Russell City Energy Center

Appendix 8.1-A
Detailed Emissions Calculations

May 2001

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Table 8.1A-1a. Summary of startup emissions data - pounds per hour.

Project	Notes	POC	CO	NO_x	SO_x	PM_{10}
Crockett Cogeneration						
6/96 avg.	Source Tests[a]	54	46	59	-	-
6/97 avg.		<1	31	41	-	-
min run		<1	27	9	-	-
max run		59	49	95	-	-
Crockett Cogeneration	FDOC[b]	170	385	160	-	-
SF Energy	FDOC	299	437	77	-	-
Sutter						
Cold Start	From	-	838	175	-	-
Hot Start	Westinghouse	-	902	170	-	-
Sutter						
Cold Start	FDOC[c]	1.1	838	175	2.7	9.0
Hot Start		1.1	902	170	2.7	9.0
Westinghouse						
Cold Start	[d]	292	1722	183	3	28
Warm Start		296	1625	221	3	25
Hot Start		442	2142	217	4	33
Bechtel - DEC						
Cold Start	From	437	3317	168	-	7
Hot Start	Westinghouse [e]	520	7343	189	-	8
Used in RCEC AFC						
Cold Start	[f]	16	838	80	1.4	9
Hot Start		16	902	80	1.4	9

Notes:
[a]Minimum and maximum values are based on the six individual runs that comprise the two sets of tests.
[b]Permit conditions have not been carried forward into the permit to operate, and are no longer in effect.
[c]Values shown are from the engineering analysis; there are no proposed permit conditions for startup emissions limits in the proposed FDOC.
[d] Westinghouse provided data for the DEC plant (3 turbines) on a lbs/start basis. The above lbs/hr values were calculated assuming a 3 hour starting period per turbine for a cold start; 2 hours for a warm start; and 1 hour for a hot start. Data do not reflect the performance of oxidation catalysts or CO catalysts.
[e]Bechtel estimates are 140 minutes for cold start for first engine; 40 minutes for cold start for second and third engines; and 30 minutes for hot start for each engine.
[f]POC values are two times full load emission rates. CO values are equivalent to values proposed for Sutter project. NO_x values are 30 percent higher than the higher of the two Crockett test averages, rounded up to the nearest 5 lbs/hr. SO_x and PM_{10} values are the full load emission rates.

Table 8.1A-1b. Summary of Startup Emissions Data - pounds per start per turbine.

Project	Notes	POC	CO	NO_x	SO_x	PM_{10}
Crockett Cogeneration						
6/96 avg.	Source Tests[a]	71	62	79	-	-
6/97 avg.		1	41	54	-	-
min run		<1	36	12	-	-
max run		79	66	127	-	-
Crockett Cogeneration	FDOC[b]	340	770	320	-	-
SF Energy	FDOC[c]	299	437	77	-	-
Sutter						
Cold Start	From	-	611	2932	-	-
Hot Start	Westinghouse	-	339	1804	-	-
Sutter						
Cold Start	Proposed	3	2514	525	8	27
Hot Start	FDOC[d]	1	902	170	3	9
Westinghouse						
Cold Start	[e]	875	5167	550	8	83
Warm Start		592	3250	442	5	50
Hot Start		442	2142	217	4	33
Bechtel - DEC						
Cold Start	From	1019	7740	391	-	17
Hot Start	Westinghouse	520	3671	189	-	4
Used in RCEC AFC						
Cold Start	[f]	48	2514	240	4.2	27
Hot Start		16	902	80	1.4	9

Notes:
[a]Data extrapolated from reported hourly values by ratio of 80/60.
[b]Values based on maximum two hours per startup.
[c]Values based on maximum one hour per startup.
[d]Values based on maximum three hours per cold start, one hour per hot start.
[e]Westinghouse provided data for the DEC plant (3 turbines). Data do not reflect the performance of oxidation catalysts or CO catalysts.
[f]Based on maximum three hours per cold start, one hour per hot start.

Table 8.1A-2. Detailed calculations for maximum hourly, daily, and annual criteria pollutant emissions.

Maximum Hourly, Daily and Annual Emissions	Base Load			Cold Start		Hot Start		NOx			SO2
	max. hour	hrs/day	hrs/yr	hrs/day	hrs/yr	hrs/day	hrs/yr	Base Load lb/hr	Cold Start lb/hr	Hot Start lb/hr	lb/hr
Turbine 1, no DB	1	4	6844	3	156	1	260	19.5	80	80	1.40
Turbine 2, no DB	0	2	6844	3	156	1	260	19.5	80	80	1.40
Turbine 1, w/ DB&PA	0	16	1500	0	0	0	0	21.4	0	0	1.50
Turbine 2, w/ DB&PA	1	16	1500	0	0	0	0	21.4	0	0	1.50
Emergency generator	1	1	200	0	0	0	0	1.77	0	0	0.004
Fire pump engine	1	1	30	0	0	0	0	3.90	0	0	0.106
Cooling tower	1	24	8760	0	0	0	0	0	0	0	0

	CO			POC			
	Base Load lb/hr	Cold Start lb/hr	Hot Start lb/hr	Base Load lb/hr	Cold Start lb/hr	Hot Start lb/hr	PM10 lb/hr
Turbine 1, no DB	28.8	838.0	902.0	2.6	16.0	16.0	9.0
Turbine 2, no DB	28.8	838.0	902.0	2.6	16.0	16.0	9.0
Turbine 1, w/ DB&PA	31.7	0	0	2.8	0.0	0.0	12.0
Turbine 2, w/ DB&PA	31.7	0	0	2.8	0.0	0.0	12.0
Emergency generator	3.02	0	0	1.42	0.0	0.0	0.0006
Fire pump engine	2.35	0	0	0.48	0.0	0.0	0.13
Cooling tower	0	0	0	0.0	0.0	0.0	0.69

	NOx			SO2			CO			POC			PM10		
	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
Turbine 1, no DB	80.0	398.0	83.4	1.4	11.2	5.1	902.0	3,531.2	281.2	16.0	74.2	12.1	9.0	72.0	32.7
Turbine 2, no DB	0.0	359.0	83.4	0.0	8.4	5.1	0.0	3,473.6	281.2	0.0	69.1	12.1	0.0	54.0	32.7
Turbine 1, w/ DB	0.0	342.4	16.1	0.0	24.0	1.1	0.0	507.2	23.8	0.0	44.8	2.1	0.0	192.0	9.0
Turbine 2, w/ DB	21.4	342.4	16.1	1.5	24.0	1.1	31.7	507.2	23.8	2.8	44.8	2.1	12.0	192.0	9.0
Emergency generator	0.0	0.0	0.18	0.0	0.0	0.0004	3.0	3.0	0.3	1.4	1.4	0.142	0.0	0.0	0.0001
Fire pump engine	3.9000	3.9000	0.0585	0.1060	0.1060	0.0016	0.0000	0.0000	0.0353	0.0000	0.0000	0.0072	0.0000	0.0000	0.0019
Cooling tower	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	16.4	3.0
Total	105.3 lb/hr	1445.7 lb/day	134.6 tpy	3.0 lb/hr	67.7 lb/day	12.4 tpy	936.7 lb/hr	8,022.2 lb/day	610.2 tpy	20.2 lb/hr	234.3 lb/day	28.5 tpy	21.7 lb/hr	526.4 lb/day	86.3 tpy

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NOTES FOR TABLE 8.1A-2

Calculation of Maximum Hourly, Daily and Annual Emissions

Calculation of Maximum Hourly Emissions

a. Turbines/HRSGs

As hourly NO_x, CO and POC emissions from the turbines are higher during startup than during full load operation, highest hourly emissions occur while one turbine is in startup mode. Except for startup, maximum hourly emissions from the turbines occur while operating at full load and 94 degF with power augmentation and duct firing. Emissions under this operating mode are higher than under part load or low temperature operations as the duct burner operates only at full load and high temperature conditions. Emissions under full and part load conditions at maximum and minimum site temperature conditions are shown in Tables 8.1A-3a and 3b.

Only one turbine at a time will be in startup mode. Therefore highest hourly emissions from the turbines will occur when one turbine is starting up and the other is operating at full load with power augmentation and duct firing.

b. Auxiliary Boiler

No auxiliary boiler is proposed for the RCEC project.

c. Emergency Generator and Fire Pump

The emergency generator and the fire pump will not operate simultaneously. Maximum hourly NO_x and SO_2 emissions will occur while the fire pump is operating; highest hourly CO and PM_{10} emissions occur when the emergency generator is operating. Emissions from these units are shown in Table 8.1A-2. Toxic pollutant emissions from these devices are shown in Tables 8.1A-7, and 8.1A-8.

d. Cooling Tower

Maximum hourly emissions occur while the cooling tower is operating at full capacity.

Calculation of Maximum Daily Emissions

a. Turbines/HRSGs

As discussed above for the hourly emissions calculations, hourly NO_x, CO and POC emissions are highest during startup. The operating conditions having the next highest hourly emissions are full load operation at 94 degF with power augmentation and duct firing, followed by full load operation at 34 degF. Duct burner operation will not exceed 16 hours a day. Therefore maximum daily turbine emissions will occur on a day when each turbine has one hot and one cold start, operates at full load with power augmentation and duct firing for 16 hours, and operates at full load without power augmentation and duct burning for the rest of the day. Again, both turbines will not be in startup mode simultaneously; there will be a two-hour period between starting the first and second turbines.

b. Auxiliary Boiler

No auxiliary boiler is proposed for the RCEC project.

c. Emergency Generator and Fire Pump

The emergency generator and fire pump will operate a maximum of one hour per day for testing, and the two units will not be tested on the same day. Therefore maximum daily emissions correspond to one hour of operation of the unit that has the higher emissions.

d. Cooling Tower

Maximum daily cooling tower emissions will occur while the cooling tower is in operation for 24 hours.

8.1A.1.3 Maximum Annual Emissions

a. Turbines/HRSGs

Each turbine is assumed to have a maximum of 52 cold starts (156 hours) and 260 hot starts (260 hours) each year. Duct firing will be limited to the equivalent of 1500 full load hours per year per turbine. Therefore the calculation of maximum annual emissions from each turbine is based on the following assumptions:

156 hours of cold start operation
260 hours of hot start operation
1500 hours of operation with power augmentation and duct firing
6844 hours of operation at full load, 34 degF

b. Auxiliary Boiler

No auxiliary boiler is proposed for the RCEC project.

c. Emergency Generator and Fire Pump

The emergency generator and fire pump will operate a maximum of 200 and 30 hours respectively per year each. Annual emissions are based on this yearly operation.

Table 8.1A-3a. Gas turbines: parameters for screening modeling.

Case	Ambient Temp, deg F	Load, %	Exhaust Temp, deg K	Diameter, m	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Exhaust Velocity, ft/sec	Stack Temp, deg F	Stack Diam, ft	Exhaust Flow, acfm
2	34	100% no DB, no PA	349.67	5.486	495.79	20.97	68.80	170	18	1,050,510
3	34	70% no DB, no PA	349.67	5.486	408.56	17.28	56.70	170	18	865,700
11	94	100% no DB, no PA	349.67	5.486	461.89	19.54	64.10	170	18	978,700
12	94	70% no DB, no PA	349.67	5.486	376.14	15.91	52.20	170	18	797,000
14	59	100% w/PA and DB	349.67	5.486	505.83	21.40	70.20	170	18	1,071,800
16	94	100% w/PA and DB	349.67	5.486	488.56	20.67	67.80	170	18	1,035,200

Case	NOx, g/s	SO2, g/s	CO, g/s	PM10, g/s	NOx, lb/hr	SO2, lb/hr	CO, lb/hr	PM10, lb/hr
2	2.407	0.176	3.566	1.134	19.10	1.400	28.30	9.00
3	1.814	0.126	2.684	1.134	14.40	1.000	21.30	9.00
11	2.205	0.164	3.276	1.134	17.50	1.300	26.00	9.00
12	1.588	0.113	2.356	1.134	12.60	0.900	18.70	9.00
14	2.696	0.189	3.994	1.512	21.40	1.500	31.70	12.00
16	2.596	0.189	3.856	1.512	20.60	1.500	30.60	12.00

Table 8.1A-3b. Exhaust and emissions characteristics for screening modeling analysis.

	Case 2	Case 3	Case 11	Case 12	Case 14	Case 16
	Low Temp Full Load w/o DB&PA	Low Temp Part Load	High Temp Full Load w/o DB&PA	High Temp Part Load	Annual Avgerage Temp Full Load w/ DB&PA	High Temp Full Load w/ DB&PA
Ambient Temp, F	34	34	94	94	59	94
RH, %	81	25	21	21	81	21
GT Load	100%	70%	100%	70%	100%	100%
Evap Cooler	off	off	on	off	on	on
Power Aug	off	off	off	off	on	on
GT heat input, MMBtu/hr	1979.4	1481.3	1819.7	1301.5	2017.2	1938.4
DB heat input, MMBtu/hr	0.0	0.0	0.0	0.0	200.0	200.0
Stack flow, lb/hr	3,892,145	3,214,566	3,611,972	2,956,737	3,882,594	3,741,967
Stack temp, F	170	170	170	170	170	170
Stack exhaust, vol %						
O2	12.5	13.22	12.33	13.45	10.54	10.42
CO2	3.79	3.47	3.73	3.3	4.16	4.16
H2O	8.07	7.43	9.38	7.71	14.29	14.91
Stack velocity, fps	68.8	56.7	64.1	52.2	70.2	67.8
NOx, lb/hr	19.1	14.4	17.5	12.6	21.4	20.2
NOx, ppmvd @ 15% O2 (2)	2.5	2.5	2.5	2.5	2.5	2.5
CO, lb/hr	28.3	21.3	26	18.7	31.7	29.9
CO, ppmvd @ 15% O2 (2)	6.0	6.0	6.0	6.0	6.0	6.0
VOC, lb/hr	2.5	1.9	2.3	1.7	2.8	2.7
VOC, ppmvd @ 15% O2 (2)	1.0	1.0	1.0	1.0	1.0	1.0
PM10, lb/hr (2)	9.0	9.0	9.0	9.0	12.0	12.0
SO2, lb/hr (3)	1.400	1.000	1.300	0.900	1.500	1.500
NH3, lb/hr	14.1	10.6	13	9.3	15.8	15.3
NH3, ppmvd @ 15% O2 (2)	5.0	5.0	5.0	5.0	5.0	5.0

Notes: 1. DB&PA: duct burner and power augmentation

Table 8.1A-4 (cont'd). Calculation of noncriteria pollutant emissions from cooling tower (1).

Calculation of Noncriteria Pollutant Emissions from Cooling Tower (cooling tower)						Modeled Emission Rates (each cell)		Modeled Concentrations (total all cells)	
Constituent	Concentration in Cooling Tower Return Water		Emissions, lb/hr	Emissions, lb/day	Emissions, ton/yr	One-hour Emissions, g/s	Annual Emissions, g/s	One-hour Impacts, ug/m3	Annual Impacts, ug/m3
Ammonia	4	ppm	1.37E-03	3.29E-02	6.00E-03	1.73E-05	1.73E-05	(2)	(2)
Arsenic	0	ppm	--	--	--	--	--	--	--
Cadmium	0	ppm	--	--	--	--	--	--	--
Chromium (III)	0	ppm	--	--	--	--	--	--	--
Copper	0	ppm	--	--	--	--	--	--	--
Lead	0	ppm	--	--	--	--	--	--	--
Mercury	0	ppm	--	--	--	--	--	--	--
Nickel	0	ppm	--	--	--	--	--	--	--
Silver	0	ppm	--	--	--	--	--	--	--
Zinc	0	ppm	--	--	--	--	--	--	--
PAHs	--		--	--	--	--	--	--	--

Notes: (1) Emissions calculated from maximum drift rate of 342.39 lb/hr.

(2) Modeled with turbines (see previous).

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Table 8.1A-5
Ammonia Emissions Calculations

Calculation of ammonia emissions from the gas turbines and duct burners is based on the proposed ammonia slip limit of 5 ppmvd.

Gas Turbines

Data supplied by Bechtel/Calpine pertaining to the operational scenarios for the gas turbines and duct burners indicates the following with respect to ammonia emissions for each gas turbine.

Table 8.1A-5. Ammonia emissions.

Scenario	Emissions
Maximum hourly, Case 14 W/Duct Burners, Pwr Aug, at 59 deg F	15.8 lbs/hr
Maximum annual, based on proposed Annual operating scenario.	65.39 tons/yr
Annualized hourly emissions, at 8760 hrs/yr	14.93 lbs/hr

Table 8.1A-6. Calculation of cooling tower emissions.

Cooling Tower Flow Characteristics: (from Bechtel, 4/27/01)	
Water Flow Rate, 10E6 lbm/hr	68.48
Water Flow Rate, gal/min	137,012
Drift Rate, %	0.0005
Drift, lbm water/hr	342.39
PM10 Emissions based on TDS Level	
TDS level, ppm	2000
PM10, lb/hr	0.685
PM10, tpy	3.00
PM10 Emissions for Modeling	
PM10 Emissions per cell, g/s	8.63E-03

Tower Description:	10 Cells
	Non-contact, closed circuit, counter flow
	Forced draft
	ACFM per cell = 1,478,900 (approx.)

Table 8.1A-7. Gaseous fuel IC engine air toxic emissions calculations.

Fuel Type:	Natural Gas		Max Hrs/Day:	1			Normalized Conc's	
Scf/Hr:	6302		Max Hrs/Yr:	200			ug/m3	ug/m3
MMcf/Hr:	0.006302						3238.32642	92.92491
MMcf/Yr:	1.2604						1-Hr	Annual
Substance	EF lbs/mmcf	lbs/hr	lbs/yr	tons/yr	Max Hr. g/sec	Annual g/sec	Impact ug/m3	Impact ug/m3
Acenaphtene	1.51E-04	9.52E-07	1.90E-04	9.52E-08	1.20E-07	2.74E-09	3.89E-04	2.55E-07
Acenapthylene	5.25E-04	3.31E-06	6.62E-04	3.31E-07	4.17E-07	9.53E-09	1.35E-03	8.85E-07
Anthracene	1.19E-04	7.50E-07	1.50E-04	7.50E-08	9.46E-08	2.16E-09	3.06E-04	2.01E-07
Benzo-a-anthracene	5.88E-05	3.71E-07	7.41E-05	3.71E-08	4.67E-08	1.07E-09	1.51E-04	9.91E-08
BaP	2.70E-06	1.70E-08	3.40E-06	1.70E-09	2.15E-09	4.90E-11	6.95E-06	4.55E-09
Benzo-a-fluoranthene	4.09E-05	2.58E-07	5.16E-05	2.58E-08	3.25E-08	7.42E-10	1.05E-04	6.90E-08
Benzo-ghi-perylene	7.54E-06	4.75E-08	9.50E-06	4.75E-09	5.99E-09	1.37E-10	1.94E-05	1.27E-08
Benzo-k-fluoranthene	7.83E-06	4.93E-08	9.87E-06	4.93E-09	6.22E-09	1.42E-10	2.02E-05	1.32E-08
Chrysene	1.43E-05	9.01E-08	1.80E-05	9.01E-09	1.14E-08	2.59E-10	3.68E-05	2.41E-08
Dibenz-ah-anthracene	2.70E-06	1.70E-08	3.40E-06	1.70E-09	2.15E-09	4.90E-11	6.95E-06	4.55E-09
Fluoranthene	2.91E-04	1.83E-06	3.67E-04	1.83E-07	2.31E-07	5.28E-09	7.49E-04	4.91E-07
Fluorene	4.36E-04	2.75E-06	5.50E-04	2.75E-07	3.47E-07	7.91E-09	1.12E-03	7.35E-07
Indeno-123cd-pyrene	7.17E-06	4.52E-08	9.04E-06	4.52E-09	5.70E-09	1.30E-10	1.85E-05	1.21E-08
Naphthalene	2.51E-02	1.58E-04	3.16E-02	1.58E-05	1.99E-05	4.55E-07	6.46E-02	4.23E-05
Phenanthrene	1.85E-03	1.17E-05	2.33E-03	1.17E-06	1.47E-06	3.36E-08	4.76E-03	3.12E-06
Pyrene	1.87E-04	1.18E-06	2.36E-04	1.18E-07	1.49E-07	3.39E-09	4.81E-04	3.15E-07
Ethylbenzene	7.11E-02	4.48E-04	8.96E-02	4.48E-05	5.65E-05	1.29E-06	1.83E-01	1.20E-04
13 Butadiene	3.67E-01	2.31E-03	4.63E-01	2.31E-04	2.92E-04	6.66E-06	9.45E-01	6.19E-04
Acetaldehyde	5.29E-01	3.33E-03	6.67E-01	3.33E-04	4.20E-04	9.60E-06	1.36E+00	8.92E-04
Acrolein	5.90E-02	3.72E-04	7.44E-02	3.72E-05	4.69E-05	1.07E-06	1.52E-01	9.95E-05
Benzene	2.18E-01	1.37E-03	2.75E-01	1.37E-04	1.73E-04	3.96E-06	5.61E-01	3.68E-04
Formaldehyde	4.71E+00	2.97E-02	5.94E+00	2.97E-03	3.74E-03	8.55E-05	1.21E+01	7.94E-03
Propylene	5.38E+00	3.39E-02	6.78E+00	3.39E-03	4.28E-03	9.76E-05	1.38E+01	9.07E-03
Toluene	2.39E-01	1.51E-03	3.01E-01	1.51E-04	1.90E-04	4.34E-06	6.15E-01	4.03E-04
Xylenes	6.46E-01	4.07E-03	8.14E-01	4.07E-04	5.13E-04	1.17E-05	1.66E+00	1.09E-03

EFs: CARB-CATEF Database (mean values for source type and category)

Table 8.1A-8. Liquid Fuel IC engine air toxics emissions calculations.

