14.721	n/a	5.7364	2.837	0.7400	n/a	17.926	4.852	2.64	n/a
3	Avg. Base	21.268	0.411	8.2876	4.054	0.8441	0.0898	25.898	6.572	1.78	0.242
4	Avg. Low	16.465	n/a	6.4159	3.192	0.8162	n/a	20.049	5.423	2.50	n/a
5	Avg. Peak	**24.437**	**0.442**	**9.5226**	**4.744**	**1.0111**	**0.0967**	**29.757**	**7.815**	2.05	**0.260**
6	Hot Base	21.108	0.401	8.2252	4.007	0.8293	0.0876	25.703	6.460	1.75	0.236
7	Hot Low	15.998	n/a	6.2340	3.068	0.8153	n/a	19.481	5.292	**2.74**	n/a
8	Hot Peak	24.367	0.432	9.4953	4.700	0.9932	0.0945	29.672	7.705	2.01	0.254

Table B-4
Gateway Generating Station
Emission Rates and Stack Parameters for Refined Modeling

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s NOx	SO2	CO	PM10
Averaging Period: One hour									
Gas Turbine 1	5.108	59.436	355.37	408.350	19.923	1.9131	0.7455	2.3296	n/a
Gas Turbine 2	5.108	59.436	355.37	408.350	19.923	1.9131	0.7455	2.3296	n/a
Dewpoint Heater	0.203	4.715	422.04	0.927	28.719	0.0494	2.310E-03	2.408E-02	n/a
Fire Pump Engine	0.154	3.251	683.15	0.821	44.058	0.3633	3.704E-04	2.667E-02	n/a
Averaging Period: Three hours SOx									
Gas Turbine 1	5.108	59.436	355.37	408.350	19.923	n/a	0.7455	n/a	n/a
Gas Turbine 2	5.108	59.436	355.37	408.350	19.923	n/a	0.7455	n/a	n/a
Dewpoint Heater	0.203	4.715	422.04	0.927	28.719	n/a	2.310E-03	n/a	n/a
Fire Pump Engine	0.154	3.251	683.15	0.821	44.058	n/a	1.235E-04	n/a	n/a
Averaging Period: Eight hours CO									
Gas Turbine 1	5.108	59.436	355.37	408.350	19.923	n/a	n/a	85.6324	n/a
Gas Turbine 2	5.108	59.436	355.37	408.350	19.923	n/a	n/a	85.6324	n/a
Dewpoint Heater	0.203	4.715	422.04	0.927	28.719	n/a	n/a	2.408E-02	n/a
Fire Pump Engine	0.154	3.251	683.15	0.821	44.058	n/a	n/a	3.333E-03	n/a
Averaging Period: 24-hour SOx									
Gas Turbine 1	5.108	59.436	355.37	408.350	19.923	n/a	0.7455	n/a	n/a
Gas Turbine 2	5.108	59.436	355.37	408.350	19.923	n/a	0.7455	n/a	n/a
Dewpoint Heater	0.203	4.715	422.04	0.927	28.719	n/a	2.310E-03	n/a	n/a
Fire Pump Engine	0.154	3.251	683.15	0.821	44.058	n/a	1.544E-05	n/a	n/a
Averaging Period: 24-hour PM10									
Gas Turbine 1	5.108	59.436	355.37	273.286	13.334	n/a	n/a	n/a	1.3860
Gas Turbine 2	5.108	59.436	355.37	273.286	13.334	n/a	n/a	n/a	1.3860
Dewpoint Heater	0.203	4.715	422.04	0.927	28.719	n/a	n/a	n/a	6.044E-03
Fire Pump Engine	0.154	3.251	683.15	0.821	44.058	n/a	n/a	n/a	4.167E-04
WSAC (each, eight cells)	1.651	5.823	308.15	28.317	13.227	n/a	n/a	n/a	3.058E-03
Averaging Period: Annual									
Gas Turbine 1	5.108	59.436	355.37	408.350	19.923	2.4813	0.5316	n/a	1.4594
Gas Turbine 2	5.108	59.436	355.37	408.350	19.923	2.4813	0.5316	n/a	1.4594
Dewpoint Heater	0.203	4.715	422.04	0.927	28.719	4.939E-02	1.733E-03	n/a	6.044E-03
Fire Pump Engine	0.154	3.251	683.15	0.821	44.058	2.074E-03	2.114E-06	n/a	5.708E-05
WSAC (each, eight cells)	1.651	5.823	308.15	28.317	13.227	n/a	n/a	n/a	3.058E-03