Fuel Type:	**Diesel**	**Max Hrs/Day:**		**1**			**Normalized Conc's**	
Gal/Hr:	**15.4**	**Max Hrs/Yr:**		**30**			**ug/m3**	**ug/m3**
Mgal/Hr:	**0.0154**						**1504.05872**	**48.75942**
Mgal/Yr:	**0.462**						**1-Hr**	**Annual**
	EF				**Max Hr.**	**Annual**	**Impact**	**Impact**
Substance	**lbs/Mgal**	**lbs/hr**	**lbs/yr**	**tons/yr**	**g/sec**	**g/sec**	**ug/m3**	**ug/m3**
Acenaphtene	6.71E-04	1.03E-05	3.10E-04	1.55E-07	1.30E-06	4.46E-09	1.96E-03	2.18E-07
Acenapthylene	1.02E-03	1.57E-05	4.71E-04	2.36E-07	1.98E-06	6.78E-09	2.98E-03	3.31E-07
Anthracene	2.23E-04	3.43E-06	1.03E-04	5.15E-08	4.33E-07	1.48E-09	6.51E-04	7.23E-08
Benzo-a-anthracene	9.60E-05	1.48E-06	4.44E-05	2.22E-08	1.86E-07	6.38E-10	2.80E-04	3.11E-08
BaP	7.90E-05	1.22E-06	3.65E-05	1.82E-08	1.53E-07	5.25E-10	2.31E-04	2.56E-08
Benzo-a-fluoranthene	1.12E-04	1.72E-06	5.17E-05	2.59E-08	2.18E-07	7.45E-10	3.27E-04	3.63E-08
Benzo-ghi-perylene	9.00E-05	1.39E-06	4.16E-05	2.08E-08	1.75E-07	5.99E-10	2.63E-04	2.92E-08
Benzo-k-fluoranthene	7.83E-05	1.21E-06	3.62E-05	1.81E-08	1.52E-07	5.21E-10	2.29E-04	2.54E-08
Chrysene	1.30E-04	2.00E-06	6.01E-05	3.00E-08	2.52E-07	8.65E-10	3.80E-04	4.22E-08
Dibenz-ah-anthracene	8.20E-05	1.26E-06	3.79E-05	1.89E-08	1.59E-07	5.45E-10	2.40E-04	2.66E-08
Fluoranthene	3.30E-04	5.08E-06	1.52E-04	7.62E-08	6.41E-07	2.19E-09	9.64E-04	1.07E-07
Fluorene	9.65E-04	1.49E-05	4.46E-04	2.23E-07	1.87E-06	6.42E-09	2.82E-03	3.13E-07
Indeno-123cd-pyrene	8.45E-05	1.30E-06	3.90E-05	1.95E-08	1.64E-07	5.62E-10	2.47E-04	2.74E-08
Naphthalene	1.60E-02	2.46E-04	7.39E-03	3.70E-06	3.11E-05	1.06E-07	4.67E-02	5.19E-06
Phenanthrene	3.54E-03	5.45E-05	1.64E-03	8.18E-07	6.88E-06	2.35E-08	1.03E-02	1.15E-06
Pyrene	2.64E-04	4.07E-06	1.22E-04	6.10E-08	5.13E-07	1.76E-09	7.71E-04	8.56E-08
Ethylbenzene	6.76E-03	1.04E-04	3.12E-03	1.56E-06	1.31E-05	4.50E-08	1.97E-02	2.19E-06
13 Butadiene	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Acetaldehyde	3.47E-03	5.34E-05	1.60E-03	8.02E-07	6.74E-06	2.31E-08	1.01E-02	1.13E-06
Acrolein	1.07E-03	1.65E-05	4.94E-04	2.47E-07	2.08E-06	7.12E-09	3.13E-03	3.47E-07
Benzene	1.81E-01	2.79E-03	8.36E-02	4.18E-05	3.52E-04	1.20E-06	5.29E-01	5.87E-05
Formaldehyde	5.10E-02	7.85E-04	2.36E-02	1.18E-05	9.90E-05	3.39E-07	1.49E-01	1.65E-05
Propylene	3.41E-01	5.25E-03	1.58E-01	7.88E-05	6.62E-04	2.27E-06	9.96E-01	1.11E-04
Toluene	6.10E-02	9.39E-04	2.82E-02	1.41E-05	1.18E-04	4.06E-07	1.78E-01	1.98E-05
Xylenes	2.10E-02	3.23E-04	9.70E-03	4.85E-06	4.08E-05	1.40E-07	6.13E-02	6.81E-06
Hexane	1.39E-03	2.14E-05	6.42E-04	3.21E-07	2.70E-06	9.24E-09	4.06E-03	4.51E-07
Arsenic	1.60E-03	2.46E-05	7.39E-04	3.70E-07	3.11E-06	1.06E-08	4.67E-03	5.19E-07
Beryllium	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cadmium	1.50E-03	2.31E-05	6.93E-04	3.47E-07	2.91E-06	9.98E-09	4.38E-03	4.86E-07
Hex Chromium	1.00E-04	1.54E-06	4.62E-05	2.31E-08	1.94E-07	6.65E-10	2.92E-04	3.24E-08
Copper	4.10E-03	6.31E-05	1.89E-03	9.47E-07	7.96E-06	2.73E-08	1.20E-02	1.33E-06
Lead	8.30E-03	1.28E-04	3.83E-03	1.92E-06	1.61E-05	5.52E-08	2.42E-02	2.69E-06
Manganese	3.10E-03	4.77E-05	1.43E-03	7.16E-07	6.02E-06	2.06E-08	9.06E-03	1.01E-06
Mercury	2.00E-03	3.08E-05	9.24E-04	4.62E-07	3.88E-06	1.33E-08	5.84E-03	6.49E-07
Nickel	3.90E-03	6.01E-05	1.80E-03	9.01E-07	7.57E-06	2.59E-08	1.14E-02	1.26E-06
Selenium	2.20E-03	3.39E-05	1.02E-03	5.08E-07	4.27E-06	1.46E-08	6.43E-03	7.13E-07
Zinc	2.24E-02	3.45E-04	1.03E-02	5.17E-06	4.35E-05	1.49E-07	6.54E-02	7.26E-06
Diesel PM	8.3E+00	1.28E-01	3.8E+00	1.91E-03	1.61E-02	5.51E-05	2.42E+01	2.69E-03

EFs: CARB-CATEF Database (mean values for source type and category)
Metals EFs from VCAPCD, 1/8/96

Table 8.1A-9. Approximate dailiy and annual turbine/duct burner fuel use.
Russell City Energy Center

	Operating Hours			Max Hourly Fuel Use, MMBtu
	max. hour	hrs/day	hrs/yr	
Turbine 1, no DB	0	24	6844	1979.4
Turbine 2, no DB	0	24	6844	1979.4
Aux Boiler*	0	0	0	0
Turbine 1, w/ DB	1	16	1500	2217.2
Turbine 2, w/ DB	1	16	1500	2217.2
T1-Start/Shutdown	0	0	416	1481.3
T2-Start/Shutdown	0	0	416	1481.3

	Fuel Use		
	MMBtu/hr	MMBtu/day	MMBtu/yr
Turbine 1, no DB	1979.4	47,505.6	13,547,014
Turbine 2, no DB	1979.4	47,505.6	13,547,014
Aux Boiler*	0	0.0	0
Turbine 1, w/ DB	2,217.2	35,475.2	3,325,800
Turbine 2, w/ DB	2,217.2	35,475.2	3,325,800
Startup/Shutdown	1,481.3	4,443.9	1,232,442
Total, GTs	**9,874.5**	**170,405.5**	**34,978,068.8**
Total, One GT		85,202.8	17,489,034

Due to the wide variations in the capability of the turbines and duct burners with respect to daily and annual operations, the values presented above are approximations only.

* No Aux Boiler proposed for this facility.

Russell City Energy Center AFC

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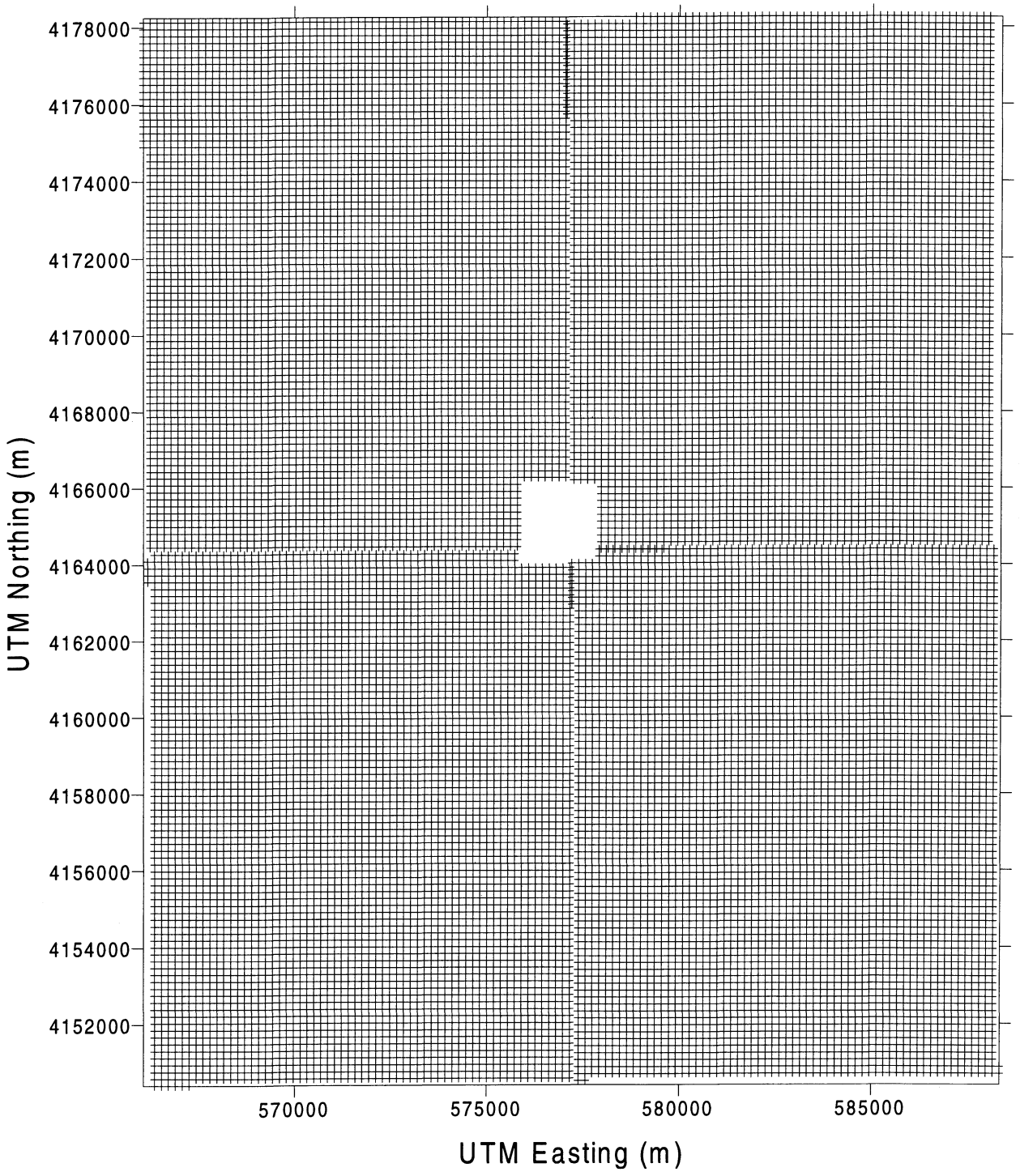
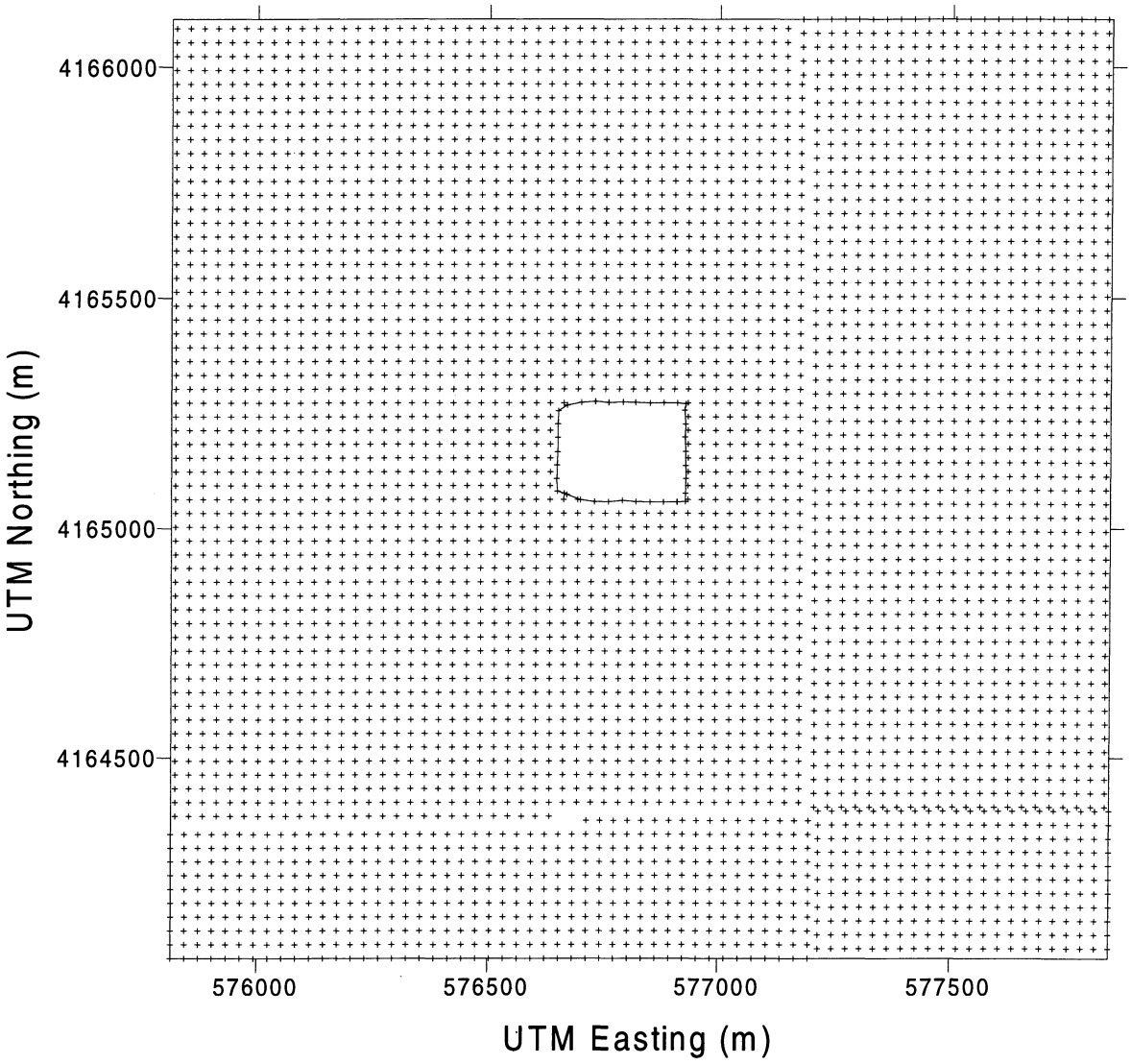
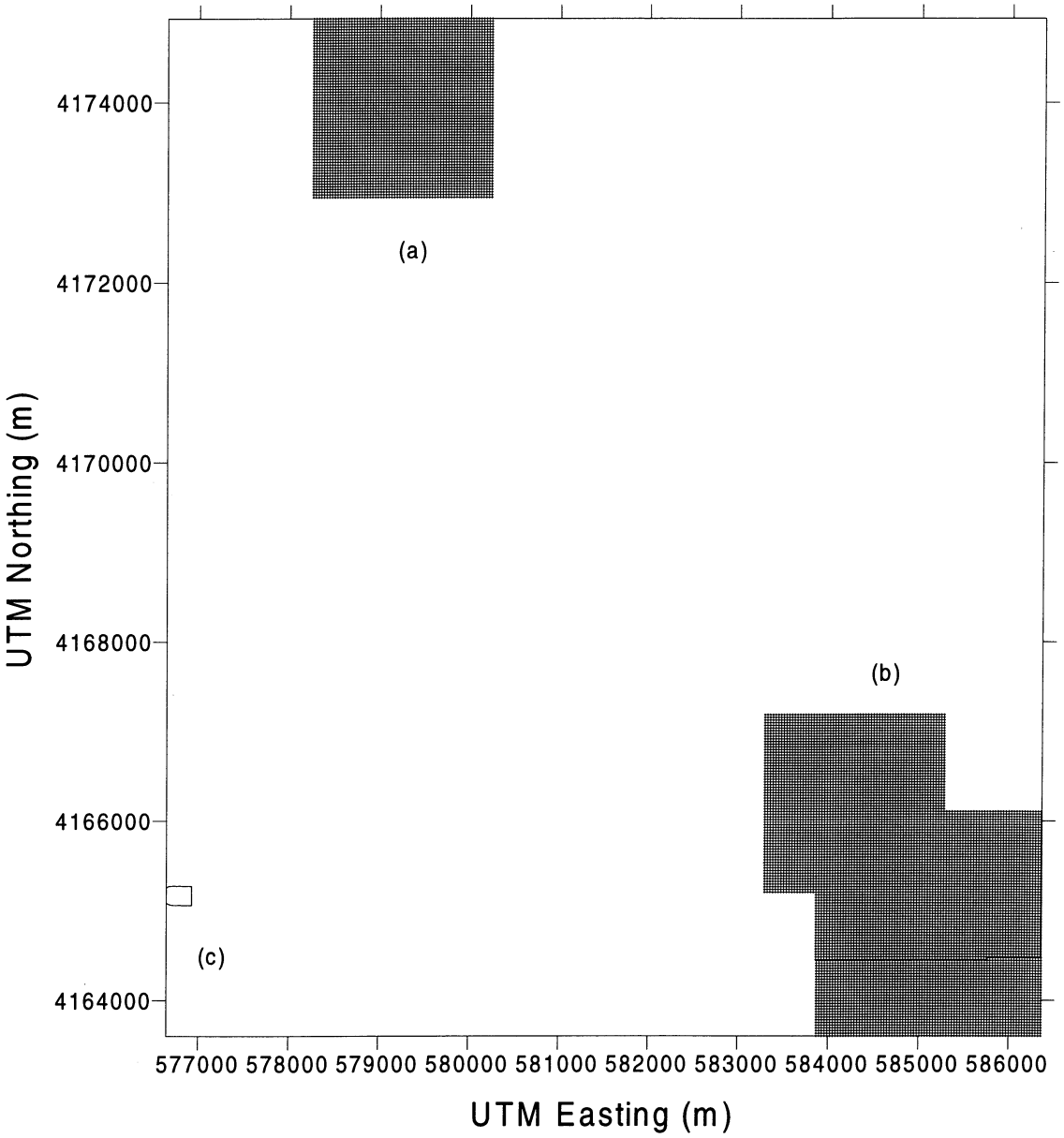
Calpine - Russell City Energy Center
Coarse ISCST Receptor Grid



Calpine -- Russell City Energy Center
Downwash ISCST Receptor Grid

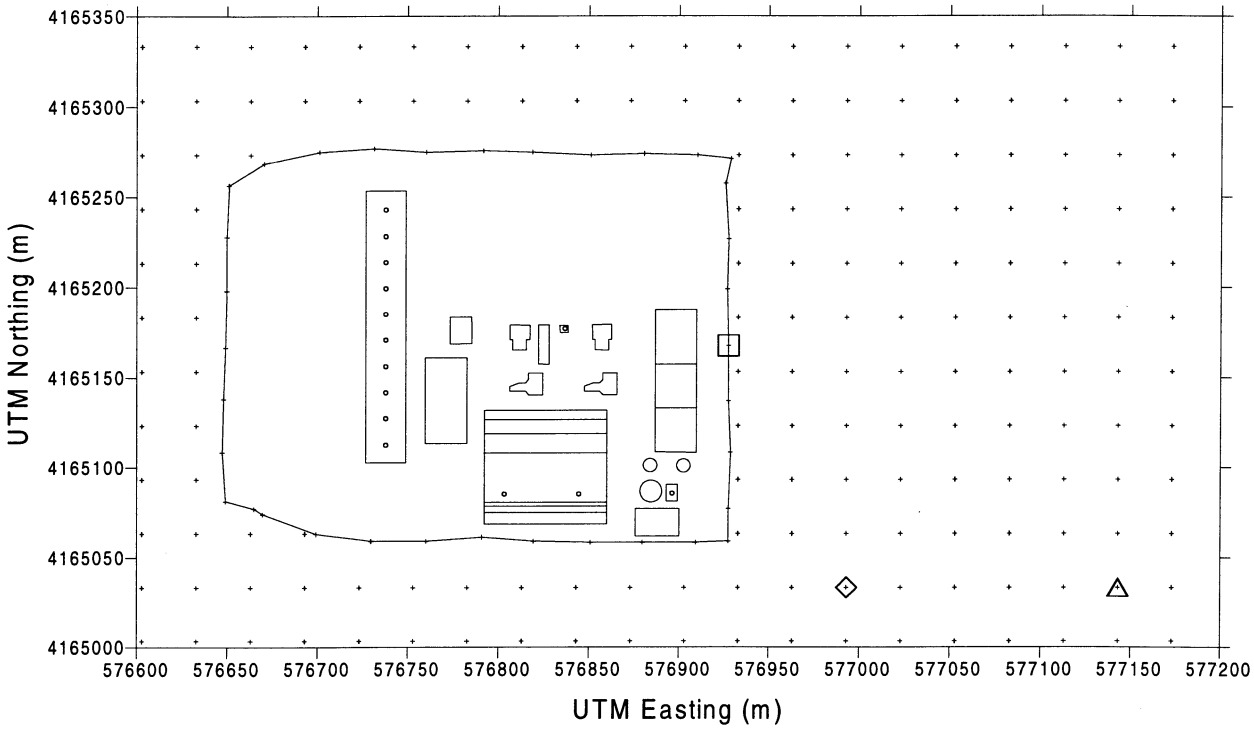


Calpine - Russell City Energy Center
Fine ISCST Receptor Grids



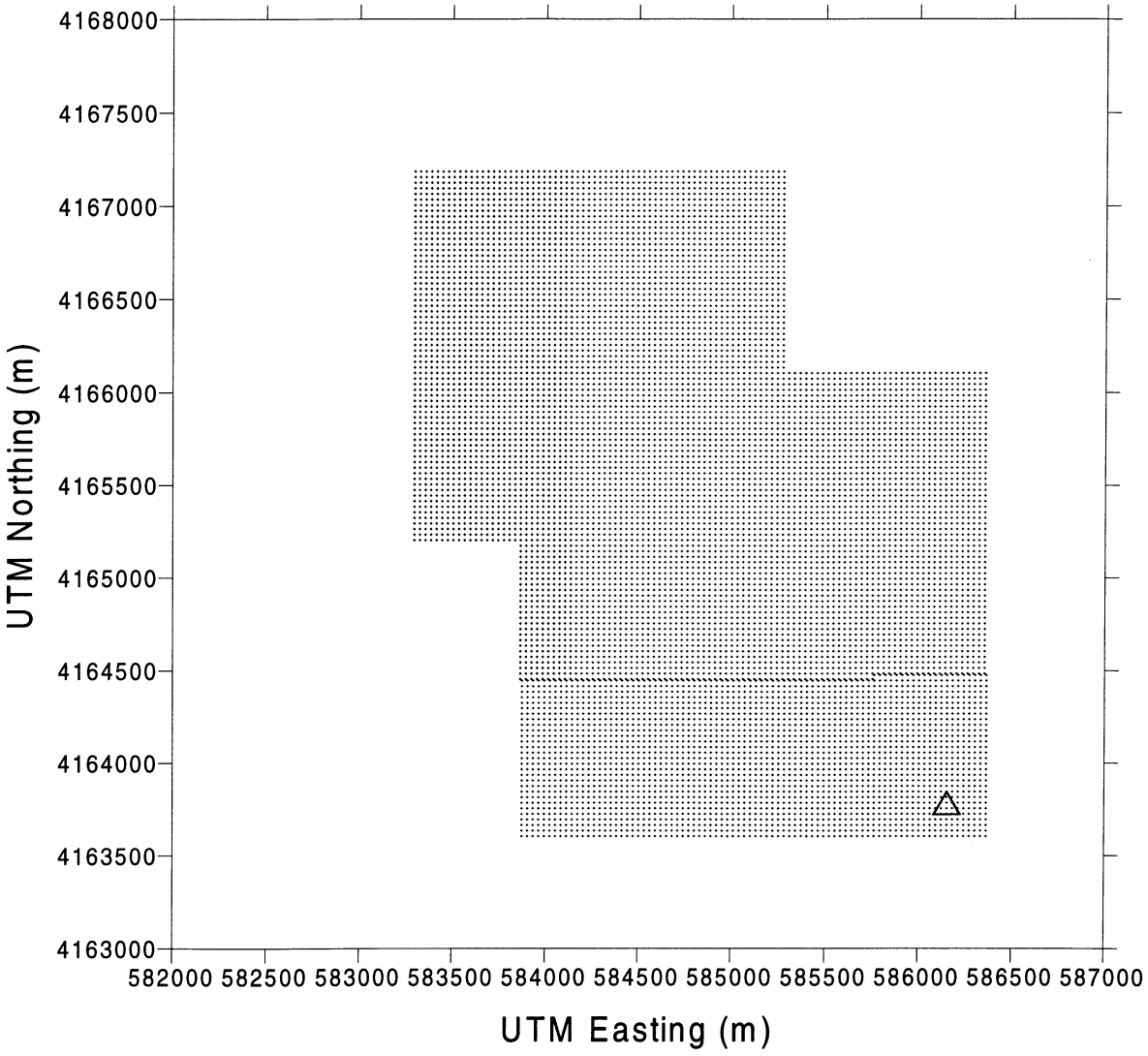
(a) Fine grid for 1-hour NO2-OLM Commissioning Concentrations
(b) Fine grid for 1990 Annual Concentrations for Turbines Only (Air Toxics), Ammonia, and SO2 and 3-hour Turbine Only Concentrations
(c) Facility Outline