Table B-5
Gateway Generating Station
Calculation of Inversion Fumigation Impacts

CTG Emission Rates, g/s per train

Case	NOx	SO2	CO	PM10
1	1.688	0.658	2.056	1.386
2	1.104	0.430	1.345	1.386
3	1.688	0.658	2.056	1.386
4	1.162	0.453	1.415	1.386
5	1.913	0.745	2.330	1.512
6	1.688	0.658	2.056	1.386
7	1.018	0.397	1.239	1.386
8	1.913	0.745	2.330	1.512

Inversion Breakup Modeling Results from SCREEN3

Case	Unit Impacts, ug/m3 per g/s	Maximum One-Hour Avg Impacts, ug/m3, 2 trains				Distance to Maximum (m)
		NOx	SO2	CO	PM10	
1	1.035	3.4944	1.3617	4.2552	2.8690	18,291
2	1.32	2.9155	1.1361	3.5503	18.2952	15,269
3	1.132	3.8219	1.4893	4.6540	15.6895	17,107
4	1.402	3.2578	1.2695	3.9671	19.4317	14,592
5	1.185	4.5341	1.7668	5.5212	17.9172	16,538
6	1.348	4.5512	1.7735	5.5420	18.6833	15,032
7	1.816	3.6959	1.4402	4.5005	25.1698	12,034
8	1.413	5.4065	2.1068	6.5835	21.3646	14,507

Flat Terrain Modeling Results from SCREEN3

Case	Unit Impacts, ug/m3 per g/s	Maximum One-Hour Avg Impacts, ug/m3, 2 trains				Distance to Maximum (m)
		NOx	SO2	CO	PM10	
1	0.9819	3.3151	1.2918	4.0369	2.7218	1,074
2	1.316	2.9067	1.1327	3.5395	3.6480	1,085
3	1.089	3.6767	1.4327	4.4772	3.0187	1,149
4	1.521	3.5344	1.3772	4.3038	4.2162	1,038
5	1.17	4.4767	1.7444	5.4513	3.5381	1,124
6	1.532	5.1724	2.0156	6.2985	4.2467	1,035
7	2.068	4.2088	1.6400	5.1250	5.7325	949
8	1.642	6.2827	2.4482	7.6504	4.9654	1,014

Adjust unit impacts for longer averaging periods to account for 90-minute duration of fumigation

Case	1-hr unit	3-hr unit	8-hr unit	24-hr unit
1	1.035	1.008	0.992	0.985
2	1.320	1.318	1.317	1.316
3	1.132	1.111	1.097	1.092
4	1.521	1.521	1.521	1.521
5	1.185	1.178	1.173	1.171
6	1.532	1.532	1.532	1.532
7	2.068	2.068	2.068	2.068
8	1.642	1.642	1.642	1.642

Table B-5 (cont'd)

Calculation of Fumigation Impacts

Case/Avg Period	NOx	SO2	CO	PM10
One-Hour				
1	3.4944	1.3617	4.2552	-
2	2.9155	1.1361	3.5503	-
3	3.8219	1.4893	4.6540	-
4	3.5344	1.3772	4.3038	-
5	4.5341	1.7668	5.5212	-
6	5.1724	2.0156	6.2985	-
7	4.2088	1.6400	5.1250	-
8	**6.2827**	**2.4482**	**7.6504**	-
3 Hours				
1	-	1.1941	-	-
2	-	1.0209	-	-
3	-	1.3149	-	-
4	-	1.2395	-	-
5	-	1.5801	-	-
6	-	1.8140	-	-
7	-	1.4760	-	-
8	-	**2.2034**	-	-
8 Hours				
1	-	-	2.8545	-
2	-	-	2.4791	-
3	-	-	3.1572	-
4	-	-	3.0127	-
5	-	-	3.8251	-
6	-	-	4.4089	-
7	-	-	3.5875	-
8	-	-	**5.3553**	-
24 Hours				
1	-	0.5185	-	1.0924
2	-	0.4532	-	1.4595
3	-	0.5745	-	1.2105
4	-	0.5509	-	1.6865
5	-	0.6983	-	1.4164
6	-	0.8062	-	1.6987
7	-	0.6560	-	**2.2930**
8	-	**0.9793**	-	1.9862