Calpine -- Russell City Energy Center
Maximum Air Toxic Impact Locations



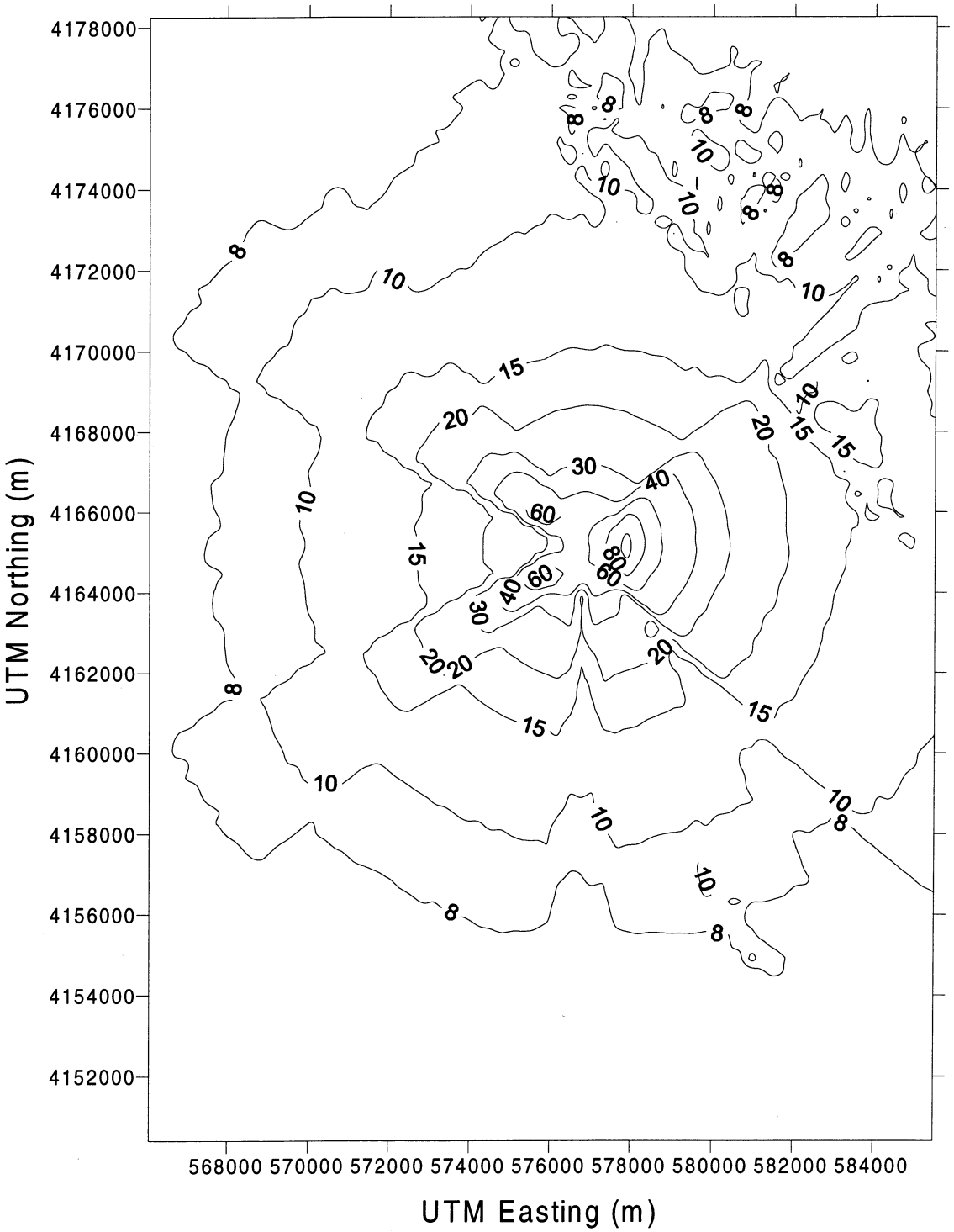
Triangle = 1-hour Turbine/Ammonia Maxima
Diamond = 1-hour and Annual Firepump Maxima
Square = 1-hour and Annual Emergency Generator Maxima

Calpine - Russell City Energy Center
Maximum Air Toxic Impact Locations

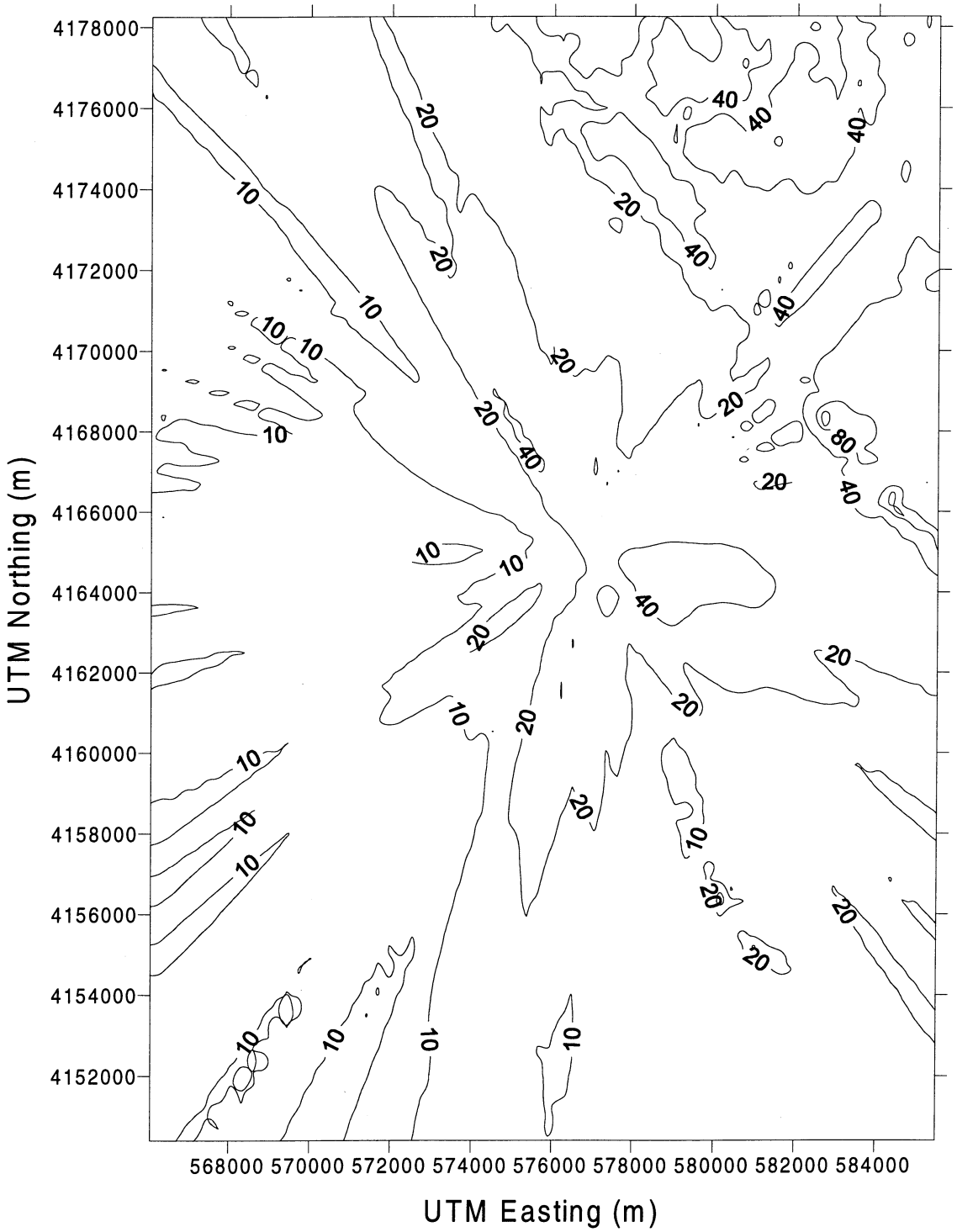


Triangle = Annual Turbine/Ammonia Maxima

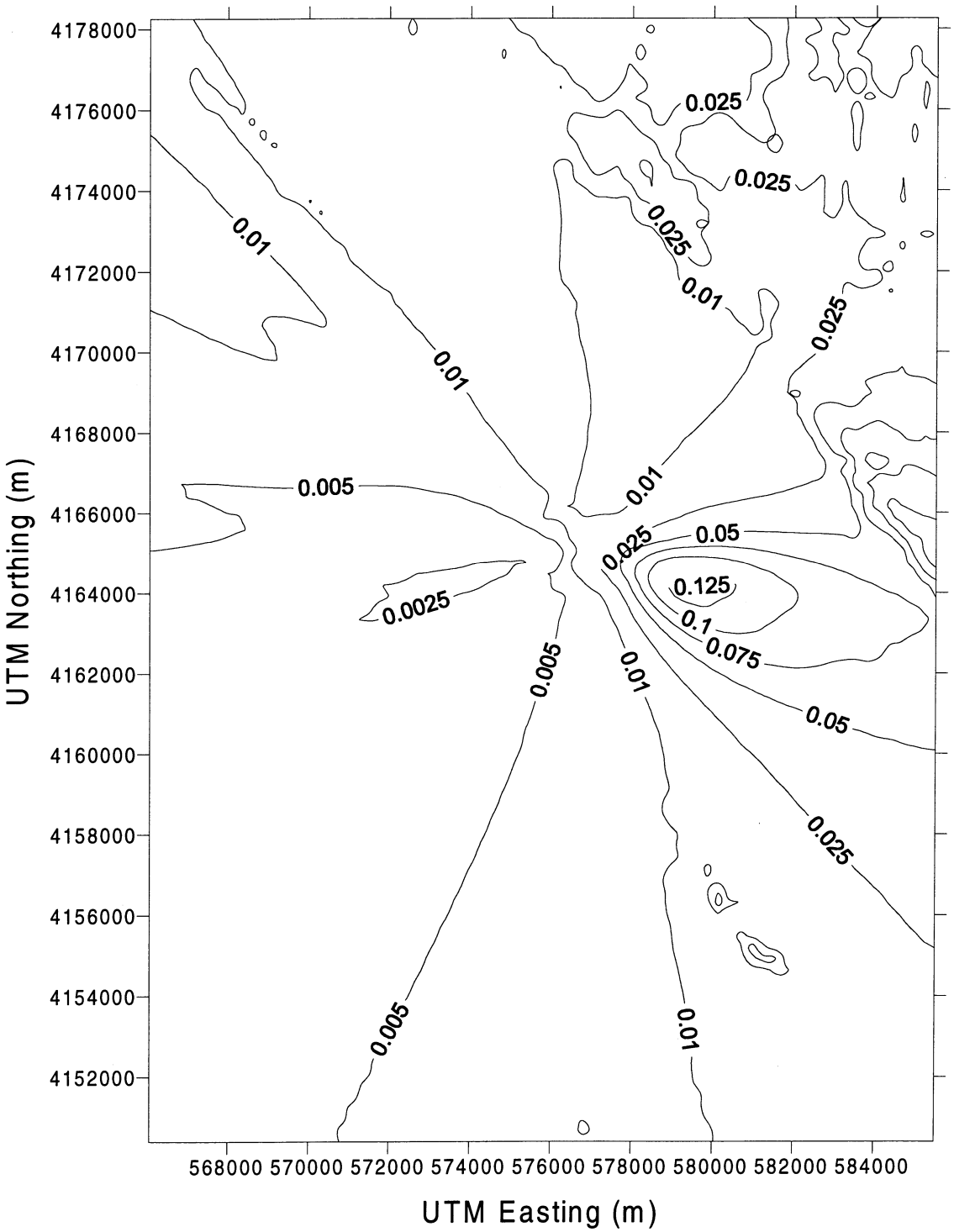
Calpine - Russell City Energy Center
Maximum 1-hour CO Concentrations (ug/m3)



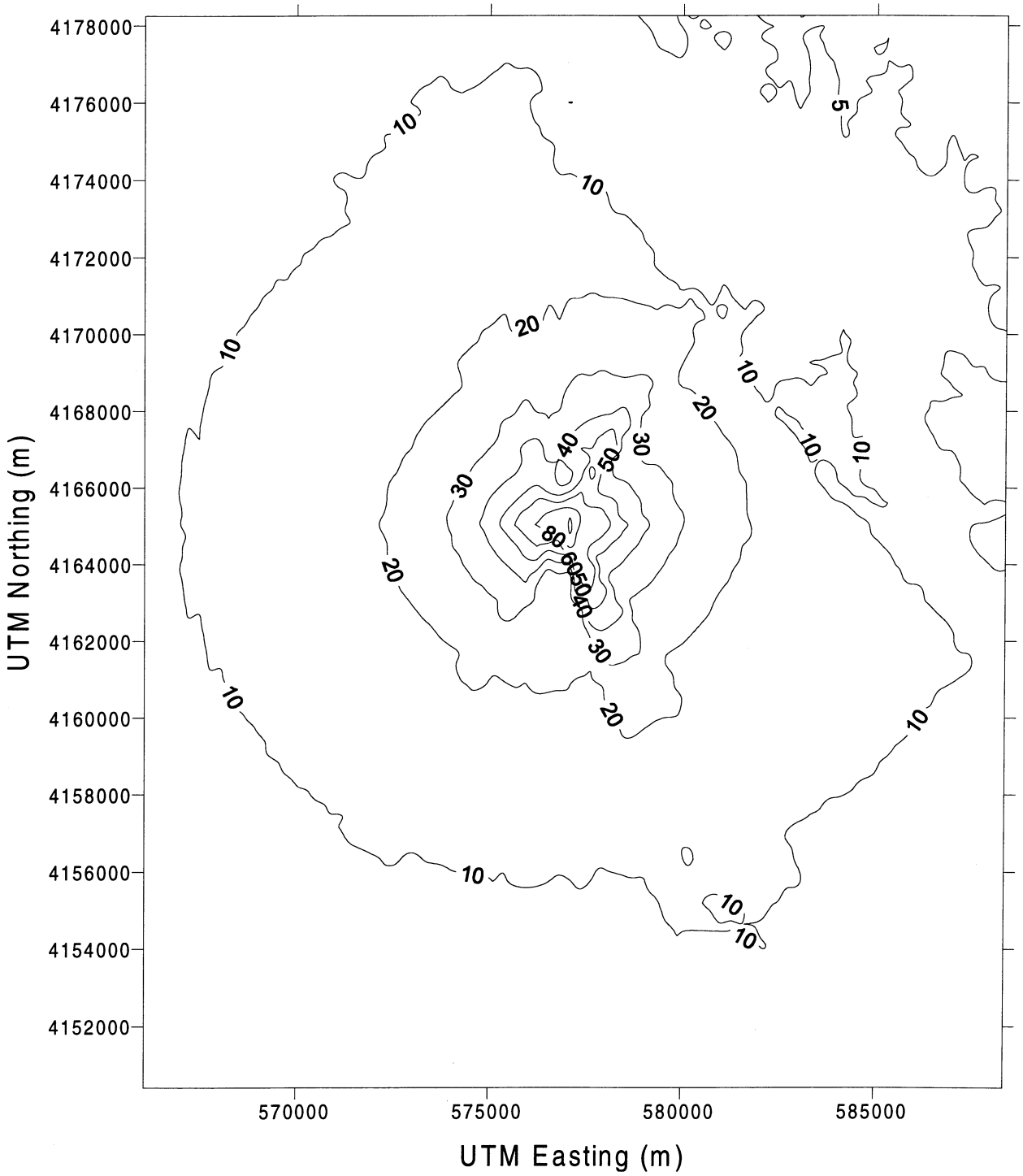
Calpine - Russell City Energy Center
Maximum 8-hour CO Concentrations (ug/m3)



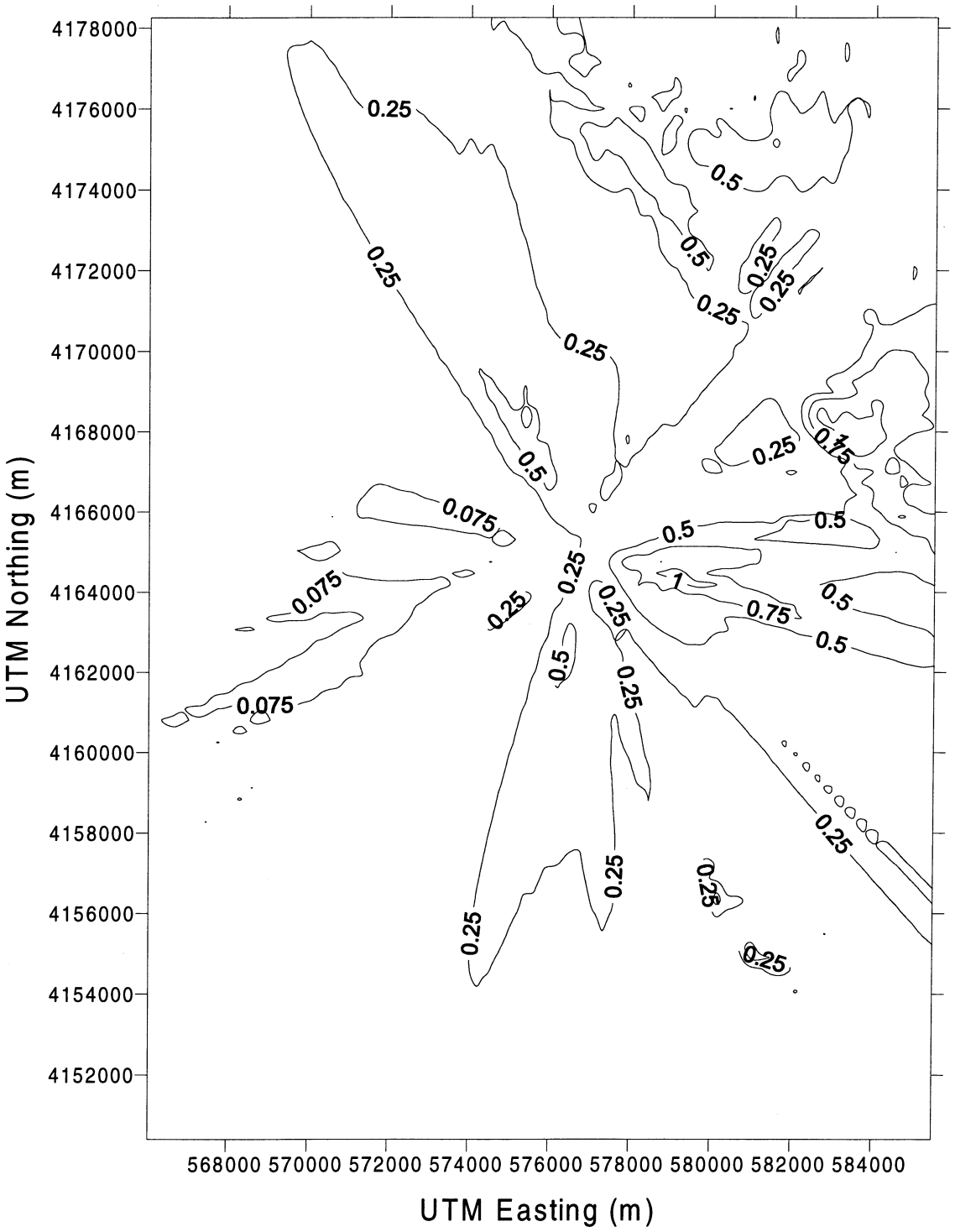
Calpine - Russell City Energy Center
Maximum Annual NO2 Concentrations (ug/m3)
based on 75% Ambient Ratio Method



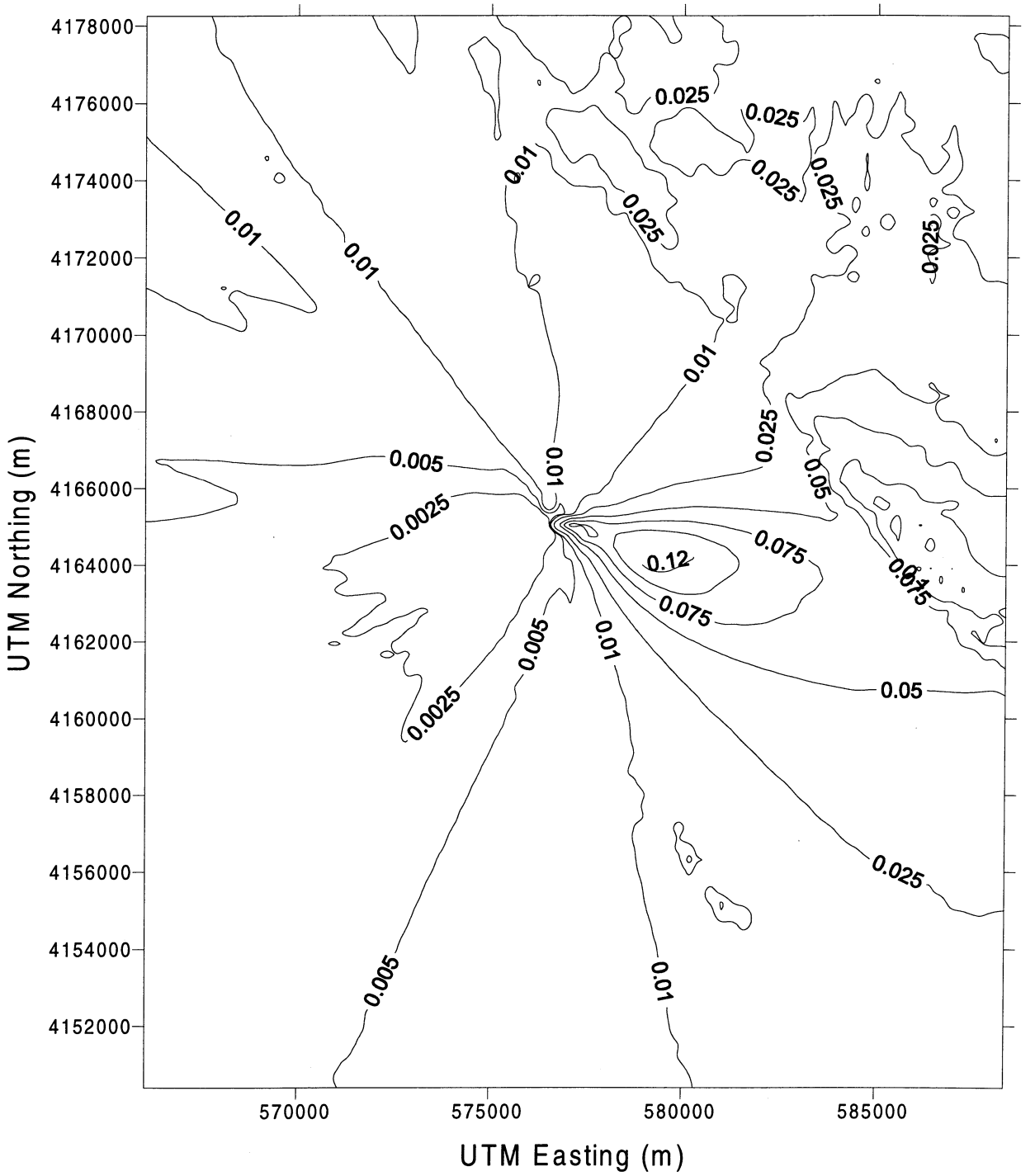
Calpine - Russell City Energy Center
Maximum 1-hour NO2 Concentrations (ug/m3)
based on Ozone Limiting Method



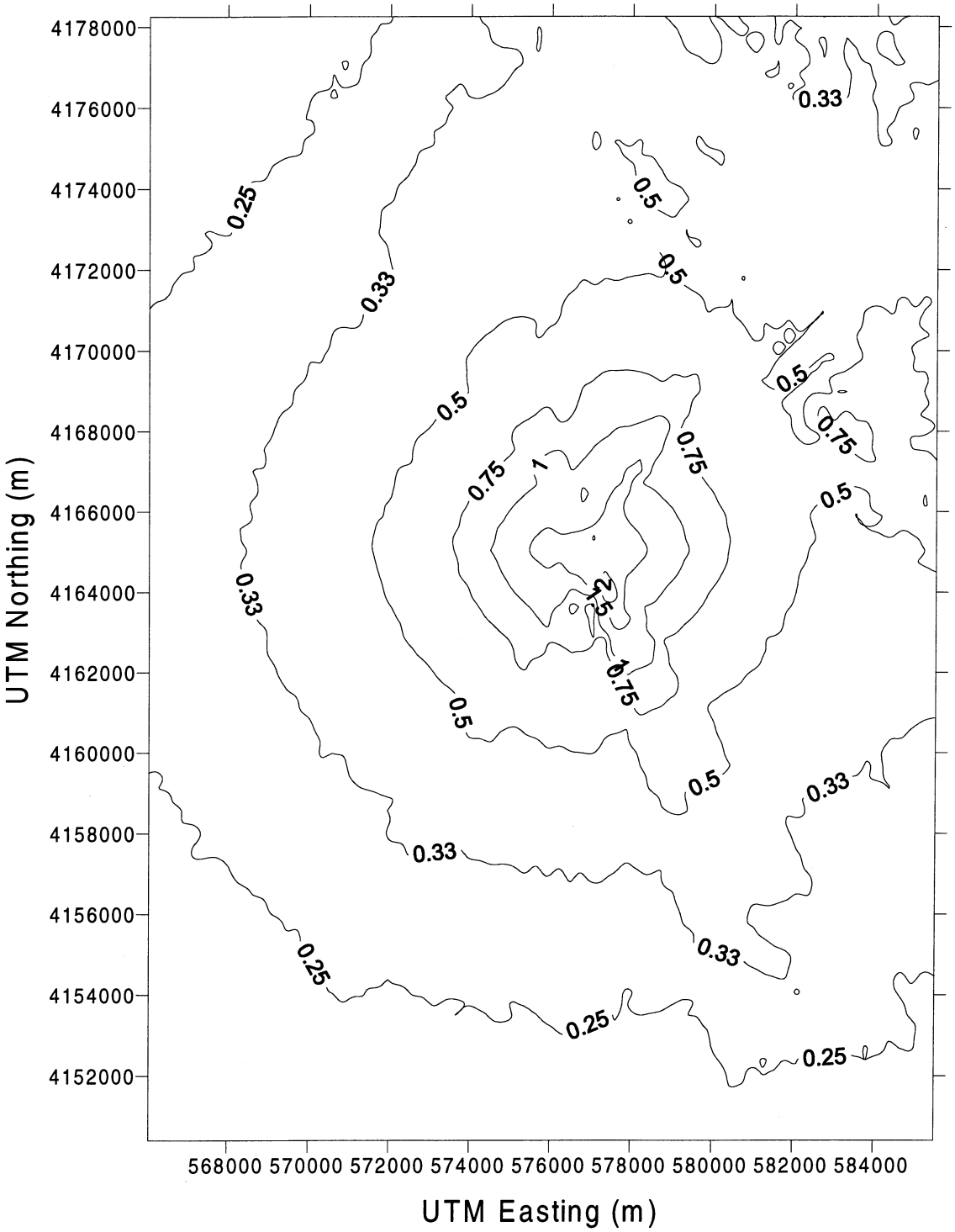
Calpine - Russell City Energy Center
Maximum 24-hour PM10 Concentrations (ug/m3)



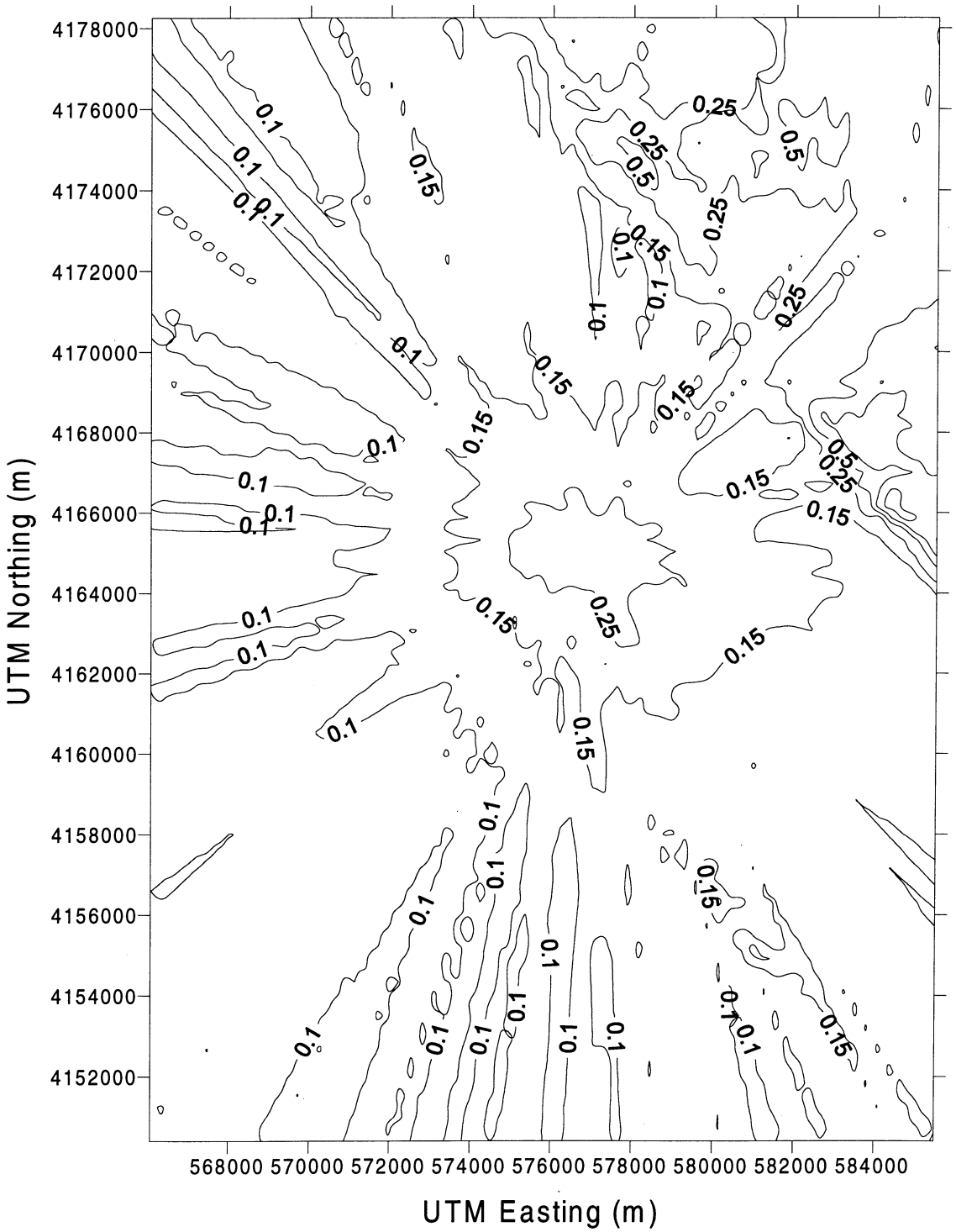
Calpine - Russell City Energy Center
Maximum Annual PM10 Concentrations (ug/m3)



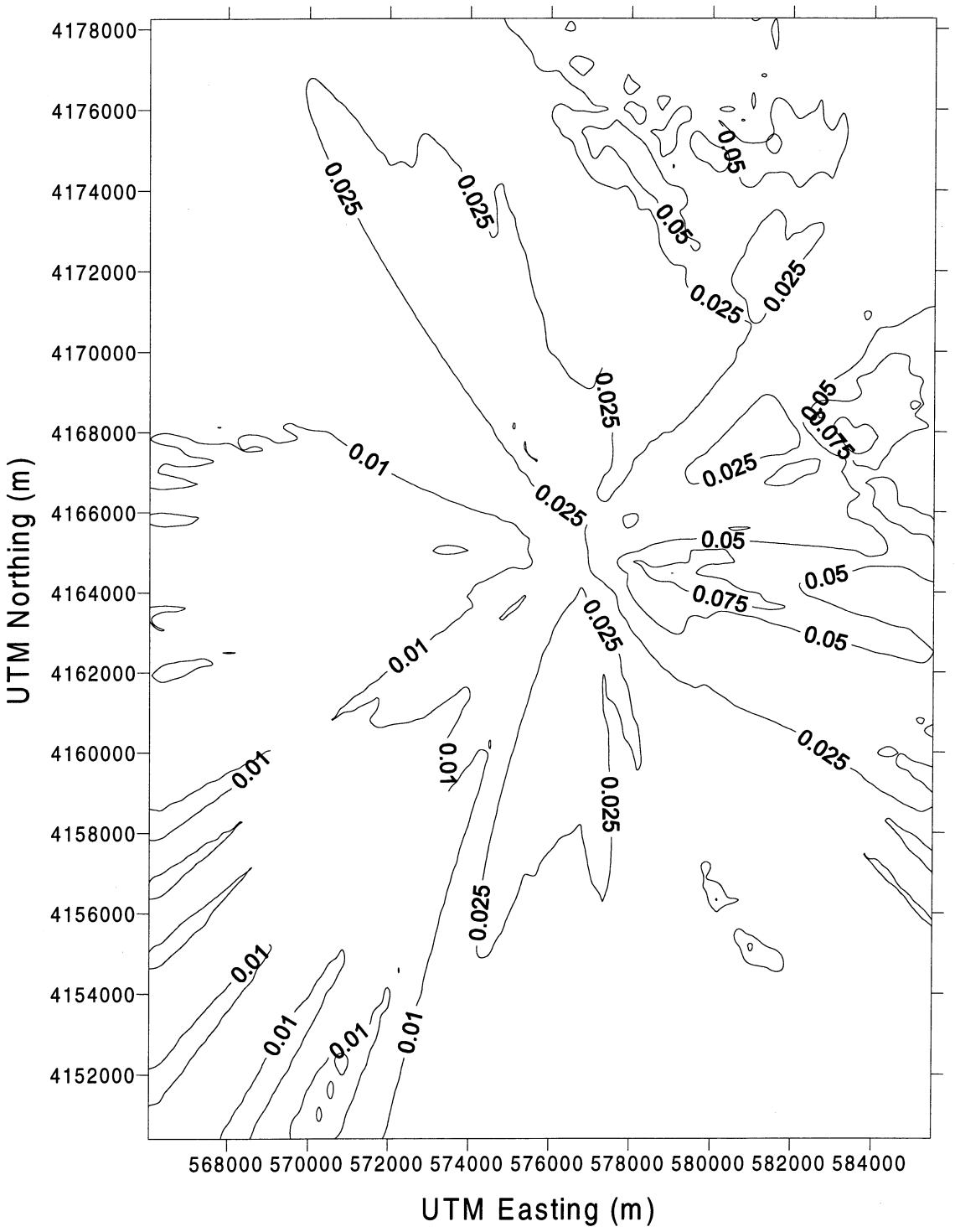
Calpine - Russell City Energy Center
Maximum 1-hour SO2 Concentrations (ug/m3)



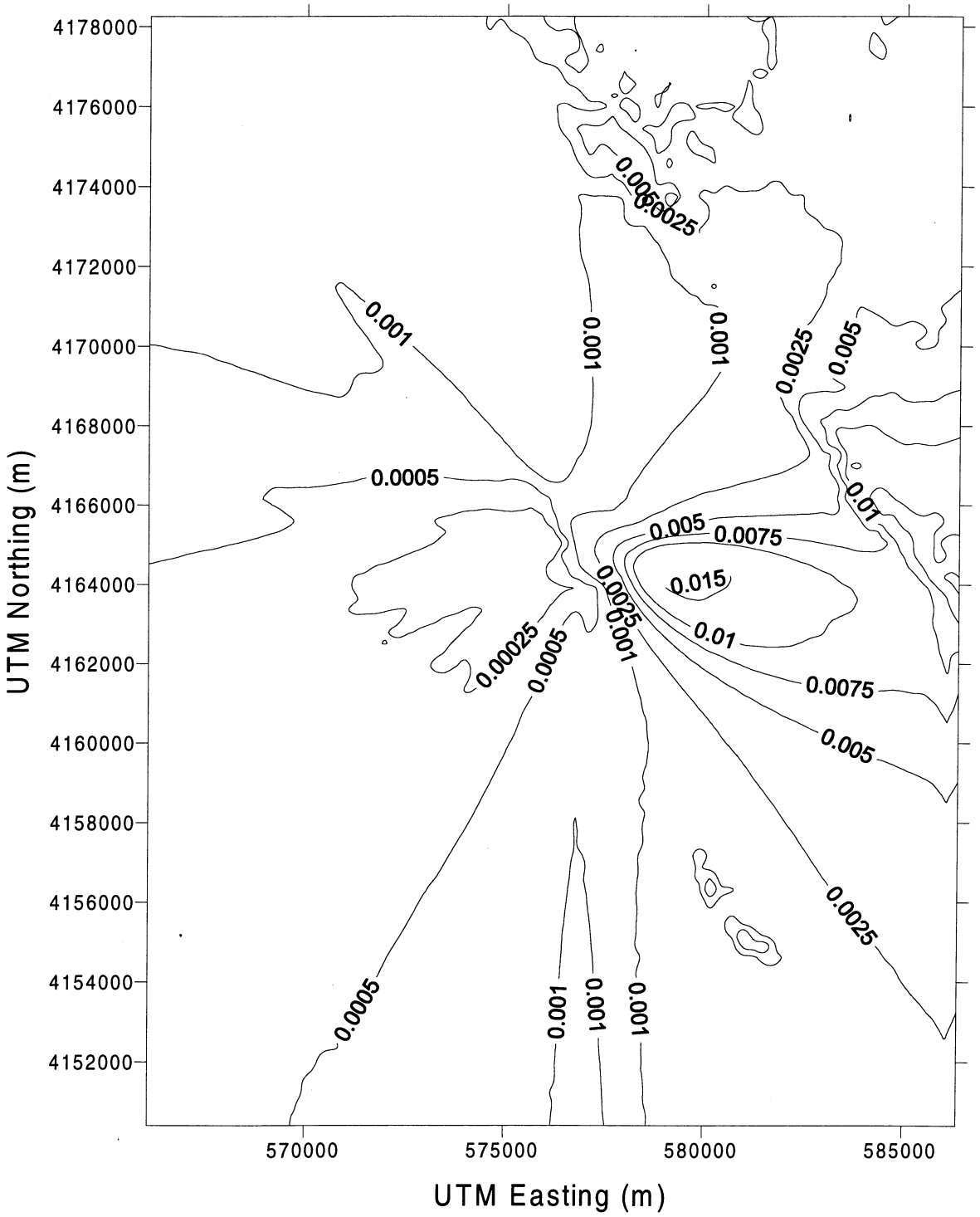
Calpine - Russell City Energy Center
Maximum 3-hour SO2 Concentrations (ug/m3)



Calpine - Russell City Energy Center
Maximum 24-hour SO2 Concentrations (ug/m3)



Calpine - Russell City Energy Center
Maximum Annual SO2 Concentrations (ug/m3)



Russell City Energy Center AFC

May 2001

Russell City Energy Center

Appendix 8.1-B
Modeling Analysis

May 2001

Russell City Energy Center AFC

May 2001

Table 8.1B-1A. Russell City Energy Center onsite structure coordinates.

East Stack UTM:	4165085.2 N	West Stack UTM:	4165084.11 N
	576844.48 E		576803.39 E
	Grid Center 0,0		

Structure/Building/Tank	State Plane Coors. E	State Plane Coors. N	Resultant UTM Coors. E	Resultant UTM Coors. N	GEP/BPIP
Steam Turbine	6207336.78	1914794.74	576759.64	4165161.00	Yes
Ht=31 ft	6207412.96	1914794.74	576782.86	4165161.00	
L=40 ft	6207412.96	1914638.82	576782.86	4165113.47	
W=22 ft.	6207336.78	1914638.82	576759.64	4165113.47	
Turbine East	6207608.54	1914765.46	576842.47	4165152.07	No
Ht=	6207621.73	1914765.46	576846.49	4165152.07	
L=75 ft.	6207620.99	1914743.50	576846.27	4165145.38	
W=34.5 ft.	6207624.65	1914743.50	576847.38	4165145.38	
	6207624.65	1914732.52	576847.38	4165142.03	
	6207632.71	1914731.79	576849.84	4165141.81	
	6207632.71	1914698.84	576849.84	4165131.77	
	6207622.46	1914698.84	576846.71	4165131.77	
	6207623.19	1914679.08	576846.94	4165125.74	
	6207606.34	1914679.08	576841.80	4165125.74	
	6207609.27	1914698.85	576842.69	4165131.77	
	6207598.28	1914699.58	576839.34	4165131.99	
	6207597.55	1914743.50	576839.12	4165145.38	
	6207608.54	1914742.77	576842.47	4165145.16	
Turbine West	6207473.76	1915766.19	576801.39	4165457.10	No
Ht=	6207486.21	1914765.46	576805.19	4165152.07	
L=75 ft.	6207486.21	1914744.23	576805.19	4165145.60	
W=34.5 ft.	6207490.61	1914744.23	576806.53	4165145.60	
	6207490.61	1914732.52	576806.53	4165142.03	
	6207497.93	1914732.52	576808.76	4165142.03	
	6207497.93	1914698.84	576808.76	4165131.77	
	6207487.68	1914698.84	576805.63	4165131.77	
	6207489.88	1914679.81	576806.30	4165125.97	
	6207472.30	1914678.35	576800.95	4165125.52	
	6207473.76	1914698.84	576801.39	4165131.77	
	6207463.51	1914698.84	576798.27	4165131.77	
	6207463.51	1914743.50	576798.27	4165145.38	
	6207474.50	1914743.50	576801.62	4165145.38	
HRSG East	6207670.80	1914662.24	576861.45	4165120.61	Yes
Ht=100 ft w/o enclosure	6207670.80	1914510.72	576861.45	4165074.43	
L=122 ft.	6207623.92	1914511.45	576847.16	4165074.65	
W=41.7 ft.	6207623.92	1914555.36	576847.16	4165088.03	
	6207606.34	1914555.37	576841.80	4165088.04	
	6207605.61	1914511.45	576841.58	4165074.65	
	6207576.31	1914511.45	576832.65	4165074.65	
	6207576.31	1914662.24	576832.65	4165120.61	

Table 8.1B-1A Structure/Building/Tank	State Plane Coors. E	State Plane Coors. N	Resultant UTM Coors. E	Resultant UTM Coors. N	
HRSG West					
Ht=100 ft. w/o enclosure	6207536.02	1914662.24	576820.37	4165120.61	Yes
L=122 ft.	6207536.02	1914512.18	576820.37	4165074.87	
W=41.7 ft.	6207489.88	1914512.18	576806.30	4165074.87	
	6207489.88	1914554.64	576806.30	4165087.82	
	6207470.83	1914555.37	576800.50	4165088.04	
	6207470.83	1914512.18	576800.50	4165074.87	
	6207441.53	1914512.18	576791.57	4165074.87	