Table B-6
Gateway Generating Station
Calculation of Shoreline Fumigation Impacts

Emission Rates, g/s per CTG

Case	NOx	SO2	CO	PM10
1	1.688	0.658	2.056	1.386
2	1.104	0.430	1.345	1.386
3	1.688	0.658	2.056	1.386
4	1.162	0.453	1.415	1.386
5	1.913	0.745	2.330	1.512
6	1.688	0.658	2.056	1.386
7	1.018	0.397	1.239	1.386
8	1.913	0.745	2.330	1.512

Shoreline Fumigation Breakup Modeling Results from SCREEN3

	Unit Impacts, ug/m3 per g/s					Distance to Maximum (m)
Case	TIBL 2	TIBL 3	TIBL 4	TIBL 5	TIBL 6	
1	0.713	1.941	3.670	5.558	7.334	1,553
2	0.897	2.541	4.876	7.429	9.756	1,188
3	0.776	2.144	4.075	6.184	8.148	1,409
4	0.948	2.710	5.220	7.978	10.450	1,111
5	0.811	2.255	4.298	6.528	8.595	1,340
6	0.915	2.601	4.998	7.624	10.000	1,159
7	1.183	3.559	6.956	10.710	13.890	833
8	0.954	2.732	5.265	8.049	10.540	1,102

Highest Shoreline Fumigation Breakup Modeling Results (TIBL = 6)

Case	Impacts, ug/m3 per g/s	Maximum One-Hour Avg Impacts, ug/m3, 2 trains				Distance to Maximum (m)
		NO2	SO2	CO	PM10	
1	7.334	24.76	9.65	30.15	20.33	1,647
2	9.76	21.55	8.40	26.24	27.04	1,144
3	8.148	27.51	10.72	33.50	22.59	1,409
4	10.45	24.28	9.46	29.57	28.97	1,111
5	8.595	32.89	12.81	40.05	25.99	1,340
6	10.00	33.76	13.16	41.11	27.72	1,159
7	13.89	28.27	11.02	34.42	38.50	855
8	10.54	40.33	15.71	49.11	31.87	1,102

Table B-6 (cont'd)

Flat Terrain Modeling Results from SCREEN3

Case	Impacts, ug/m3 per g/s	Maximum One-Hour Avg Impacts, ug/m3, 2 trains				Distance to Maximum (m)
		NOx	SO2	CO	PM10	
1	0.9754	3.2932	1.2833	4.0101	2.7038	1,075
2	1.242	2.7433	1.0690	3.3405	3.4428	1,104
3	1.089	3.6767	1.4327	4.4772	3.0187	1,149
4	1.521	3.5344	1.3772	4.3038	4.2162	1,038
5	1.17	4.4767	1.7444	5.4513	3.5381	1,124
6	1.532	5.1724	2.0156	6.2985	4.2467	1,035
7	2.068	4.2088	1.6400	5.1250	5.7325	949
8	1.642	6.2827	2.4482	7.6504	4.9654	1,014

Adjust unit impacts for longer averaging periods to account for 180-minute duration of fumigation (ug/m3 per g/s)

Case	1-hr unit	3-hr unit	8-hr unit	24-hr unit
1	7.334	7.334	3.360	1.770
2	9.76	9.76	4.435	2.306
3	8.148	8.148	3.736	1.971
4	10.45	10.45	4.869	2.637
5	8.595	8.595	3.954	2.098
6	10.00	10.00	4.708	2.591
7	13.89	13.89	6.501	3.546
8	10.54	10.54	4.979	2.754

Table B-6 (cont'd)

Calculation of Shoreline Fumigation Impacts

Case/Avg Period	NO2	SO2	CO	PM10
One-Hour				
1	24.76	9.65	30.15	-
2	21.55	8.40	26.24	-
3	27.51	10.72	33.50	-
4	24.28	9.46	29.57	-
5	32.89	12.81	40.05	-
6	33.76	13.16	41.11	-
7	28.27	11.02	34.42	-
8	**40.33**	**15.71**	**49.11**	-
3 Hours				
1	-	8.68	-	-
2	-	7.56	-	-
3	-	9.65	-	-
4	-	8.52	-	-
5	-	11.53	-	-
6	-	11.84	-	-
7	-	9.91	-	-
8	-	**14.14**	-	-
8 Hours				
1	-	-	9.67	-
2	-	-	8.35	-
3	-	-	10.75	-
4	-	-	9.64	-
5	-	-	12.90	-
6	-	-	13.55	-
7	-	-	11.28	-
8	-	-	**16.24**	-
24 Hours				
1	-	0.93	-	1.96
2	-	0.79	-	2.56
3	-	1.04	-	2.19
4	-	0.96	-	2.92
5	-	1.25	-	2.54
6	-	1.36	-	2.87
7	-	1.12	-	**3.93**
8	-	**1.64**	-	3.33

Table B-7
Gateway Generating Station
Emission Rates and Stack Parameters for Modeling Startup Impacts
One CTG in startup, per Condition 22

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Em Rates, g/s	
						NOx	CO
One unit in startup	5.108	59.436	355.222	273.286	13.334	20.16	113.40
One unit in operation (Case 5)	5.108	59.436	355.222	408.350	19.923	1.91	2.33
Dewpoint Heater	0.203	4.715	421.889	0.927	28.719	0.05	0.02

Table B-8
Gateway Generating Station
Emission Rates and Stack Parameters for Modeling Commissioning Impacts

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Em Rates, g/s	
						NOx	CO
Gas Turbine 1	5.108	59.436	355.222	273.286	13.334	25.20	252.00
Gas Turbine 2	5.108	59.436	355.222	273.286	13.334	25.20	252.00

Max. Modeled Impact During Commissioning of Two CTGs

	Max Modeled Conc, ug/m3	Background, ug/m3	Total Impact, ug/m3	State Standard, ug/m3	Federal Standard, ug/m3
NO2, 1 hr ozone lmtd	152	109	261	338	--
CO, 1 hr	4,065	5,125	9,190	23,000	40,000
CO, 8 hr	1,042	2,133	3,175	10,000	10,000

Attachment B-1

Modeling Protocol and BAAQMD Comments

sierra research

Gateway Generating Station Modeling Protocol

prepared for:

Pacific Gas & Electric Company

August 2007

prepared by:

Sierra Research, Inc.

1801 J Street

Sacramento, California 95811

Gateway Generating Station
Modeling Protocol

August 2007

Prepared for
Pacific Gas & Electric Company

Prepared by

Sierra Research
1801 J Street
Sacramento, CA 95811
(916) 444-6666

Gateway Generating Station
Modeling Protocol

Table of Contents

Gateway Generating Station
Modeling Protocol
August 2007

1. BACKGROUND

On behalf of Pacific Gas & Electric Company (PG&E), Sierra Research is submitting this modeling protocol to the Bay Area Air Quality Management District (BAAQMD or District) and California Energy Commission (CEC) for approval of the air dispersion and health risk assessment modeling proposed to be conducted in support of modifications to the Gateway Generating Station (GGS or Project) BAAQMD Authority to Construct and the CEC Conditions of Certification. GGS was permitted by the BAAQMD and licensed by the CEC in 2001 as Contra Costa Power Project Unit 8 (CC8), which was then owned by Mirant Delta LLC. Mirant commenced construction of the facility in late 2001, but suspended construction activities in February 2002. Ownership of the project was transferred to PG&E in November 2006, and construction recommenced in early February 2007. The BAAQMD renewed the Authority to Construct in June 2007. In August 2007, the CEC approved several changes to the project that did not require changes to the BAAQMD Authority to Construct; the most notable air quality-related change was the replacement of the original wet cooling tower with an air-cooled condenser and small wet surface-air cooler.