	6207440.80	1914662.24	576791.34	4165120.61	
CT Main XFMR East					
Ht=28 ft.	6207674.46	1914854.76	576862.56	4165179.29	Yes
L=45 ft.	6207674.46	1914827.68	576862.56	4165171.04	
W=35 ft.	6207668.60	1914827.68	576860.78	4165171.04	
	6207668.60	1914807.92	576860.78	4165165.01	
	6207644.43	1914808.65	576853.41	4165165.24	
	6207644.43	1914827.68	576853.41	4165171.04	
	6207640.03	1914827.68	576852.07	4165171.04	
	6207639.30	1914854.30	576851.85	4165179.15	
CT Main XFMT West					
Ht=26 ft.	6207526.50	1914853.30	576817.47	4165178.85	Yes
L=45 ft.	6207525.77	1914826.95	576817.24	4165170.82	
W=36 ft.	6207519.91	1914826.95	576815.46	4165170.82	
	6207519.91	1914808.65	576815.46	4165165.24	
	6207495.00	1914808.65	576807.86	4165165.24	
	6207495.00	1914826.95	576807.86	4165170.82	
	6207490.61	1914826.95	576806.53	4165170.82	
	6207490.61	1914854.03	576806.53	4165179.07	
ST Main XFMR					
Ht=26 ft.	6207421.02	1914868.67	576785.32	4165183.53	Yes
L=50 ft.	6207421.75	1914820.36	576785.54	4165168.81	
W=40 ft.	6207382.20	1914819.63	576773.48	4165168.58	
	6207382.20	1914868.67	576773.48	4165183.53	
NH3 Storage Dike					
Ht=5 ft.	6207409.30	1914594.90	576781.74	4165100.09	No
L=44 ft.	6207409.30	1914556.83	576781.74	4165088.48	
W=15 ft.	6207390.99	1914556.83	576776.16	4165088.48	
	6207390.99	1914594.90	576776.16	4165100.09	
Switch Gear Bldg	6207560.93	1914854.11	576827.96	4165179.09	Yes
Ht=20 ft.	6207560.93	1914782.37	576827.96	4165157.23	
L=70 ft.	6207541.88	1914783.10	576822.15	4165157.45	
W=20 ft.	6207541.88	1914854.11	576822.15	4165179.09	
Cooling Tower	6207293.57	1915090.25	576746.47	4165251.07	Yes
Ht=54 ft.	6207294.30	1914611.07	576746.69	4165105.02	
L=480 ft.	6207236.43	1914611.81	576729.05	4165105.24	
W=48 ft	6207235.70	1915089.80	576728.83	4165250.93	
Cells	6207264.99	1915063.45	576737.76	4165242.90	
Ht=64 ft.	6207264.99	1915015.13	576737.76	4165228.17	
Diam=28 ft.	6207264.99	1914968.28	576737.76	4165213.89	
	6207264.99	1914920.70	576737.76	4165199.39	
	6207264.99	1914873.85	576737.76	4165185.11	
	6207264.99	1914827.00	576737.76	4165170.83	
	6207264.99	1914778.69	576737.76	4165156.11	
	6207264.99	1914731.26	576737.76	4165141.65	
	6207264.99	1914684.41	576737.76	4165127.37	
	6207264.99	1914636.10	576737.76	4165112.64	
CT Air Inlet East	6207683.99	1914766.40	576865.47	4165152.36	Yes
Ht=44 ft.	6207683.99	1914726.87	576865.47	4165140.31	
W=40 ft.	6207658.35	1914726.87	576857.65	4165140.31	
L=40 ft.	6207652.50	1914733.46	576855.87	4165142.32	
	6207625.39	1914733.46	576847.61	4165142.32	
	6207625.39	1914742.98	576847.61	4165145.22	
	6207640.77	1914748.83	576852.30	4165147.00	
	6207652.50	1914748.83	576855.87	4165147.00	

	6207658.35	1914754.69	576857.65	4165148.79	
	6207658.35	1914766.40	576857.65	4165152.36	
CT Air Inlet West	6207549.21	1914766.40	576824.39	4165152.36	Yes
Ht=44 ft.	6207549.21	1914726.87	576824.39	4165140.31	
W=40 ft.	6207523.57	1914726.87	576816.57	4165140.31	
L=40 ft.	6207518.20	1914734.19	576814.94	4165142.54	
	6207489.88	1914734.19	576806.30	4165142.54	
	6207489.88	1914742.24	576806.30	4165145.00	
	6207505.99	1914748.83	576811.21	4165147.00	
	6207518.44	1914748.83	576815.01	4165147.00	
	6207523.57	1914755.42	576816.57	4165149.01	
	6207523.57	1914766.40	576816.57	4165152.36	
DeMin H20 East	6207805.58	1914598.03	576902.53	4165101.04	Yes
Ht=25 ft.					
Diam=25 ft.					
DeMin H20 West	6207744.78	1914598.76	576884.00	4165101.26	Yes
Ht=25 ft.					
Diam=25 ft.					
GT Stack East	6207615.13	1914546.06	576844.48	4165085.20	
Ht=145 ft.					
Diam=18 ft.					
GT Stack West	6207480.35	1914546.06	576803.40	4165085.20	
Ht=145 ft.					
Diam=18 ft.					
Warehouse/Maint. Bldg	6207829.02	1914887.20	576909.67	4165189.18	Yes
Ht=20 ft.	6207829.02	1914782.65	576909.67	4165157.31	
L=100 ft.	6207754.25	1914782.67	576886.88	4165157.32	
W=75 ft.	6207754.30	1914882.20	576886.90	4165187.66	
Admin Bldg	6207829.02	1914782.65	576909.67	4165157.31	Yes
Ht=20 ft.	6207829.02	1914702.86	576909.67	4165132.99	
L=80 ft.	6207754.30	1914702.86	576886.90	4165132.99	
W=75 ft.	6207754.25	1914782.67	576886.88	4165157.32	
H2O Treatment Bldg	6207829.02	1914702.86	576909.67	4165132.99	Yes
Ht=20 ft.	6207829.02	1914622.34	576909.67	4165108.45	
L=80 ft.	6207754.30	1914623.06	576886.90	4165108.67	
W=75 ft.	6207754.30	1914702.86	576886.90	4165132.99	
Fire Water Tank	6207746.25	1914551.18	576884.45	4165086.76	Yes
Ht=33 ft.					
Diam=40 ft.					
Blr Feedwater/Chem Bldg	6207541.88	1914580.47	576822.15	4165095.69	No
Ht=20 ft.	6207542.62	1914535.81	576822.38	4165082.08	
L=42.5 ft.	6207508.19	1914536.54	576811.88	4165082.30	
W=33 ft.	6207508.92	1914580.47	576812.11	4165095.69	
Blr Feedwater Bldg	6207676.66	1914575.34	576863.23	4165094.12	No
Ht=20 ft.	6207677.40	1914548.26	576863.46	4165085.87	
L=32.5 ft.	6207626.12	1914548.26	576847.83	4165085.87	
W=33 ft.	6207626.12	1914580.47	576847.83	4165095.69	
	6207659.08	1914580.47	576857.88	4165095.69	
	6207660.55	1914575.30	576858.32	4165094.11	

Emer Gen Set Bldg		6207594.62	1914852.92	576838.23	4165178.73	Yes
Ht=8.5 ft.		6207595.35	1914840.48	576838.45	4165174.94	
L=15.5 ft.		6207580.70	1914840.48	576833.99	4165174.94	
W=6.5 ft		6207579.98	1914852.65	576833.77	4165178.65	
Stack		6207589.51	1914847.32	576836.67	4165177.02	
Ht=10 ft.						
Diam=1 ft.						
Fire Pump/Engine House		6207794.59	1914563.04	576899.18	4165090.38	Yes
Ht=16 ft.		6207794.59	1914533.03	576899.18	4165081.23	
L=30 ft.		6207774.82	1914533.02	576893.15	4165081.23	
W=20 ft.		6207774.82	1914563.04	576893.15	4165090.38	
Stack		6207784.89	1914547.34	576896.22	4165085.59	
Ht=10 ft.						
Diam=1 ft.						
Gas Compressor Bldg		6207797.52	1914519.64	576900.07	4165077.15	Yes
Ht=16 ft.		6207797.52	1914469.13	576900.07	4165061.75	
L=80 ft.		6207717.68	1914469.13	576875.74	4165061.75	
W=50 ft.		6207717.69	1914519.64	576875.74	4165077.15	
Switchyard Control Room		6207377.80	1915006.94	576772.14	4165225.68	No
Ht=16 ft.		6207377.80	1914958.62	576772.14	4165210.95	
L=50 ft.		6207357.29	1914958.62	576765.89	4165210.95	
W=20 ft.		6207358.02	1915006.20	576766.11	4165225.45	
Gas Scrubber East		6207597.55	1914781.47	576839.12	4165156.95	No
Ht=16 ft.		6207597.55	1914730.96	576839.12	4165141.56	
		6207586.56	1914730.96	576835.77	4165141.56	
		6207586.56	1914781.70	576835.77	4165157.02	
Gas Scrubber West		6207463.51	1914781.47	576798.27	4165156.95	No
Ht=16 ft.		6207463.51	1914730.96	576798.27	4165141.56	
		6207451.79	1914730.96	576794.69	4165141.56	
		6207451.79	1914781.47	576794.69	4165156.95	
Fence Corners	NE	6207886.01	1915163.28	576927.04	4165273.33	
	SE	6207887.40	1914456.39	576927.47	4165057.87	
	SW-1	6207164.72	1914460.78	576707.20	4165059.21	
	SW-2	6206969.87	1914536.91	576647.80	4165082.41	
	NW-1	6206977.20	1915103.50	576650.04	4165255.11	
	NW-2	6207022.61	1915140.10	576663.88	4165266.26	
	NW-3	6207194.02	1915170.84	576716.13	4165275.63	
T22 H2O Treat. Area		6207214.21	1915106.60	576722.28	4165256.05	Yes
Ht=20 ft.		6207214.21	1914807.20	576722.28	4165164.80	
L=		6206994.46	1914807.20	576655.30	4165164.80	
W=		6206994.46	1915106.60	576655.30	4165256.05	
Open HRSG West	Part 1	6207488.31	1914678.01	576805.83	4165125.42	Yes
Ht=45 ft.		6207500.76	1914631.16	576809.62	4165111.14	
L=50 ft.		6207459.74	1914631.16	576797.12	4165111.14	
W=44 ft.		6207470.73	1914678.01	576800.47	4165125.42	
	Part 2	6207500.76	1914631.16	576809.62	4165111.14	
Ht=100 ft.		6207501.49	1914560.15	576809.84	4165089.49	
L=72 ft.		6207457.54	1914560.15	576796.45	4165089.49	
W=44 ft.		6207459.74	1914631.16	576797.12	4165111.14	
Open HRSG East	Part 1	6207622.36	1914679.47	576846.68	4165125.86	Yes
Ht=45 ft.		6207635.54	1914631.69	576850.70	4165111.30	

L=50 ft.		6207593.79	1914631.31	576837.98	4165111.18
W=44 ft.		6207606.24	1914679.47	576841.77	4165125.86
	Part 2	6207635.54	1914631.69	576850.70	4165111.30
Ht=100 ft.		6207637.74	1914560.15	576851.37	4165089.49
L=72 ft.		6207593.06	1914560.15	576837.75	4165089.49
W=44 ft.		6207593.79	1914631.31	576837.98	4165111.18

All data derived from Table 8.1B-1B and CAD Drawing file (russellv14.dwg).

Table 8.1B-1B. RCEC structure size and height data.
Input assumptions for AFC and design.

	RCEC	
Item	**Dimensions**	**Remarks**
Equipment grade elevation	10'	
HRSG oper grating	82'	
HRSG highest drum	90'	
HRSG top of casing	74'	
HRSG top -works support steel	115'	
HRSG top of highest relief valves and vent	125'	
HRSG Sreening	3 sides 98' wide by 180' long by 120' high- max	
HRSG inlet duct to stack wall	127' long	
HRSG duct Width	31.5' wide	
Stack dimensions / height	18' dia / 145' h	
CTG noise barrier	NA	
Steam turbine operating deck	37'	
Gas Turbine air inlets, top, bottom, width	44', 8', 40'	See Note 2
Steam Turbine Condenser height	28'h x 22'w x 40'h	
Steam Turbine weather / noise enclosure height	31'	See Note 2
Steam turbine generator enclosure height	25'	
Steam Turbine generator noise barrier	NA	
Steam turbine generator cooler height	30'	
Raw / fire water storage tank volume, gal	270,000	240,000 for fire water
Raw / fire water storage tank diameter / height	40' Dia / 33' H	32' h = 300,000 gal
Demineralized storage tank volume, gal	153,000	
Demineralized storage tank diameter / height	25' Dia / 25' H	
Cooling tower	10 cell 54'H x (56' basin & 48' structure)W x 480'-6"L	See Note 4: Plume abated 54' to deck & fan cone 10' tall
Admin / control bld	20' h x 80' x 75'	See Notes 1
Warehouse / maintenance	20' h x 75' x 100'	See Notes 1
Water treatment bld	20' h x 80' x 75'	See Notes 1
Fire pump house	16' h x 20' x 30'	
Gas compressor bld	16' h x 80' x 50'	
Circ water pump house	16' hx 43' x 70'	See note 3
Switchyard control house	16'h x 20' x 50'	
Boiler Feed pump Room - w/o chem feed	20' h x 32.5' x 33'	
Boiler Feed pump Room - w/ chem feed	20' h x 42.5' x 33'	
Switchgear / battery building	20' h x 20'w x 70' l	
emergency generator building	8.5' h x 6.5 ' x 15.5'	
STG Transformer pit / fire wall	26'h x 36 ' x 28' wall	
CTG transformer pit / fire wall	26'h x 36 ' x 28' wall	
Ammonia storage tank	10.8' dia. x 40' long	
Ammonia storage tank dike	5' h x 15' x 44'	
Note 1: One common building 75' wide by 250' long		
Note 2: Outdoor plant arrangement		
Note 3: Circ. Water pumps inside building - noise considersations.		
Note 4: Cooling tower dimensions for plume free design point between 30 F and 45 F @ 90% RH		
Square Footages to nearest 100 ft2		
Admin / control = 6000		
Warehouse = 7500		
Water treat = 6000		
Gas comp = 4000		
BFP A / B = 1000 / 1400		
Fire Pump = 600		
Circ Water pump building = 3000		

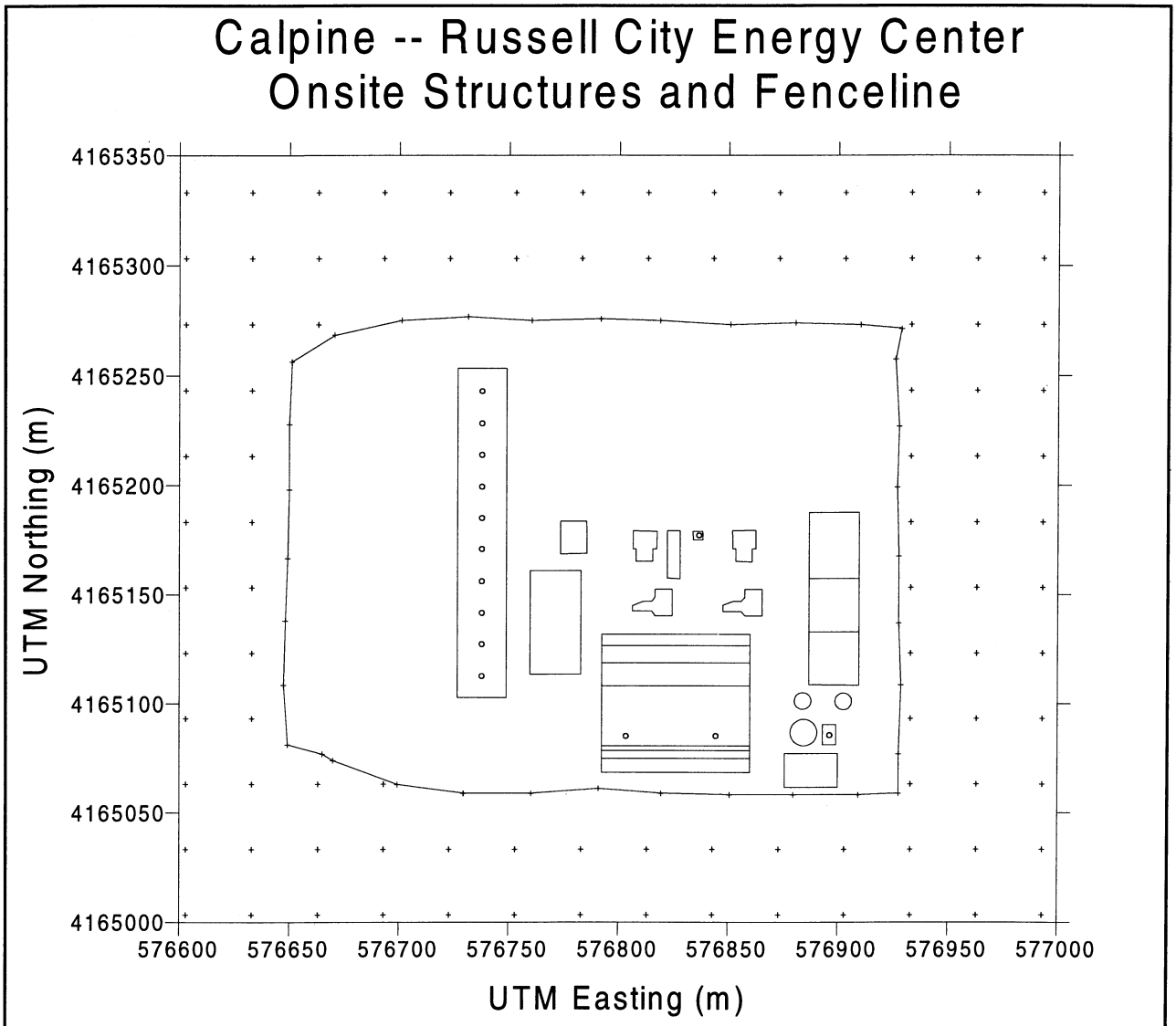


Figure 8.1B-1. Project dimensions as modeled.

Table 8.1B-2. RCEC emissions - screening analysis for worst-case source configuration.

GENERAL DATA:		Case 2	Case 3	Case 11	Case 12	Case 14	Case 16	Emer. Generator	Firepump
Manufacturer/Model		West 501F	West 501F	West 501F	West 501F	West 501F	West 501F	Caterpiller G3512 90 LE	Cummins 6CTA8.3-F3
Ambient Temperature, F		34	34	94	94	59	94		
Load, %		100.0	70.0	100.0	70.0	PWR AUG	PWR AUG		
Evaporative Cooler?		off	off	on	off	on	on		
Duct Burner?		off	off	off	off	on	on		
Modeling Stack Parameters									
Stack Height (m)		44.196	44.196	44.196	44.196	44.196	44.196	3.048	9.144
Stack Diameter (m)		5.4864	5.4864	5.4864	5.4864	5.4864	5.4864	0.2286	0.1016
Stack Exit Velocity (m/s)		21.0	17.3	19.6	15.9	21.4	20.7	48.4	83.5
Stack Temperature (K)		349.7	349.7	349.7	349.7	349.7	349.7	649.1	748.0
NOx (g/s/turbine)		2.405	1.810	2.209	1.591	2.696	2.601	0.223	4.914E-01
SO2 (g/s/turbine)		0.173	0.129	0.159	0.113	0.189	0.187	4.868E-04	1.336E-02
CO (g/s/turbine)		3.564	2.682	3.273	2.356	3.995	3.854	0.380	0.296
PM10 (g/s/turbine)		1.134	1.134	1.134	1.134	1.512	1.512	7.884E-05	0.01605
Maximum Unitized Impacts (ug/m3) at 1 g/s/turbine							Hrs/yr=	**200**	**30**
	1-hour	6.65850	9.99262	7.77954	11.85301	6.57389	6.87891	3238.32642	1504.05872
	3-hour	5.97715	7.47526	6.02534	8.70393	5.96665	5.98053	2026.96667	825.68140
	8-hour	2.32783	4.48348	3.07746	5.57665	2.31939	2.46504	760.11249	501.18179
	24-hour	1.13745	2.26713	1.49752	2.94345	1.05586	1.20234	370.91162	200.09004
	Annual	#N/A	#N/A	#N/A	#N/A	0.10138	#N/A	92.92491	48.75942
Maximum Pollutant Impacts (ug/m3)									
NOx (w/o OLM)	1-hour	16.01	18.09	17.19	***18.86***	17.72	17.89	722.15	***739.09***
	Annual					***0.273***		0.47	0.08
SO2	1-hour	1.15	1.29	1.24	***1.34***	1.24	1.29	1.58	***20.09***
	3-hour	1.03	0.96	0.96	0.98	***1.13***	1.12	0.33	***3.68***
	24-hour	0.20	0.29	0.24	***0.33***	0.20	0.22	0.008	***0.111***
	Annual					***0.019***		0.0010	0.0821
CO	1-hour	23.73	26.80	25.46	***27.93***	26.26	26.51	***1230.56***	445.20
	8-hour	8.30	12.02	10.07	***13.14***	9.27	9.50	36.11	***18.54***
PM10	24-hour	1.29	2.57	1.70	***3.34***	1.60	1.82	0.0012	***0.1338***
	Annual					***0.153***		0.00017	0.00268

Notes:

1. All values shown above are estimated, not guaranteed.
2. Stack velocity shown is based on a stack diameter of 18.0 feet.
3. SO2 and PM10 values are based on a fuel sulfur content of 4 ppmv.
4. Duct burner emissions are based on the following emission rates:
   NOX emission = 0.08 LB/MMBTU (HHV)
   CO emission = 0.10 LB/MMBTU (HHV)
   VOC emission = 0.02 LB/MMBTU (HHV)
   PM10 emission = 0.01 LB/MMBTU (HHV)
5. Firepump/Emerg.Gen emissions shown above are for one hour of operation. Since each source is only tested for one hour, at most, in any one day, 3-hour, 8-hour, and 24-hour emissions are 1-hour emissions divided by 3, 8, and 24, respectively.

Table 8.1B-2 (cont'd) Russell City Energy Center fine grid analysis for maximum turbine impacts.

		Case 12				Case 14				
GENERAL DATA:										
Manufacturer/Model		**West 501F**				**West 501F**				
Ambient Temperature, F		**94**				**59**				
Load, %		**70.0**				**PWR AUG**				
Evaporative Cooler?		**off**				**on**				
Duct Burner?		**off**				**on**				
Modeling Stack Parameters										
Stack Height (m)		44.196				44.196				
Stack Diameter (m)		5.4864				5.4864				
Stack Exit Velocity (m/s)		15.9				21.4				
Stack Temperature (K)		349.7				349.7				
Emission Rate by Avg.Time		**1-hour**	**3-hour**	**8-hour**	**24-hour**	**1-hour**	**3-hour**	**8-hour**	**24-hour**	**Annual**
NOx (g/s/turbine)		1.591				2.696				2.353
SO2 (g/s/turbine)		0.113	0.113		0.113	0.189	0.189			0.178
CO (g/s/turbine)		2.356		41.068		3.995				
PM10 (g/s/turbine)		1.134			1.134	1.512				1.200
Maximum Unitized Impacts (ug/m3) at 1 g/s/turbine										
	1-hour	11.85301				6.57389				
	3-hour	8.70393				6.05729				
	8-hour	5.57665				2.31939				
	24-hour	2.94345				1.05586				
	Annual					0.10770				
Maximum Pollutant Impacts (ug/m3)										
NOx (w/o OLM)	1-hour	***18.86***				17.72				
	Annual					0.290				***0.253***
SO2	1-hour	***1.34***				1.24				
	3-hour	0.98	0.98			1.14	***1.145***			
	24-hour	0.33			***0.3326***	0.20				
	Annual					0.020				***0.0192***
CO	1-hour	***27.93***				26.26				
	8-hour	13.14		***229.02***		9.27				
PM10	24-hour	3.34			***3.34***	1.60				
	Annual					0.163				***0.129***

Notes:

1. All values shown above are estimated, not guaranteed.
2. Stack velocity shown is based on a stack diameter of 18.0 feet.
3. SO2 and PM10 values are based on a fuel sulfur content of 4 ppmv.
4. Duct burner emissions are based on the following emission rates:
   NOX emission = 0.08 LB/MMBTU (HHV)
   CO emission = 0.10 LB/MMBTU (HHV)
   VOC emission = 0.02 LB/MMBTU (HHV)
   PM10 emission = 0.01 LB/MMBTU (HHV)

Table 8.1B-3. Emission rates and stack parameters for modeling.