PG&E has reviewed the permit conditions and emission limits in the Authority to Construct and the Conditions of Certification and has determined that several changes to the physical design of the facility and to several of the operating assumptions are needed to allow the facility to operate effectively and efficiently. In the application to be filed with the District and the CEC, PG&E will propose the following changes to the permitted facility:

- Eliminate the 10-cell wet cooling tower and replace it with a dry cooling system, including an exempt wet surface air cooler;[1]
- Replace the permitted natural gas-fired dew point gas heater with a smaller unit and increase allowable daily hours of operation;
- Change the allowable emission limits for the gas turbines during startup operations;

[1] As indicated above, this amendment has already been approved by the CEC. However, since the installation of the dry cooling system did not require a change to the BAAQMD ATC, the BAAQMD permit does not yet include this project modification.

- Reduce the permitted hourly emission rates for NOx and PM_{10} and increase the allowable ammonia slip limit, based on current BACT and on operating experience from other 7FA gas turbine facilities;
- Reduce the annual average allowable sulfur content of the natural gas;
- Reduce the permitted hourly emission rates and increase the annual emission limit for CO, based on current BACT and operating experience from other 7FA gas turbine facilities;
- Change the allowable emission rates for the gas turbines and HRSGs during commissioning activities, based on recent project experience; and
- Replace the electric motor-driven fire water pump with a 300 kW Diesel fire pump engine.

Annual emission limits of all pollutants except CO will be reduced or will stay the same as the limits in the existing ATC and conditions of certification. The proposed increase in annual CO emissions will exceed 100 tons per year, so the Project will be a major modification of the existing major source under District New Source Review regulations.

PG&E is also proposing to increase allowable short-term emissions of NOx and CO from the CTGs/HRSGs during startups and commissioning operations. No increases in short-term or annual SO_2 or PM_{10} emissions will result from the proposed permit modifications.

Impacts from operation of the facility will be compared to the following thresholds:

Air Quality Criteria	NO_2	CO
PSD Significant Impact Levels	n/a[a,b]	√
BAAQMD Significant Impact Levels	n/a[a]	√
PSD Monitoring Exemption Levels	n/a[a]	√
Ambient Air Quality Standards (AAQS)	√[c]	√

Notes:
a. PSD significant impact and monitoring exemption levels apply only if the project is subject to PSD review. Because the project will not result in an increase in permitted annual NOx emissions, the project is not subject to PSD review for NO_2.
b. n/a: Not applicable.
c. State one-hour average NO_2 standard only.

2. Project Location

The project is located at 3225 Wilbur Avenue, Antioch. The location of the site is approximately 4208.2 km N, 609.0 km E. The nominal site elevation is 2 meters (6.6 feet) above mean sea level.

3. EMISSION SOURCES

GGS is a 530-megawatt (MW) nominal combined cycle electric generation facility. Permitted equipment at GGS consists of two GE 7FA natural gas-fired combustion turbines with supplemental duct fired heat recovery steam generators (S-41, S-42, S-43 and S-44), a natural gas fired dew point gas heater (S-45), a 10-cell cooling tower (S-46) and an oil-water separator (S-48). The proposed equipment changes and their potential emissions and air quality impacts are listed below.

- Replace the 10-cell cooling tower (S-46) with air-cooled condenser and small wet surface-air cooler, both exempt from permitting, reducing PM_{10} emissions;
- Replace the natural gas-fired dew point gas heater (S-45) with a smaller unit and increase allowable daily operation, reducing hourly NOx emissions (no increase in annual NOx emissions); and
- Add a new Diesel fire pump engine, adding a source of Diesel particulate matter (a toxic air contaminant).

4. METEOROLOGICAL DATA

The ambient air quality analysis will use four years of meteorological data (1994 through 1997) collected at the existing Contra Costa Power Plant less than one-half of a mile from the proposed project site. Upper air data will be taken from Oakland. The BAAQMD's standard maximum mixing height of 600 meters will be used. The meteorological data processor AERMET will be used to generate AERMOD-compatible meteorological data for air dispersion modeling.

5. SITE REPRESENTATION – METEOROLOGICAL DATA

USEPA defines the term "site specific data" to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates in the Clean Air Act at Section 165(e)(1), which requires an analysis "of the ambient air quality at the proposed site and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility."

This requirement and USEPA's guidance on the use of on-site monitoring data are also outlined in the "*Meteorological Monitoring Guidance for Regulatory Modeling Applications*" (2000). The representativeness of the data depends on (a) the proximity of the meteorological monitoring site to the area under consideration, (b) the complexity of the topography of the area, (c) the exposure of the meteorological sensors, and (d) the period of time during which the data are collected. The meteorological data collected at the Contra Costa Power Plant have previously been accepted by the BAAQMD and CEC staffs as representative of conditions at the project site.[2]

6. EXISTING AMBIENT AIR QUALITY DATA

Background ambient air quality data for the project area during 2004-2006 will be obtained from the monitoring site nearest to the project site. The Pittsburg 10th Street monitoring site is the nearest with background data for CO and NO_2. Modeled concentrations will be added to these representative background concentrations to determine compliance with the CAAQS and NAAQS.

7. AIR QUALITY DISPERSION MODELS

Overview

The following USEPA air dispersion models are proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources' operating parameters and their locations:

- American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) model, also known as AERMOD (Version 07026);
- Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME, current version 04274); and
- SCREEN3 (Version 96043).

The following models are not expected to be used, but they are listed in the event that an optional specialized modeling analysis is necessary for the project.

- Complex Terrain SCREEN (CTSCREEN, Version 94111); and
- Complex Terrain Dispersion Model (CTDMPLUS, Version 93228).

The three primary models listed above, and how they are used, are discussed below. Further information on the use of CTDMPLUS and CTSCREEN is provided in Appendix B.

Simple, Complex, and Intermediate Terrain Impacts

For modeling project emissions in simple, complex, and intermediate terrain, the USEPA-recommended guideline model AERMOD will be used with the AERMET-processed hourly meteorological data from the Contra Costa Power Plant monitoring station during 1994-1997. The AERMOD model requires hourly

---

[2] BAAQMD, Final Determination of Compliance, Contra Costa Power Plant Unit 8 Project, February 2, 2001; and CEC Final Staff Assessment for Contra Costa Power Plant Unit 8 Project (00-AFC-1), March 2001.

meteorological data consisting of wind vector and speed (with reference height), temperature (with reference height), Monin-Obukhov length, surface roughness length, heights of the mechanically- and convectively-generated boundary layers, surface friction velocity, convective velocity scale, and vertical potential temperature gradient in the 500-meter layer above the planetary boundary layer. The model assumes that there is no variability in meteorological parameters over a one-hour time period, hence the term "steady-state." The AERMOD 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 this model. The parameters we propose to use in the AERMET Stage 3 processing to characterize surface conditions are shown in detail in Appendix A.

Standard AERMOD control parameters will be used (stack tip downwash, non-screening mode, non-flat terrain, sequential meteorological data check employed). 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 per USEPA and BAAQMD guidance. Other options that will be used in accordance with BAAQMD guidance include gradual plume rise and buoyancy-induced dispersion. As for the original modeling analysis for this facility, the rural default option will be used.[3]