	Emission Rates, g/s								Emission Rates, lb/hr							
	Stack Diam, m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	NOx	SO2	CO	PM10	Stack Diam, ft	Exh Temp, Deg F	Exh Flow Rate, ft3/m	Exhaust Velocity, ft/s	NOx	SO2	CO	PM10
Averaging Period: One hour																
Turbine 1/HRSG	5.4864	349.7	376.14	15.9	1.591	0.113	2.356	n/a	18	170	797,000	52.20	12.626	0.9	18.7	n/a
Turbine 2/HRSG	5.4864	349.7	376.14	15.9	1.591	0.113	2.356	n/a	18	170	797,000	52.20	12.626	0.9	18.7	n/a
Em Generator	0.2286	649.1	1.99	48.4	(1)	(1)	0.380	n/a	0.75	709	4,210	158.82	(1)	(1)	3.015	n/a
Fire Pump	0.1016	748.0	0.68	83.5	4.914E-01	1.336E-02	(1)	n/a	0.33	887	1,435	274.06	3.9	0.106	(1)	n/a
Cooling Tower (each cell)	10.0584	294.1	674.08	8.5	n/a	n/a	n/a	n/a	33	69.9	1,428,300	27.83	n/a	n/a	n/a	n/a
Averaging Period: Three hours																
Turbine 1/HRSG	5.4864	349.7	505.83	21.4	n/a	0.189	n/a	n/a	18	170	1,071,800	70.20	n/a	1.5	n/a	n/a
Turbine 2/HRSG	5.4864	349.7	505.83	21.4	n/a	0.189	n/a	n/a	18	170	1,071,800	70.20	n/a	1.5	n/a	n/a
Em Generator	0.2286	649.1	1.99	48.4	n/a	(1)	n/a	n/a	0.75	709	4,210	158.82	n/a	(1)	n/a	n/a
Fire Pump	0.1016	748.0	0.68	83.5	n/a	4.452E-03	n/a	n/a	0.33	887	1,435	274.06	n/a	3.53E-02	n/a	n/a
Cooling Tower (each cell)	10.0584	294.1	674.08	8.5	n/a	n/a	n/a	n/a	33	69.9	1,428,300	27.83	n/a	n/a	n/a	n/a
Averaging Period: Eight hours																
Turbine 1/HRSG	5.4864	349.7	376.14	15.9	n/a	n/a	41.068	n/a	18	170	797,000	52.20	n/a	n/a	325.94	n/a
Turbine 2/HRSG	5.4864	349.7	376.14	15.9	n/a	n/a	41.068	n/a	18	170	797,000	52.20	n/a	n/a	325.94	n/a
Em Generator	0.2286	649.1	1.99	48.4	n/a	n/a	(1)	n/a	0.75	709	4,210	158.82	n/a	n/a	(1)	n/a
Fire Pump	0.1016	748.0	0.68	83.5	n/a	n/a	3.701E-02	n/a	0.33	887	1,435	274.06	n/a	n/a	0.294	n/a
Cooling Tower (each cell)	10.0584	294.1	674.08	8.5	n/a	n/a	n/a	n/a	33	69.9	1,428,300	27.83	n/a	n/a	n/a	n/a
Averaging Period: 24 hours																
Turbine 1/HRSG	5.4864	349.7	376.14	15.9	n/a	0.113	n/a	1.134	18	170	797,000	52.20	n/a	0.9	n/a	9
Turbine 2/HRSG	5.4864	349.7	376.14	15.9	n/a	0.113	n/a	1.134	18	170	797,000	52.20	n/a	0.9	n/a	9
Em Generator	0.2286	649.1	1.99	48.4	n/a	(1)	n/a	(1)	0.75	709	4,210	158.82	n/a	(1)	n/a	(1)
Fire Pump	0.1016	748.0	0.68	83.5	n/a	5.565E-04	n/a	6.694E-04	0.33	887	1,435	274.06	n/a	4.42E-03	n/a	0.0053125
Cooling Tower (each cell)	10.0584	294.1	674.08	8.5	n/a	n/a	n/a	8.631E-03	33	69.9	1,428,300	27.83	n/a	n/a	n/a	0.0685
Averaging Period: Annual																
Turbine 1/HRSG	5.4864	349.7	505.83	21.4	1.927	0.178	n/a	1.200	18	170	1,071,800	70.20	15.2968	1.416	n/a	9.521
Turbine 2/HRSG	5.4864	349.7	505.83	21.4	1.927	0.178	n/a	1.200	18	170	1,071,800	70.20	15.2968	1.416	n/a	9.521
Em Generator	0.2286	649.1	1.99	48.4	5.100E-03	1.112E-05	n/a	1.801E-06	0.75	709	4,210	158.82	4.05E-02	8.82E-05	n/a	1.43E-05
Fire Pump	0.1016	748.0	0.68	83.5	1.683E-03	4.574E-05	n/a	5.502E-05	0.33	887	1,435	274.06	1.34E-02	3.63E-04	n/a	4.37E-04
Cooling Tower (each cell)	10.0584	294.1	674.08	8.5	n/a	n/a	n/a	8.631E-03	33	69.9	1,428,300	27.83	n/a	n/a	n/a	0.0685

Note: 1. Emergency generator and fire pump will not operate during the same 24-hour period.

Higher concentration from screening assessement used for each pollutant and averaging period.

Table 8.1B-4. Russell City Project - SCREEN3 turbine fumigation impacts (maximum for A=2,3,4,5,6).

		Case 12				Case 14				
GENERAL DATA:										
Manufacturer/Model		West 501F				West 501F				
Ambient Temperature, F		94				59				
Load, %		70.0				PWR AUG				
Evaporative Cooler?		off				on				
Duct Burner?		off				on				
1-hour Emission Rates										
NOx (g/s/turbine)		1.591				2.696				
SO2 (g/s/turbine)		0.113				0.189				
CO (g/s/turbine)		2.356				3.995				
PM10 (g/s/turbine)		1.134				1.512				
		REFINED NORMAL	SCREENING NORMAL	INVERSION FUMIGATION	SHORELINE FUMIGATION	REFINED NORMAL	SCREENING NORMAL	INVERSION FUMIGATION	SHORELINE FUMIGATION	Fumigation Avg.Time
Maximum Impacts (ug/m3) at 1 g/s/turbine										
	1-hour	11.85301	6.396	1.608	4.421	6.57389	5.143	1.326	3.391	Ratios
	3-hour	8.70393	5.756	1.447	3.979	5.96665	4.629	1.193	3.052	0.9
	8-hour	5.57665	4.477	1.126	3.095	2.31939	3.600	0.928	2.374	0.7
	24-hour	2.94345	2.558	0.643	1.768	1.05586	2.057	0.530	1.356	0.4
Maximum Pollutant Impacts (ug/m3)		For 2 turbs	--- Multiplied by 2 for two turbines ---			For 2 turbs	--- Multiplied by 2 for two turbines ---			
NOx (w/o OLM)	1-hour	18.86	20.35	5.12	14.07	17.72	27.73	7.15	18.28	
SO2	1-hour	1.34	1.45	0.36	1.00	1.24	1.94	0.50	1.28	
	3-hour	0.98	1.30	0.33	0.90	1.13	1.75	0.45	1.15	
	24-hour	0.33	0.58	0.15	0.40	0.20	0.78	0.20	0.51	
CO	1-hour	27.93	30.14	7.58	20.83	26.26	41.09	10.59	27.09	
	8-hour	13.14	21.10	5.31	14.58	9.27	28.76	7.41	18.97	
PM10	1-hour	13.44	14.51	3.65	10.03	9.94	15.55	4.01	10.25	
	24-hour	3.34	5.80	1.46	4.01	1.60	6.22	1.60	4.10	
				13,298	4,425			15,329	5,540	meters

		--- EMER.GEN ---		--- FIREPUMP ---		--- EMER.GEN ---		--- FIREPUMP ---	
		INVERSION FUMIGATION	SHORELINE FUMIGATION	INVERSION FUMIGATION	SHORELINE FUMIGATION	INVERSION FUMIGATION	SHORELINE FUMIGATION	INVERSION FUMIGATION	SHORELINE FUMIGATION
Maximum Impacts (ug/m3) at/beyond Fumigation Distances for Auxiliary Sources									
	1-hour	14.37	41.34	14.24	40.78	12.36	33.63	12.26	33.21
	3-hour	12.93	37.21	12.82	36.70	11.12	30.27	11.03	29.89
	8-hour	10.06	28.94	9.97	28.55	8.65	23.54	8.58	23.25
	24-hour	5.75	16.54	5.70	16.31	4.94	13.45	4.90	13.28
Maximum Pollutant Emissions (g/s)									
NOx	1-hour	0.223		4.914E-01					
SO2	1-hour	4.868E-04		1.336E-02					
	3-hour	1.623E-04		4.453E-03					
	24-hour	2.028E-05		5.567E-04					
CO	1-hour	0.380		0.296					
	8-hour	0.048		0.037					
PM10	1-hour	7.884E-05		1.605E-02					
	24-hour	3.285E-06		6.688E-04					
Maximum Pollutant Impacts (ug/m3)									
NOx (w/o OLM)	1-hour	3.20	9.22	7.00	20.04	2.76	7.50	6.02	16.32
SO2	1-hour	7.00E-03	2.01E-02	1.90E-01	5.45E-01	6.02E-03	1.64E-02	1.64E-01	4.44E-01
	3-hour	2.10E-03	6.04E-03	5.71E-02	1.63E-01	1.80E-03	4.91E-03	4.91E-02	1.33E-01
	24-hour	1.17E-04	3.35E-04	3.17E-03	9.08E-03	1.00E-04	2.73E-04	2.73E-03	7.39E-03
CO	1-hour	5.46	15.71	4.22	12.07	4.70	12.78	3.63	9.83
	8-hour	0.48	1.37	0.37	1.06	0.41	1.12	0.32	0.86
PM10	1-hour	1.13E-03	3.26E-03	2.29E-01	6.55E-01	9.74E-04	2.65E-03	1.97E-01	5.33E-01
	24-hour	1.89E-05	5.43E-05	3.81E-03	1.09E-02	1.62E-05	4.42E-05	3.28E-03	8.88E-03

		INVERSION FUMIGATION	SHORELINE FUMIGATION	INVERSION FUMIGATION	SHORELINE FUMIGATION
Total (Turbine + Emer.Gen/Firepump) Pollutant Impacts (ug/m3)					
NOx (w/o OLM)	1-hour	12.11	34.11	13.17	**34.60**
SO2	1-hour	0.55	1.54	0.67	**1.73**
	3-hour	0.38	1.06	0.50	**1.29**
	24-hour	0.15	0.41	0.20	**0.52**
CO	1-hour	13.04	36.54	15.29	**39.87**
	8-hour	5.78	15.96	7.83	**20.09**
PM10	1-hour	3.88	10.68	4.21	**10.79**
	24-hour	1.46	4.02	1.61	**4.11**

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Appendix 8.1-C
Protocol for Increments Analysis

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APPENDIX 8.1-C PROTOCOL FOR INCREMENTS ANALYSIS

Overview of Requirements for Increments Analysis

The federal Prevention of Significant Deterioration (PSD) program is intended to ensure that economic growth in areas with good air quality occurs without causing the deterioration of that air quality to unhealthful levels. The PSD program contains a number of requirements that apply to new or modified sources of air pollution that are located in clean air areas. In the Bay Area, the Bay Area Air Quality Management District (BAAQMD) has been delegated authority by the USEPA to administer the PSD program for NO_2, SO_2 and PM_{10}, the pollutants for which federal ambient standards are currently being attained. These PSD program requirements, applied on a pollutant-specific basis, include conducting an increments analysis to demonstrate that no increments will be exceeded as a result of the proposed new or modified source.

Increments are the maximum increases in concentration that are allowed to occur above baseline concentrations for each pollutant for which an increment has been established. Currently, increments have been established for NO_2, SO_2 and PM_{10}. These allowable increments are shown in the table below.

Class II Increments	
Pollutant/Averaging Time	**Allowable Class Increments ($\mu g/m^3$)**
NO_2	
Annual	25
SO_2	
3-Hour	512
24-Hour	91
Annual	20
PM_{10}	
24-Hour	30
Annual	17

The baseline concentrations are defined for each pollutant and averaging time, and are the ambient concentrations of each pollutant existing at the time that the first complete PSD application affecting the area is submitted. Federal regulations establish the dates after which major and minor source impacts on increment consumption need to be considered in an increments analysis, as follows:

- Major source baseline date: The date after which actual emissions associated with modifications at a major stationary source affect the available increment.
- Trigger date: The date after which the minor source baseline date may be established.
- Minor source baseline date: The earliest date after the trigger date on which a complete PSD application is received by the reviewing agency. After this date, actual emission changes (including increases in throughput or production that do not require permit changes) from all sources (major and minor stationary sources, area sources and mobile sources) affect the available increment.

BAAQMD regulations require that before an Authority to Construct can be issued for a facility projecting significant increases in NO_2, SO_2 and PM_{10}, the applicant must perform an increments analysis to

demonstrate that the project will not cause an exceedance of the applicable increment. The ambient impacts from RCEC for NO_2, SO_2 and annual PM_{10} have been shown to be below significance levels for all averaging times; therefore, increments analyses are not required for these pollutants and averaging periods. Should further modeling indicate that a significance level is exceeded, the following procedures will be used to perform the increment analysis.

Methodology

Establishing the Impact Area - The first step in the increments analysis is the establishment of the impact area for each pollutant and averaging period. The impact area includes the area where the emissions from the new source will cause a significant ambient impact. The impact area is a circular area with a radius extending from the source to the most distant point where modeling indicates that the ambient impact will be significant.

As described in the air quality modeling analyses contained in Section 8.1 of the AFC, affected emissions from RCEC will be modeled using the appropriate short and/or long term emission rates, the ISCST3 model and the Union City meteorological data set. Based on these modeling analyses, a region surrounding the project site will be identified as the area in which RCEC could have a "significant" air quality impact on ambient levels.

Identifying Sources Affecting the Impact Area

Once the impact area is established, sources consuming increment within the impact area must be identified and emission inventories developed for those sources. The sources include not only those located within the impact area, but also those located outside the impact area whose emissions could contribute to ambient impacts there. These inventories must account for the change in emissions between the pollutant-specific baseline date and the date of the permit application for the new source or modification. Based on these inventories, the changes in emissions are modeled to determine the amount of increment consumed for each pollutant.

In order to ensure that other emission sources that might have significant impacts on the impact area in conjunction with RCEC are identified, we will request from District staff a list of facilities that meet the following criteria:

- Major Sources: All sources within 50 kilometers of the impact area (52 km of the project) that have had significant permitted increases in affected emissions (greater than 25 tons per year) since the applicable major source baseline date.
- Minor Sources: All sources within 20 kilometers of the identified impact area (22 km of the project) that have had any permitted increases in affected emissions since the applicable minor source baseline date.

Because the increments analysis is intended to evaluate changes in ambient impacts since the baseline date due to increment-consuming sources, the analysis should compare impacts from emissions during the appropriate baseline period (two years prior to the baseline date) and from current emissions. However, the District staff indicates that actual emissions data are not available from the District's inventory system for the appropriate baseline periods. Only the most current year of actual emissions data are available. Therefore, it will not be possible to determine the changes in actual emissions from the identified point sources. Based on consultations with District staff, it has been suggested that permitted changes in emissions from the identified point sources be modeled instead, if an increment analysis is required.

In addition to point sources, and based on recent draft USEPA guidelines, all area and mobile sources affecting increment are to be included in the increments analysis. We will also request a gridded inventory of mobile and area source emissions changes since the appropriate minor source baseline dates for use in modeling increment consumption from these sources. Emissions changes are allocated to pre-defined grid cell sizes in these inventories.

Data Used in the Increments Analysis

Stack Parameters for Sources

For the permitted changes in emissions, we anticipate that the computer printout will provide minimal stack data, especially when the emissions are fugitive in nature. The following default stack parameters will be used for sources identified as "fugitive" on the computer printout:

Release height:	1 meter
Temperature:	ambient (70 degF)
Stack cross-sectional area:	1 ft^2
Flow rate:	3000 ACFM

Modeling Area and Mobile Source Emissions

As discussed above, we expect to obtain from the District staff data on the change in affected emissions between the appropriate baseline date and the most recent available inventory for use in modeling increment consumption by area and mobile sources. These data will be provided for pre-defined grid cells for the project region. Gridded emission data for the grid cells that overlap the impact areas will be used in modeling increment consumption by these sources. The ISCST3 model and the Union City meteorological data will be used for modeling all increment-consuming sources.

The following exhaust temperatures and release heights will be used in modeling area and mobile source impacts:

Source Parameters for Area and Mobile Source Modeling	
Release height	2 meters
Exhaust temperature	298°K

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Appendix 8.1-D
Screening Health Risk Assessment

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APPENDIX 8.1D SCREENING HEALTH RISK ASSESSMENT

The screening health risk assessment was conducted in accordance with the procedures developed by the California Air Pollution Control Officers' Association (CAPCOA) in the *Air Toxics "Hot Spots" Program: Revised 1992 Risk Assessment Guidelines,* CAPCOA, 1993).

The screening health risk assessment was carried out in three steps. First, emissions of toxic air pollutants from the project were calculated. These calculations are described in Section 8.1.4.1.1 and Appendix 8.1A, Table 8.1A-4, and the emissions are summarized in Table 8.1-20. Emissions from the emergency generator and fire pump are given in Appendix 8.1A, Tables 8.1A-7 and 8.1A-8.

Next, the ISCST3 model was used to predict the maximum concentration at each receptor due to the facility. This was done first for the coarse grid of receptors, and the locations of maximum risk were determined. Fine grids were set up around the locations of maximum modeled risk and impacts were reevaluated using ISCST3. Finally, the ARB/OEHHA Health Risk Assessment (HRA) Program (September 1996, with 9-27-00 updated databases) was used to evaluate acute, chronic and cancer risks through inhalation and non-inhalation pathways based upon the maximum predicted concentration at each receptor.

Based upon the water quality data (front-end RO permeate) chromium (in any form) is not expected to be found in the cooling tower drift.

The other assumptions used in running the HRA program were as follows:

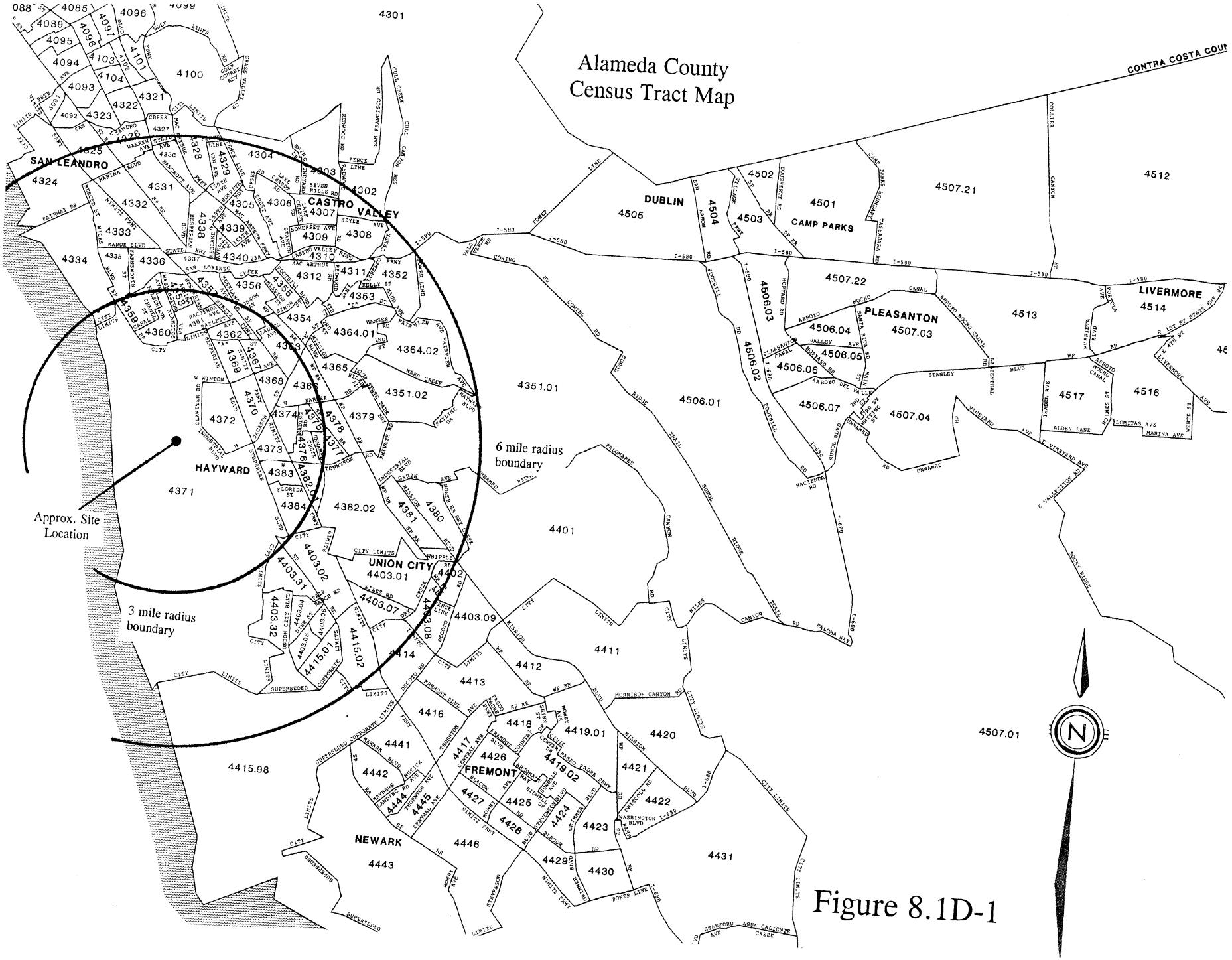
- Emission rates for non-criteria pollutants are taken from Table 8.1-20 of the AFC
- Number of residents affected is based upon the 1999 adjusted population data for those census tracts or portions of census tracts which lie within a 3 and 6 mile radius of the proposed facility.
- Number of workers affected is based upon the county average percentage of non-farm workers as compared to the total county population in 1999. This average was applied to all affected census tracts.
- Deposition velocity is taken to be 0.02 m/s, as recommended by ARB for controlled sources.
- Fraction of residents with gardens is taken to be 0.25, which is probably conservatively high for the urban area.
- Fraction of produce grown at home is taken to be 0.05, which is also believed to be conservatively high.

The HRA program is a single source model, using the emissions from a single source and the relationship between emissions and ambient concentration to calculate modeled concentration and then to determine modeled risk. The HRA input files use emission rates for each toxic pollutant, in grams per second, and a value of χ/Q, in $\mu g/m^3$ per gram per second. Since RCEC has multiple sources, the actual maximum modeled concentration of each toxic substance was used in place of the emission rate and χ/Q was taken as 1 to allow the model to evaluate total risk from all sources. While the modeled impacts of the cooling tower and the combustion sources were modeled separately (for ammonia only), the HRA program results were added together to determine total risk. The maximum modeled annual concentrations from all sources occurred at the same location.

The receptor grids used for these modeling analyses are similar to those used for the refined modeling, with the addition of discrete receptors located at schools, hospitals, day care centers, elder care facilities, retirement homes, and nursing homes. Residences nearest the proposed facility were also included as discrete receptors. A list of the discrete sensitive receptors is included in Table 8.1D-1 (Parts 1 and 2). Figure 8.1D-1 shows the boundary limits for the 3 and 6 mile radius areas. Table 8.1D-2 delineates the census tract population data, and Table 8.1D-3 and Attachment 8.1De delineates the census tract and population support data used in the SHRA.

The HRA program results for acute and chronic inhalation and chronic non-inhalation exposures, cancer burden and individual cancer risk (workplace and residential) for the cooling tower and the combustion sources are attached. Separate calculations are shown for each type of exposure and risk, and the results of the calculations are summarized below.

The modeling results show that the maximum modeled cancer risk from RCEC is expected to be 0.174 in one million. This risk is well below the one in one million level considered significant. The chronic and acute non-cancer hazard indices are <0.0216 and <0.246, respectively. Both are well below the significant impact level of 1. The total cancer burden was calculated to be 0.043, which is also well below 1.0. Detailed calculations and results for each significant receptor are included in the modeling results, which are being submitted electronically.


Alameda County
Census Tract Map
Approx. Site Location
3 mile radius boundary
6 mile radius boundary
SAN LEANDRO
CASTRO VALLEY
HAYWARD
UNION CITY
FREMONT
NEWARK
DUBLIN
CAMP PARKS
PLEASANTON
LIVERMORE
CONTRA COSTA COU
4301
4100
4321
4322
4323
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4514
4516
4517
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Figure 8.1D-1

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Table 8.1D-1, Part 1. Russell City sensitive receptor locational data.

Name	ADDRESS	CITY	ZIP CODE	Longitude	Latitude	Elevation	Elevation
A Kids Kingdom	18550 Redwood Rd	Castro Valley	94546	122.0728	37.7101	60-90ft	75
A Special Place	27305 Hintwood Ave	Hayward	94544	122.0681	37.6391	0-30ft	15
Abc Academy	670 Sunset Blvd	Hayward	94541	122.0926	37.6759	0-30ft	15
Abc pre-School & Day Care	20135 San Miguel Ave	Castro Valley	94546	122.0798	37.6985	30-60ft	45
Adventure Montessori Academy	4101 Pleiades Pl	Union City	94587	122.0654	37.5876	0-30ft	15
Adventure Time Lorenzo Manor	18250 Bengal Ave	Hayward	94541	122.1188	37.6748	0-30ft	15
Alameda County Medical Center	15400 Foothill Blvd	San Leandro	94578	122.1196	37.7080	0-30ft	15
All Saints School	22870 2nd Street	Hayward	94541	122.0802	37.6773	30-60ft	45
Alvarado Elementary School	31100 Fredi St	Union City	94587	122.0760	37.5951	0-30ft	15
Alzheimer's Services	561 A St	Hayward	94541	122.0879	37.6714	0-30ft	15
American Heritage Christian	425 Gresel St	Hayward	94544	122.0341	37.6181	0-30ft	15
Ardenwood Elementary School	33955 Emilia Ln	Fremont	94555	122.0510	37.5727	0-30ft	15
Avenue Pre-School	1521 159th Ave	San Leandro	94578	122.1170	37.7024	0-30ft	15
Barnard White Middle School	725 Wipple Rd	Union City	94587	122.0293	37.6058	0-30ft	15
Bay Point Healthcare Center	442 Sunset Blvd	Hayward	94579	122.0966	37.6742	0-30ft	15
Bay School	2001 Bockman Rd	San Lorenzo, CA	94580	122.1463	37.6717	0-30ft	15
Beth Sholom Pro-Shool	642 Dolores Ave	San Leandro	94578	122.1446	37.7249	0-30ft	15
Bethesda Christian Retirement	22427 Montgomery St	Hayward	94541	122.0867	37.6716	0-30ft	15
Bohannon Middle School	800 Bockman Rd	San Lorenzo, CA	94580	122.1247	37.6710	0-30ft	15
Bowman Elem	520 Jefferson St	Hayward	94544	122.0611	37.6417	0-30ft	15
Brenkwitz School	22100 Princeton St	Hayward	94545	122.0980	37.6721	0-30ft	15
Bret Harte Intermediate School	1047 E St	Hayward	94541	122.0251	37.5991	0-30ft	15
Broadmoor Parent Nursery	951 Dowling Blvd	San Leandro	94578	122.1457	37.7366	0-30ft	15
Burbank Elementary	353 B St	Hayward	94541	122.0934	37.6682	0-30ft	15
Burbank Pre School	15661 Washington Ave	San Lorenzo	94580	122.1369	37.6827	0-30ft	15
Camelot Schools	21753 Vallejo St	Hayward	94541	122.0936	37.6775	0-30ft	15
Castro Valley Elementary	20185 San Miguel Ave	Castro Valley	94546	122.0798	37.6981	30-60ft	45
Castro Valley Parent Nursery	3657 Christensen Ln	Castro Valley	94546	122.0836	37.7065	60-90ft	75
Cesar Chavez Middle School	2801 Hop Ranch Rd	Union City	94587	122.0462	37.5903	0-30ft	15
Chabot Elementary	19104 Lake Chabot Rd	Castro Valley	94546	122.0890	37.7071	60-90ft	75

Table 8.1D-1, Part 1. (continued)

Name	ADDRESS	CITY	ZIP CODE	Longitude	Latitude	Elevation	Elevation
Cherryland Elementary	585 Willow Ave	Hayward	94541	122.0970	37.6766	0-30ft	15
Cherubim's Children Center	30540 Mission Blvd	Hayward	94544	122.0302	37.6163	0-30ft	15
Child Family & Community Servic	20900 Corsair Blvd	Hayward	94545	122.1235	37.6554	0-30ft	15
Children's Choice	185 W Harder Rd	Hayward	94544	122.0853	37.6480	0-30ft	15
Circle Time Nursery	26555 Gading Rd	Hayward	94544	122.0802	37.6412	0-30ft	15
Colonial Acres Elementary	17115 Meekland Ave	Hayward	94580	122.1155	37.6840	0-30ft	15
Cornerstone Pentesostal Church	24150 Hesperian Blvd	Hayward	94545	122.1084	37.6521	0-30ft	15
Corvallis School	14790 Corvallis St	San Leandro	94579	122.1511	37.6966	0-30ft	15
Courtyard Care Center	1625 Denton Ave	Hayward	94545	122.1131	37.6467	0-30ft	15
Darwin Head Start	2560 Darwin St	Hayward	94545	122.1014	37.6315	0-30ft	15
Dayton Elementary School	1500 Dayton Ave	San Lorenzo	94579	122.1557	37.6888	0-30ft	15
Debbie's Daycare	2664 Hawthorne Ave	Hayward	94545	122.1052	37.6331	0-30ft	15
Diana's Care Home	27402 Manon Ave	Hayward	94580	122.0686	37.6365	0-30ft	15
Driftwood Healthcare Center	19700 Hesperian Blvd	Hayward	94542	122.1184	37.6679	0-30ft	15
Early Head Start Program	680 W Tennyson Rd	Hayward	94544	122.0676	37.6319	0-30ft	15
East Ave Elementary School	2424 East Ave	Hayward	94541	122.0562	37.6714	90-120ft	105
Eden Area Head Start	951 Palisade St	Hayward	94542	122.0726	37.6629	30-60ft	45
Eden Gardens Elementary	2184 Thayer Ave	Hayward	94545	122.1064	37.6375	0-30ft	15
Eden Villa	19960 Santa Maria Ave	Castro Valley, C	94546	122.0774	37.7007	30-60ft	45
Edendale Elementary School	16160 Ashland Ave	San Lorenzo, CA	94580	122.1178	37.6957	0-30ft	15
Eden-West Rehab & convalescent	1805 West St	Hayward	94541	122.1151	37.6450	0-30ft	15
Eldridge Elementary School	26825 Eldridge Ave	Hayward, CA	94544	122.0846	37.6370	0-30ft	15
Elmhurst Daycare & Preschool	380 Elmhurst St	Hayward	94544	122.0932	37.6559	0-30ft	15
Emerald Care Home	2729 Dowe Ave	Union City, CA	94587	122.0437	37.5897	0-30ft	15
Evergreen Residential Care	239 Blossom Way	Hayward, CA	94580	122.1060	37.6773	0-30ft	15
Evergreen Senior Center	985 Sueirro St	Hayward	94541	122.1146	37.6626	0-30ft	15
Fairview Elementary School	23515 Maud Ave	Hayward	94541	122.0511	37.6812	120-150ft	135
Fairview Hills Pre-School	2841 Romagnolo St	Hayward	94541	122.0522	37.6814	90-120ft	105
Fern Lodge Inc	18457 Madison Ave	Castro Valley, C	94546	122.0627	37.7088	90-120ft	105
Galicia's Tulip Care Home	1771 Tulip Ave	Hayward, CA	94542	122.0795	37.6242	0-30ft	15

Table 8.1D-1, Part 1. (continued)

Name	ADDRESS	CITY	ZIP CODE	Longitude	Latitude	Elevation	Elevation
Garfield Elementary School	13050 Aurora Dr	San Leandro	94577	122.1852	37.7044	0-30ft	15
Gerrylaide Manor	261 Medford Ave	Hayward, CA	94541	122.1078	37.6809	0-30ft	15
Glassbrook Elementary School	975 Schafer Rd	Hayward	94544	122.0798	37.6410	0-30ft	15
Grant School	879 Grant Ave	San Lorenzo, CA	94580	122.1335	37.6804	0-30ft	15
Growing Years Day Camp	20166 Wisteria St	Castro Valley	94546	122.0850	37.6988	30-60ft	45
Growing Years Preschool	20320 Anita Ave	Castro Valley	94546	122.0822	37.6974	30-60ft	45
Happiness Hill Pre-School	20600 John Dr	Castro Valley	94546	122.0912	37.6925	60-90ft	75
Hartnell Home Care	2041 Hartnell St	Union City, CA	94587	122.0283	37.5920	0-30ft	15
Hayward Convalescent Hospital	1832 B St	Hayward, CA	94541	122.0659	37.6822	30-60ft	45
Hayward Hills Health Care Ctr	1768 B St	Hayward, CA	94541	122.0679	37.6812	30-60ft	45
Hayward Parent Co-Op Nursery	2652 Vergil Ct	Castro Valley	94546	122.0684	37.6879	30-60ft	45
Head Start Program	25926 Carlos Bee Blvd	Hayward	94542	122.0608	37.6590	0-30ft	15
Head Start Program	975 Schafer Rd	Hayward	94544	122.0798	37.6410	120-150ft	135
Helen Turner Childrens Center	23640 Reed Way	Hayward	94541	122.1063	37.6563	0-30ft	15
Hesperian School	620 Drew St	San Lorenzo, CA	94580	122.1242	37.6939	0-30ft	15
Highland Elementary	2021 Highland Blvd	Hayward	94542	122.0579	37.6622	120-150ft	135
Hillside School	15980 Marcella St	San Leandro	94578	122.1154	37.7014	0-30ft	15
Hillview Crest School	31410 Wheelon Ave	Hayward	94544	122.0354	37.6148	0-30ft	15
His Growing From Infant Care	2490 Grove Way	Castro Valley	94546	122.0697	37.6858	30-60ft	45
James Madison	14751 Juniper Street	San Leandro	94579	122.1593	37.6959	0-30ft	15
Jefferson Elementary	14311 Lark St	San Leandro	94578	122.1341	37.7138	0-30ft	15
John Muir	24823 Soto Rd	Hayward	94544	122.0820	37.6566	0-30ft	15
Jones Rest Home	524 Callan Ave	San Leandro, CA	94579	122.1499	37.7275	0-30ft	15
Kids Klub Children's Center	2500 Oliver Dr	Hayward	94545	122.0946	37.6268	0-30ft	15
Laurel Grove hospital	19933 Lake Chabot	Castro Valley	94546	122.0867	37.7000	30-60ft	45
Learning Game	31600 Alvarado Blvd	Union City	94587	122.0799	37.5917	0-30ft	15
Lea's Christian School	26236 Adrian Ave	Hayward	94545	122.1018	37.6375	0-30ft	15
Lewelling School	562 Lewelling Blvd	San Leandro	94576	122.1345	37.6866	0-30ft	15
Lighthouse Kiddie Kingdom	16053 Ashland Ave	San Lorenzo	94580	122.1178	37.6975	0-30ft	15
Lil Angels Day Care Center	28924 Ruus Rd	Hayward	94544	122.0650	37.6259	0-30ft	15

Table 8.1D-1, Part 1. (continued)

Name	ADDRESS	CITY	ZIP CODE	Longitude	Latitude	Elevation	Elevation
Little Lambs Preschool	14871 Bancroft Ave	San Leandro	94578	122.1291	37.7078	0-30ft	15
Lollipop Lane Preschool	341 Paseo Grande	San Lorenzo	94580	122.1216	37.6823	0-30ft	15
Longwood Elementary School	850 Longwood Ave	Hayward	94541	122.1092	37.6593	0-30ft	15
Lorenzo Manor School	18250 Bengal Ave	Hayward	94541	122.1188	37.6748	0-30ft	15
Majestic Pines Care Ctr	1628 B St	Hayward, CA	94541	122.0709	37.6797	30-60ft	45
Markham Elementary School	1570 Ward St	Hayward	94541	122.0725	37.6766	30-60ft	45
Marshall School	20111 Marshall St	Castro Valley	94546	122.0646	37.6991	60-90ft	75
Masonic Home For Adults	34400 Mission Blvd	Union City, CA	94587	122.0063	37.5951	0-30ft	15
Monroe Elementary School	3750 Monterey Blvd	San Lorenzo	94578	122.1452	37.6983	30-60ft	45
Montessori Children's House	166 W Harder Rd	Hayward	94544	122.0861	37.6479	0-30ft	15
Montessori Children's House	26236 Adrian Ave	Hayward	94545	122.1018	37.6375	0-30ft	15
Montessori Children's School	1836 B St	Hayward	94541	122.0657	37.6823	30-60ft	45
Montessori School	1101 Walpert St	Hayward	94541	122.0738	37.6694	30-60ft	45
Montessori School	19234 Lake Chabot rd	Castro Valley	94546	122.0887	37.7062	60-90ft	75
Montessori School	16492 Foothill Blvd	San Leandro	94578	122.1047	37.6981	60-90ft	75
Moreau Catholic High School	27170 Mission Blvd	Hayward	94544	122.0364	37.6217	0-30ft	15
Morton Bakar Center	494 Blossom Way	Hayward	94542	122.1022	37.6787	0-30ft	15
Ochoa Intermediate School	2121 Depot Rd	Hayward	94545	122.1070	37.6389	0-30ft	15
Our Future Tots Learning Ctr	963 Manor Blvd	San Leandro	94578	122.1460	37.6911	0-30ft	15
Palma Ceia School	27679 Melborne Ave	Hayward	94545	122.0838	37.6273	0-30ft	15
Park Elementary School	411 Larchmont St	Hayward	94544	122.0926	37.6531	0-30ft	15
Pioneer Elementary School	32737 Bel Aire St	Union City	94587	122.0711	37.5724	0-30ft	15
Quail Ridge Health Care Center	1440 168th Ave	San Leandro	94579	122.1066	37.6920	0-30ft	15
Redwood Convalescent Hospital	22103 Redwood Rd	Castro Valley, C	94546	122.0727	37.6868	30-60ft	45
Redwood Forest Pre-School	19200 Redwood Rd	Castro Valley	94546	122.0729	37.7068	60-90ft	75
Refugio M Cabello Elementary	4500 Cabello St	Union City	94587	122.0714	37.5869	0-30ft	15
Right World Nursery School	20613 Stanton Ave	Castro Valley	94546	122.0887	37.6934	30-60ft	45
Rise'n Shine Preschool	20104 Center St	Castro Valley	94546	122.0606	37.6975	60-90ft	75
Rose Gate	1345 Clarke St	San Leandro, CA	94579	122.1572	37.7237	0-30ft	15
Ruus School	28027 Dickens Ave	Hayward	94544	122.0725	37.6277	0-30ft	15

Table 8.1D-1, Part 1. (continued)

Name	ADDRESS	CITY	ZIP CODE	Longitude	Latitude	Elevation	Elevation
Saint Anthony Care Center	553 Smalley Ave	Hayward	94578	122.0915	37.6713	0-30ft	15
Saint Bede's Ccd	26910 Patrick Ave	Hayward	94544	122.0784	37.6363	0-30ft	15
Saint Christopher Convalescent	22822 Myrtle St	Hayward	94542	122.0904	37.6659	0-30ft	15
Saint Clement's School	790 Calhoun St	Hayward	94544	122.0571	37.6426	0-30ft	15
Saint Felicitas School	1650 Manor Blvd	San Leandro	94579	122.1583	37.6912	0-30ft	15
Saint Francis Extended Care	718 Bartlett Ave	Hayward	94542	122.1174	37.6695	0-30ft	15
Saint Joachim's Ccd	21250 Hesperian Blvd	Hayward	94541	122.1151	37.6628	0-30ft	15
Saint Therese Convalescent Hosp	21863 Valleio St	Hayward	94542	122.0930	37.6769	0-30ft	15
Saint Therese Day Care	1507 Rieger Ave	Hayward	94544	122.0824	37.6332	0-30ft	15
San Leandro Childrens	14311 Lark St	San Leandro	94578	122.1341	37.7138	0-30ft	15
San Leandro Healthcare Ctr	368 Juana Ave	San Leandro, CA	94579	122.1506	37.7243	0-30ft	15
San Leandro Hospital	13855 E 14th St	San Leandro	94546	122.1394	37.7136	0-30ft	15
San Leandro Surgery Center	15035 E 14th St	San Leandro	94578	122.1272	37.7051	0-30ft	15
San Lorenzo Community Church	945 Paseo Grande	San Lorenzo	94580	122.1318	37.6772	0-30ft	15
San Lorenzo Parent Nursery	820 Bockman Rd	San Lorenzo	94580	122.1252	37.6709	0-30ft	15
Santo Domingo Residential Care	3327 San Marco Ct	Union City	94580	122.0689	37.5942	0-30ft	15
Schafer Park Elementary	26268 Flamingo Ave	Hayward	94544	122.0861	37.6430	0-30ft	15
Seaton Rehabilation Hospital	1652 Mono Ave	San Leandro, CA	94579	122.1186	37.7025	0-30ft	15
Seaton Rehabilitation Hospital	15705 Liberty St	San Leandro	94578	122.1173	37.7057	0-30ft	15
Semore School	4312 Dyer St	Union City	94587	122.0712	37.5869	0-30ft	15
Senior Friends	13847 E 14th St	San Leandro	94578	122.1395	37.7137	0-30ft	15
Shepard Elementary	27211 Tyrell Ave	Hayward	94544	122.0731	37.6362	0-30ft	15
Sir Love	27653 Pompano Ave	Hayward	94544	122.0763	37.6302	0-30ft	15
Southgate Elementary School	26601 Calaroga Ave	Hayward	94545	122.0933	37.6393	0-30ft	15
St Anthony Care Ctr	553 Smalley Ave	Hayward, CA	94541	122.0915	37.6713	0-30ft	15
St Anthony Residential Care	4491 Ariel Ave	Fremont, CA	94555	122.0547	37.5745	0-30ft	15
St Christopher Convalescent	22822 Myrtle St	Hayward, CA	94541	122.0904	37.6659	0-30ft	15
St Francis Extended Care	718 Bartlett Ave	Hayward, CA	94541	122.1174	37.6695	0-30ft	15
St Gregory Care Ctr	22424 Charlene Way	Castro Valley, C	94546	122.0723	37.6832	0-30ft	15
St John Kronstadt Convalescent	4432 James Ave	Castro Valley, C	94546	122.0684	37.7067	0-30ft	15

Table 8.1D-1, Part 1. (continued)

Name	ADDRESS	CITY	ZIP CODE	Longitude	Latitude	Elevation	Elevation
St John's School	270 E Lewelling Blvd	San Lorenzo, CA	94580	122.1164	37.6868	0-30ft	15
St Lukes Sub Acute Care	1652 Mono Ave	San Leandro	94578	122.1186	37.7025	0-30ft	15
St Therese Convalescent Hosp	21863 Vallejo St	Hayward, CA	94541	122.0930	37.6769	0-30ft	15
Stivers Academy	461 Bartlett Ave	Hayward	94541	122.1130	37.6711	0-30ft	15
Strobridge Elementary School	21400 Bedford Dr	Castro Valley	94546	122.0865	37.6860	30-60ft	45
Sunbridge Care & Rehab Center	26660 Patrick Ave	Hayward	94580	122.0792	37.6403	0-30ft	15
Sunbridge Care & Rehab Ctr	14766 Washington Ave	San Leandro, CA	94579	122.1381	37.6966	0-30ft	15
Sunset Parent Nursery School	22100 Princeton St	Hayward	94541	122.0980	37.6721	0-30ft	15
Supporting Future	22584 S Garden Ave	Hayward	94541	122.1076	37.6613	0-30ft	15
Tennyson High School	27035 Whitman St	Hayward, CA	94544	122.0649	37.6428	0-30ft	15
Tennyson Parent Nursery School	27552 E 11th St	Hayward	94544	122.0605	37.6415	0-30ft	15
Treeview Elementary	30565 Treeview St	Hayward	94544	122.0361	37.6246	0-30ft	15
Tri Cities Children's Ctrs Inco	625 Berry Ave	Hayward	94544	122.0727	37.6563	0-30ft	15
Tri Cities Children's Ctrs Inco	541 Blanche St	Hayward	94544	122.0280	37.6151	0-30ft	15
Tri Cities Children's Ctrs Inco	23640 Reed Way	Hayward	94541	122.1063	37.6563	0-30ft	15
Tyrell Elementary	27000 Tyrell Ave	Hayward	94544	122.0746	37.6375	0-30ft	15
Valley Pointe Rehab & Nursing	20090 Stanton Ave	Castro Valley, C	94546	122.0898	37.6974	30-60ft	45
Villa Fairmont Mental Health	15200 Foothill Blvd	San Leandro, CA	94579	122.1210	37.7095	0-30ft	15
Vintage Estates of Hayward	25919 Gading Rd	Hayward	94579	122.0802	37.6470	0-30ft	15
Washington Manor School	1170 Fargo Ave	San Leandro	94579	122.1481	37.6891	0-30ft	15
Whispering Pines Rest Haven	565 Schafer Rd	Hayward	94580	122.0746	37.6410	0-30ft	15
Wisteria Care Ctr	20524 Wisteria St	Castro Valley, C	94546	122.0840	37.6961	30-60ft	45
Woodroe Woods School	22502 Woodroe Ave	Hayward	94541	122.0541	37.6897	60-90ft	75
YMCA	951 Palisade St	Hayward	94542	122.0726	37.6629	30-60ft	45
Yours & Mine	2894 D St	Hayward	94541	122.0552	37.6799	90-120ft	105

Table 8.1D-1, Part 2. Russell City sensitive receptor locational data.