Ozone Limiting Method

For evaluating compliance with the state one-hour average NO_2 standard, the tiered screening approach as described in "Supplement C To The Guideline On Air Quality Models (Revised)," EPA, August 1995 (EPA-450/2-78-027R-C) will be used. The initial assumption will be that all of the NOx converts to NO_2. If maximum hourly NO_2 concentrations need to be examined in more detail, the Plume Volume Molar Ratio Method (PVMRM) adaptation of the Ozone Limiting Method (Cole and Summerhays, 1979) will be used. AERMOD PVMRM will be used to calculate the NO_2 concentration based on the PVMRM method and hourly ozone data. Hourly ozone data collected at the Pittsburg 10th Street monitoring station during the years 1994-1997 will be used in conjunction with PVMRM to calculate hourly NO_2 concentrations from hourly NOx concentrations. Missing hourly ozone data will be substituted prior to use with day-appropriate values (e.g., from the previous day, or the next day, for the same hour). Any other missing hourly ozone data will be substituted with 40 ppb ozone (typical ozone tropospheric background level). The PVMRM involves an initial comparison of the estimated maximum NOx concentration and the ambient O_3 concentration in the plume after dilution to determine whether NO or O_3 is the limiting factor to NO_2 formation. If the O_3 concentration is greater than the maximum

---

[3] The rural vs. urban option in AERMOD is primarily designed to set the fraction of incident heat flux that is transferred into the atmosphere. This fraction becomes important in urban areas having an appreciable "urban heat island" effect due to a large presence of land covered by concrete, asphalt, and buildings. This situation does not exist for the proposed project site.

NOx concentration, total conversion is assumed. If the NOx concentration is greater than the remaining O_3 concentration, the formation of NO_2 is limited by the remaining ambient O_3 concentration. In this case, the NO_2 concentration is set equal to the O_3 concentration plus a correction factor that accounts for in-stack and near-stack thermal conversion.

Fumigation

The SCREEN3 model will be used to evaluate inversion breakup and shoreline fumigation impacts for short-term averaging periods (24 hours or less), as appropriate. The methodology in USEPA, 1992 (Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised) and BAAQMD guidance (*http://www.baaqmd.gov/pmt/air_toxics/permit_ modeling/pmt_modeling_guidance.pdf*) will be followed for these analyses. Combined impacts for all sources under fumigation conditions will be evaluated, based on USEPA and applicable BAAQMD modeling guidelines.

8. GOOD ENGINEERING PRACTICE (GEP) STACK HEIGHT AND DOWNWASH

AERMOD can account for building downwash effects on dispersing plumes. Stack locations and heights and building locations and dimensions will be input to BPIP-PRIME. The first part of BPIP-PRIME determines and reports on whether a stack is being subjected to wake effects from a structure or structures. The second part calculates direction-specific building dimensions for each structure that are used by AERMOD to evaluate wake effects. The BPIP-PRIME output is formatted for use in AERMOD input files.

9. RECEPTOR SELECTION

Receptor and source base elevations will be determined from USGS Digital Elevation Model (DEM) data using the 7½-minute format (10- to 30-meter spacing between grid nodes). All coordinates will be referenced to UTM North American Datum 1927 (NAD27), Zone 11. The AERMOD receptor elevations will be interpolated among the DEM nodes according to standard AERMAP procedure. For determining concentrations in elevated terrain, the AERMAP terrain preprocessor receptor-output (ROU) file option will be chosen; hills will not be imported into AERMOD for CTDM-like processing.

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 250-meter resolution coarse receptor grid will be developed and will extend outwards at least 10 km (or more as necessary to calculate the significant impact area).

For the full impact analyses, a nested grid will be developed to fully represent the maximum impact area(s). This grid will have 25-meter resolution along the facility fence-line in a single tier of receptors composed of four segments extending out to 100 meters from the fenceline, 100-meter resolution from 100 meters to 1,000 meters from the fenceline, and 250-meter spacing out to at least 10 km from the site. When maximum first-high or maximum second-high impacts occur in the 250-meter spaced area, additional refined receptor grids with 25-meter resolution will be placed around the maximum coarse grid impacts and extended out 1,000 meters in all directions. Concentrations within the facility fenceline will not be calculated.

10. MODELING SCENARIOS

The only changes proposed for the emissions limitations affect short-term emission limits and/or short-term standards. Therefore, the following scenarios will be modeled:

- 1-hr and 8-hr average CO during turbine startup/shutdown and turbine commissioning; and
- 1-hr average NO_2 during turbine startup/shutdown and turbine commissioning.

In the modeling analysis, startup conditions will be represented by minimum load (50% load) stack parameters and proposed permitted emission rates.

Details of Operating Scenarios

The following table gives more detail on the operating modes to be modeled.

Operating Modes of the Combustion Gas Turbines

Mode	Description
Commissioning	The process of fine-tuning each of the turbines. The facility will follow a systematic approach to optimize performance of the turbines and the associated control equipment. Emissions are expected to be greater during commissioning than during normal operation for NOx, CO, and POC. This one-time mode affects only the initial year of operation.
Startup/Shutdown	Startup NOx and CO emissions are higher because low-NOx combustors are not able to operate in their optimal mode, and the SCR and oxidation catalysts have not reached optimal temperature to begin the chemical reactions needed to reduce NOx and oxidize CO in the turbine/HRSG exhaust. Shutdown occurs at the initiation of the turbine shutdown sequence and ends with the cessation of turbine firing. Typically, the shutdown process will have lower emissions than the startup process so will not be modeled separately.

Ambient Air Quality Impact Analyses

In evaluating the impacts of the proposed project on ambient air quality, we will model the ambient impacts of the project, add those impacts to background concentrations, and compare the results to the state and federal ambient standards for NO_2 and CO.

11. CLASS I AREA IMPACT METHODOLOGY

No changes are being proposed that would affect annual emissions of pollutants that interfere with visibility or produce acid deposition (NO_2, SO_2 or PM_{10}), and hence, no significant impacts are expected on Class I areas.

12. SCREENING HEALTH RISK ANALYSIS

District Regulation 2, Rule 5 requires preconstruction review for potential health impacts from new and modified sources of toxic air contaminants. Toxic emissions are estimated for all sources within a proposed project; if emissions from a proposed project exceed the BAAQMD regulatory trigger levels, a Health Risk Screening Analysis (HRSA) is required to determine project risk and risk from each source. A HRSA was prepared for the original permitting and licensing of the CC8 project. This HRSA will be updated to reflect the proposed 10 ppm ammonia slip level, the proposed new Diesel emergency fire pump engine, and the most current risk values published by OEHHA. The HRA modeling will be prepared using ARB's Hotspots Analysis and Reporting Program (HARP) computer program (Version 1.3, October 18, 2005). The HARP model will be used to assess cancer risk as well as non-cancer chronic and acute health hazards. The HRA will include the four following pathways: inhalation, dermal absorption, soil and mother's milk ingestion.

Because the HARP model incorporates the previously USEPA-approved model ISCST3, a special methodology will be employed to be consistent with using AERMOD for the air dispersion modeling and retain the health values and risk computations provided by HARP Version 1.3. The OEHHA/ARB-approved methodology used to prepare the HRA has been described by the ARB[4] and is described below. Its use has also been accepted by both the CEC and the District for previous power plant projects.

Modeling Inputs – The risk assessment module of the HARP model is run using unit ground level impacts to obtain derived cancer risks for each toxic air contaminant (TAC). The HARP model output is cancer risk by TAC and pathway for each type of analysis, based on an exposure of 1.0 $\mu g/m^3$. Individual cancer risks are expressed in units of risk per $\mu g/m^3$ of exposure. To calculate the weighted risk for each source, the annual average emission rate in grams per second for each TAC will be multiplied by the individual cancer risk for that TAC in units of $(\mu g/m^3)^{-1}$. The resulting weighted cancer risks for each TAC will then be summed for the source. The same approach will be used to determine the non-cancer acute and chronic health hazards associated with the Project.

Health risk from exposure to a carcinogenic TAC is calculated as the product of the exposure concentration times a factor representing the risk per unit concentration (i.e., unit risk) for the TAC. In the case of cancer risk, the risk per unit concentration depends on breathing rate, the cancer potency factor of the TAC, dimensional factors, and other

[4] ARB. Part B of Topic 8 of the HARP How-To Guides: How to Perform Health Analyses Using a Ground Level Concentration.