Name	ADDRESS	CITY	ZIP CODE	East(km) Zone 10	North(km) Zone 10	Elevation Feet	Dist(km) from Facility
A Kids Kingdom	18550 Redwood Rd	Castro Valley	94546	581.736	4173.861	75	9.934
A Special Place	27305 Hintwood Ave	Hayward	94544	582.231	4166.006	15	5.551
Abc Academy	670 Sunset Blvd	Hayward	94541	580.034	4170.053	15	5.805
Abc pre-School & Day Care	20135 San Miguel Ave	Castro Valley	94546	581.137	4172.592	45	8.537
Adventure Montessori Academy	4101 Pleiades Pl	Union City	94587	582.509	4160.276	15	7.648
Adventure Time Lorenzo Manor	18250 Bengal Ave	Hayward	94541	577.708	4169.908	15	4.729
Alameda County Medical Center	15400 Foothill Blvd	San Leandro	94578	577.600	4173.605	15	8.369
All Saints School	22870 2nd Street	Hayward	94541	581.111	4170.218	45	6.602
Alvarado Elementary School	31100 Fredi St	Union City	94587	581.592	4161.099	15	6.416
Alzheimer's Services	561 A St	Hayward	94541	580.456	4169.564	15	5.678
American Heritage Christian	425 Gresel St	Hayward	94544	585.245	4163.694	15	8.665
Ardenwood Elementary School	33955 Emilia Ln	Fremont	94555	583.800	4158.655	15	9.692
Avenue Pre-School	1521 159th Ave	San Leandro	94578	577.851	4172.991	15	7.791
Barnard White Middle School	725 Wipple Rd	Union City	94587	585.700	4162.343	15	9.442
Bay Point Healthcare Center	442 Sunset Blvd	Hayward	94579	579.669	4169.865	15	5.446
Bay School	2001 Bockman Rd	San Lorenzo, CA	94580	575.286	4169.546	15	4.501
Beth Sholom Pro-Shool	642 Dolores Ave	San Leandro	94578	575.403	4175.465	15	10.269
Bethesda Christian Retirement	22427 Montgomery St	Hayward	94541	580.553	4169.596	15	5.766
Bohannon Middle School	800 Bockman Rd	San Lorenzo, CA	94580	577.197	4169.502	15	4.246
Bowman Elem	520 Jefferson St	Hayward	94544	582.841	4166.290	15	6.197
Brenkwitz School	22100 Princeton St	Hayward	94545	579.548	4169.647	15	5.197
Bret Harte Intermediate School	1047 E St	Hayward	94541	586.076	4161.607	15	10.045
Broadmoor Parent Nursery	951 Dowling Blvd	San Leandro	94578	575.269	4176.759	15	11.569
Burbank Elementary	353 B St	Hayward	94541	579.969	4169.190	15	5.078
Burbank Pre School	15661 Washington Ave	San Lorenzo	94580	576.107	4170.787	15	5.540
Camelot Schools	21753 Vallejo St	Hayward	94541	579.934	4170.237	15	5.902

Table 8.1D-1, Part 2. (continued)

Name	ADDRESS	CITY	ZIP CODE	East(km) Zone 10	North(km) Zone 10	Elevation Feet	Dist(km) from Facility
Castro Valley Elementary	20185 San Miguel Ave	Castro Valley	94546	581.137	4172.530	45	8.484
Castro Valley Parent Nursery	3657 Christensen Ln	Castro Valley	94546	580.785	4173.451	75	9.121
Cesar Chavez Middle School	2801 Hop Ranch Rd	Union City	94587	584.222	4160.601	15	8.837
Chabot Elementary	19104 Lake Chabot Rd	Castro Valley	94546	580.319	4173.508	75	8.976
Cherryland Elementary	585 Willow Ave	Hayward	94541	579.641	4170.142	15	5.667
Cherubim's Children Center	30540 Mission Blvd	Hayward	94544	585.590	4163.513	15	9.038
Child Family & Community Servic	20900 Corsair Blvd	Hayward	94545	577.312	4167.777	15	2.563
Children's Choice	185 W Harder Rd	Hayward	94544	580.701	4166.977	15	4.320
Circle Time Nursery	26555 Gading Rd	Hayward	94544	581.150	4166.211	15	4.520
Colonial Acres Elementary	17115 Meekland Ave	Hayward	94580	577.992	4170.958	15	5.815
Cornerstone Pentesostal Church	24150 Hesperian Blvd	Hayward	94545	578.663	4167.420	15	2.884
Corvallis School	14790 Corvallis St	San Leandro	94579	574.845	4172.316	15	7.281
Courtyard Care Center	1625 Denton Ave	Hayward	94545	578.252	4166.800	15	2.152
Darwin Head Start	2560 Darwin St	Hayward	94545	579.298	4165.146	15	2.575
Dayton Elementary School	1500 Dayton Ave	San Lorenzo	94579	574.460	4171.450	15	6.571
Debbie's Daycare	2664 Hawthorne Ave	Hayward	94545	578.953	4165.296	15	2.226
Diana's Care Home	27402 Manon Ave	Hayward	94580	582.185	4165.698	15	5.474
Driftwood Healthcare Center	19700 Hesperian Blvd	Hayward	94542	577.765	4169.138	15	3.993
Early Head Start Program	680 W Tennyson Rd	Hayward	94544	582.288	4165.205	15	5.562
East Ave Elementary School	2424 East Ave	Hayward	94541	583.248	4169.592	105	7.817
Eden Area Head Start	951 Palisade St	Hayward	94542	581.812	4168.622	45	6.084
Eden Gardens Elementary	2184 Thayer Ave	Hayward	94545	578.850	4165.789	15	2.183
Eden Villa	19960 Santa Maria Ave	Castro Valley, C	94546	581.330	4172.840	45	8.849
Edendale Elementary School	16160 Ashland Ave	San Lorenzo, CA	94580	577.784	4172.251	15	7.049
Eden-West Rehab & convalescent	1805 West St	Hayward	94541	578.058	4166.613	15	1.882
Eldridge Elementary School	26825 Eldridge Ave	Hayward, CA	94544	580.762	4165.745	15	4.061
Elmhurst Daycare & Preschool	380 Elmhurst St	Hayward	94544	580.007	4167.834	15	4.156

Table 8.1D-1, Part 2. (continued)

Name	ADDRESS	CITY	ZIP CODE	East(km) Zone 10	North(km) Zone 10	Elevation Feet	Dist(km) from Facility
Emerald Care Home	2729 Dowe Ave	Union City, CA	94587	584.444	4160.542	15	9.056
Evergreen Residential Care	239 Blossom Way	Hayward, CA	94580	578.833	4170.196	15	5.346
Evergreen Senior Center	985 Sueirro St	Hayward	94541	578.113	4168.555	15	3.554
Fairview Elementary School	23515 Maud Ave	Hayward	94541	583.679	4170.675	135	8.799
Fairview Hills Pre-School	2841 Romagnolo St	Hayward	94541	583.580	4170.705	105	8.739
Fern Lodge Inc	18457 Madison Ave	Castro Valley, C	94546	582.619	4173.747	105	10.314
Galicia's Tulip Care Home	1771 Tulip Ave	Hayward, CA	94542	581.242	4164.333	15	4.614
Garfield Elementary School	13050 Aurora Dr	San Leandro	94577	571.824	4173.153	15	9.273
Gerrylaide Manor	261 Medford Ave	Hayward, CA	94541	578.681	4170.595	15	5.661
Glassbrook Elementary School	975 Schafer Rd	Hayward	94544	581.199	4166.211	15	4.567
Grant School	879 Grant Ave	San Lorenzo, CA	94580	576.404	4170.512	15	5.240
Growing Years Day Camp	20166 Wisteria St	Castro Valley	94546	580.671	4172.618	45	8.329
Growing Years Preschool	20320 Anita Ave	Castro Valley	94546	580.917	4172.466	45	8.317
Happiness Hill Pre-School	20600 John Dr	Castro Valley	94546	580.139	4171.904	75	7.449
Hartnell Home Care	2041 Hartnell St	Union City, CA	94587	585.790	4160.802	15	10.110
Hayward Convalescent Hospital	1832 B St	Hayward, CA	94541	582.379	4170.785	45	7.888
Hayward Hills Health Care Ctr	1768 B St	Hayward, CA	94541	582.209	4170.660	45	7.680
Hayward Parent Co-Op Nursery	2652 Vergil Ct	Castro Valley	94546	582.152	4171.430	45	8.199
Head Start Program	25926 Carlos Bee Blvd	Hayward	94542	582.845	4168.231	15	6.792
Head Start Program	975 Schafer Rd	Hayward	94544	581.199	4166.211	135	4.567
Helen Turner Childrens Center	23640 Reed Way	Hayward	94541	578.830	4167.884	15	3.346
Hesperian School	620 Drew St	San Lorenzo, CA	94580	577.223	4172.030	15	6.766
Highland Elementary	2021 Highland Blvd	Hayward	94542	583.112	4168.574	135	7.184
Hillside School	15980 Marcella St	San Leandro	94578	577.999	4172.870	15	7.694
Hillview Crest School	31410 Wheelon Ave	Hayward	94544	585.126	4163.323	15	8.624
His Growing From Infant Care	2490 Grove Way	Castro Valley	94546	582.032	4171.182	45	7.934
James Madison	14751 Juniper Street	San Leandro	94579	574.110	4172.218	15	7.413
Jefferson Elementary	14311 Lark St	San Leandro	94578	576.321	4174.241	15	8.968

Table 8.1D-1, Part 2. (continued)

Name	ADDRESS	CITY	ZIP CODE	East(km) Zone 10	North(km) Zone 10	Elevation Feet	Dist(km) from Facility
John Muir	24823 Soto Rd	Hayward	94544	580.986	4167.936	15	5.018
Jones Rest Home	524 Callan Ave	San Leandro, CA	94579	574.911	4175.738	15	10.613
Kids Klub Children's Center	2500 Oliver Dr	Hayward	94545	579.891	4164.596	15	3.238
Laurel Grove hospital	19933 Lake Chabot	Castro Valley	94546	580.522	4172.739	45	8.367
Learning Game	31600 Alvarado Blvd	Union City	94587	581.228	4160.726	15	6.404
Lea's Christian School	26236 Adrian Ave	Hayward	94545	579.242	4165.792	15	2.566
Lewelling School	562 Lewelling Blvd	San Leandro	94576	576.324	4171.221	15	5.953
Lighthouse Kiddie Kingdom	16053 Ashland Ave	San Lorenzo	94580	577.783	4172.436	15	7.232
Lil Angels Day Care Center	28924 Ruus Rd	Hayward	94544	582.515	4164.529	15	5.837
Little Lambs Preschool	14871 Bancroft Ave	San Leandro	94578	576.768	4173.567	15	8.285
Lollipop Lane Preschool	341 Paseo Grande	San Lorenzo	94580	577.456	4170.737	15	5.503
Longwood Elementary School	850 Longwood Ave	Hayward	94541	578.582	4168.190	15	3.449
Lorenzo Manor School	18250 Bengal Ave	Hayward	94541	577.708	4169.908	15	4.729
Majestic Pines Care Ctr	1628 B St	Hayward, CA	94541	581.941	4170.503	45	7.379
Markham Elementary School	1570 Ward St	Hayward	94541	581.797	4170.163	45	7.038
Marshall School	20111 Marshall St	Castro Valley	94546	582.458	4172.666	75	9.347
Masonic Home For Adults	34400 Mission Blvd	Union City, CA	94587	587.724	4161.162	15	11.743
Monroe Elementary School	3750 Monterey Blvd	San Lorenzo	94578	575.357	4172.506	45	7.353
Montessori Children's House	166 W Harder Rd	Hayward	94544	580.628	4166.946	15	4.241
Montessori Children's House	26236 Adrian Ave	Hayward	94545	579.242	4165.792	15	2.566
Montessori Children's School	1836 B St	Hayward	94541	582.379	4170.785	45	7.888
Montessori School	1101 Walpert St	Hayward	94541	581.683	4169.360	45	6.418
Montessori School	19234 Lake Chabot rd	Castro Valley	94546	580.345	4173.416	75	8.902
Montessori School	16492 Foothill Blvd	San Leandro	94578	578.933	4172.508	75	7.555
Moreau Catholic High School	27170 Mission Blvd	Hayward	94544	585.044	4164.093	15	8.402
Morton Bakar Center	494 Blossom Way	Hayward	94542	579.174	4170.353	15	5.631
Ochoa Intermediate School	2121 Depot Rd	Hayward	94545	578.800	4165.942	15	2.176
Our Future Tots Learning Ctr	963 Manor Blvd	San Leandro	94578	575.291	4171.704	15	6.581

Table 8.1D-1, Part 2. (continued)

Name	ADDRESS	CITY	ZIP CODE	East(km) Zone 10	North(km) Zone 10	Elevation Feet	Dist(km) from Facility
Palma Ceia School	27679 Melborne Ave	Hayward	94545	580.847	4164.667	15	4.166
Park Elementary School	411 Larchmont St	Hayward	94544	580.059	4167.526	15	4.017
Pioneer Elementary School	32737 Bel Aire St	Union City	94587	582.034	4158.606	15	8.528
Quail Ridge Health Care Center	1440 168th Ave	San Leandro	94579	578.768	4171.829	15	6.858
Redwood Convalescent Hospital	22103 Redwood Rd	Castro Valley, C	94546	581.762	4171.303	45	7.849
Redwood Forest Pre-School	19200 Redwood Rd	Castro Valley	94546	581.715	4173.522	75	9.632
Refugio M Cabello Elementary	4500 Cabello St	Union City	94587	581.994	4160.209	15	7.313
Right World Nursery School	20613 Stanton Ave	Castro Valley	94546	580.359	4171.998	45	7.635
Rise'n Shine Preschool	20104 Center St	Castro Valley	94546	582.828	4172.485	75	9.440
Rose Gate	1345 Clarke St	San Leandro, CA	94579	574.279	4175.301	15	10.314
Ruus School	28027 Dickens Ave	Hayward	94544	581.851	4164.739	15	5.153
Saint Anthony Care Center	553 Smalley Ave	Hayward	94578	580.137	4169.561	15	5.472
Saint Bede's Ccd	26910 Patrick Ave	Hayward	94544	581.327	4165.689	15	4.618
Saint Christopher Convalescent	22822 Myrtle St	Hayward	94542	580.217	4168.945	15	5.059
Saint Clement's School	790 Calhoun St	Hayward	94544	583.207	4166.417	15	6.579
Saint Felicitas School	1650 Manor Blvd	San Leandro	94579	574.213	4171.694	15	6.887
Saint Francis Extended Care	718 Bartlett Ave	Hayward	94542	577.836	4169.323	15	4.190
Saint Joachim's Ccd	21250 Hesperian Blvd	Hayward	94541	578.064	4168.585	15	3.563
Saint Therese Convalescent Hosp	21863 Valleio St	Hayward	94542	579.984	4170.176	15	5.879
Saint Therese Day Care	1507 Rieger Ave	Hayward	94544	580.963	4165.346	15	4.236
San Leandro Childrens	14311 Lark St	San Leandro	94578	576.321	4174.241	15	8.968
San Leandro Healthcare Ctr	368 Juana Ave	San Leandro, CA	94579	574.865	4175.368	15	10.256
San Leandro Hospital	13855 E 14th St	San Leandro	94546	575.856	4174.206	15	8.966
San Leandro Surgery Center	15035 E 14th St	San Leandro	94578	576.942	4173.261	15	7.982
San Lorenzo Community Church	945 Paseo Grande	San Lorenzo	94580	576.554	4170.175	15	4.896
San Lorenzo Parent Nursery	820 Bockman Rd	San Lorenzo	94580	577.149	4169.471	15	4.210
Santo Domingo Residential Care	3327 San Marco Ct	Union City	94580	582.207	4161.012	15	6.947
Schafer Park Elementary	26268 Flamingo Ave	Hayward	94544	580.633	4166.422	15	4.069

Table 8.1D-1, Part 2. (continued)

Name	ADDRESS	CITY	ZIP CODE	East(km) Zone 10	North(km) Zone 10	Elevation Feet	Dist(km) from Facility
Seaton Rehabilation Hospital	1652 Mono Ave	San Leandro, CA	94579	577.703	4172.990	15	7.770
Seaton Rehabilitation Hospital	15705 Liberty St	San Leandro	94578	577.823	4173.330	15	8.122
Semore School	4312 Dyer St	Union City	94587	582.018	4160.209	15	7.330
Senior Friends	13847 E 14th St	San Leandro	94578	575.856	4174.206	15	8.966
Shepard Elementary	27211 Tyrell Ave	Hayward	94544	581.792	4165.663	15	5.079
Sir Love	27653 Pompano Ave	Hayward	94544	581.505	4165.013	15	4.786
Southgate Elementary School	26601 Calaroga Ave	Hayward	94545	580.000	4165.984	15	3.347
St Anthony Care Ctr	553 Smalley Ave	Hayward, CA	94541	580.137	4169.561	15	5.472
St Anthony Residential Care	4491 Ariel Ave	Fremont, CA	94555	583.479	4158.837	15	9.334
St Christopher Convalescent	22822 Myrtle St	Hayward, CA	94541	580.217	4168.945	15	5.059
St Francis Extended Care	718 Bartlett Ave	Hayward, CA	94541	577.836	4169.323	15	4.190
St Gregory Care Ctr	22424 Charlene Way	Castro Valley, C	94546	581.815	4170.903	15	7.582
St John Kronstadt Convalescent	4432 James Ave	Castro Valley, C	94546	582.131	4173.495	15	9.831
St John's School	270 E Lewelling Blvd	San Lorenzo, CA	94580	577.916	4171.266	15	6.101
St Lukes Sub Acute Care	1652 Mono Ave	San Leandro	94578	577.703	4172.990	15	7.770
St Therese Convalescent Hosp	21863 Vallejo St	Hayward, CA	94541	579.984	4170.176	15	5.879
Stivers Academy	461 Bartlett Ave	Hayward	94541	578.227	4169.512	15	4.488
Strobridge Elementary School	21400 Bedford Dr	Castro Valley	94546	580.563	4171.168	45	7.026
Sunbridge Care & Rehab Center	26660 Patrick Ave	Hayward	94580	581.249	4166.120	15	4.599
Sunbridge Care & Rehab Ctr	14766 Washington Ave	San Leandro, CA	94579	575.996	4172.327	15	7.083
Sunset Parent Nursery School	22100 Princeton St	Hayward	94541	579.548	4169.647	15	5.197
Supporting Future	22584 S Garden Ave	Hayward	94541	578.727	4168.438	15	3.736
Tennyson High School	27035 Whitman St	Hayward, CA	94544	582.496	4166.410	15	5.878
Tennyson Parent Nursery School	27552 E 11th St	Hayward	94544	582.890	4166.291	15	6.245
Treeview Elementary	30565 Treeview St	Hayward	94544	585.066	4164.432	15	8.382
Tri Cities Children's Ctrs Inco	625 Berry Ave	Hayward	94544	581.795	4167.913	15	5.710
Tri Cities Children's Ctrs Inco	541 Blanche St	Hayward	94544	585.788	4163.361	15	9.262
Tri Cities Children's Ctrs Inco	23640 Reed Way	Hayward	94541	578.830	4167.884	15	3.346

Table 8.1D-1, Part 2. (continued)

Name	ADDRESS	CITY	ZIP CODE	East(km) Zone 10	North(km) Zone 10	Elevation Feet	Dist(km) from Facility
Tyrell Elementary	27000 Tyrell Ave	Hayward	94544	581.644	4165.815	15	4.946
Valley Pointe Rehab & Nursing	20090 Stanton Ave	Castro Valley, C	94546	580.256	4172.459	45	7.998
Villa Fairmont Mental Health	15200 Foothill Blvd	San Leandro, CA	94579	577.476	4173.759	15	8.510
Vintage Estates of Hayward	25919 Gading Rd	Hayward	94579	581.144	4166.858	15	4.690
Washington Manor School	1170 Fargo Ave	San Leandro	94579	575.121	4171.487	15	6.409
Whispering Pines Rest Haven	565 Schafer Rd	Hayward	94580	581.640	4166.216	15	5.001
Wisteria Care Ctr	20524 Wisteria St	Castro Valley, C	94546	580.747	4172.310	45	8.096
Woodroe Woods School	22502 Woodroe Ave	Hayward	94541	583.399	4171.627	75	9.207
YMCA	951 Palisade St	Hayward	94542	581.812	4168.622	45	6.084
Yours & Mine	2894 D St	Hayward	94541	583.313	4170.548	105	8.432

Table 8.1D-2. Affected census tracts and population data (3-mile radius).

Tract #	% Area Affected	Total 1990	Adjusted 1999	Population Data Worker 1999
4371	75	7833	8499	3592
4403.02	5	5928	6432	2718
4403.31	10	2451	2659	1124
4384	85	1948	2114	893
4383	100	3425	3716	1570
4382.01	95	3848	4175	1764
4373	100	2948	3199	1352
4376	100	2702	2932	1239
4377	50	7464	8098	3422
4375	100	3914	4247	1795
4374	100	2968	3220	1361
4378	30	3464	3758	1588
4366	80	8755	9499	4014
4372	100	5004	5429	2294
4370	100	2968	3220	1361
4368	100	2817	3056	1292
4363	80	3866	4195	1773
4369	100	5713	6199	2620
4362	100	2668	2895	1223
4357	60	2651	2876	1216
4356	45	7714	8370	3537
4361	100	4337	4706	1989
4358	25	4387	4760	2012
4360	100	4010	4351	1839
4359	90	4602	4993	2110
4334	10	3485	3781	1598
4335	10	3937	4272	1805
4336	5	5127	5563	2351
		Total=	**131,213**	**Total= 55,451**
6 Mile Radius Data:		**Total=**	**332,116**	**Total= 104,485**

Ref: U.S. Census Bureau, Population Estimates Program, Population Div., Washington, D.C. 3/9/01, Statistical Information Staff.
1990 U.S. Census, Census Tracts and Bolck Numbering Areas (Oakland, CA. PMSA) General Characteristics of Persons, Table 1.

Table 8.1D-3. Census tract centroid listing within 3-mile radius of site.

Receptor ID	UTM Coordinates N	E	Receptor Type	Elevation (m)
4371N	4167006	575923	Census Tract Centroid	3.1
4371S	4163170	577262	Census Tract Centroid	1.5
4403.02	4162397	580455	Census Tract Centroid	1,5
4403.31	4162191	580249	Census Tract Centroid	1.4
4384	4163607	580610	Census Tract Centroid	3.1
4383	4164560	580146	Census Tract Centroid	3.1
4382.01	4164560	581125	Census Tract Centroid	4.6
4373	4165436	579760	Census Tract Centroid	7.6
4376	4165333	580919	Census Tract Centroid	7.6
4377	4165616	581331	Census Tract Centroid	13.7
4375	4166260	580970	Census Tract Centroid	13.7
4374	4166054	580249	Census Tract Centroid	15.2
4378	4166672	581176	Census Tract Centroid	9.1
4366	4167238	580507	Census Tract Centroid	18.3
4372	4166234	578138	Census Tract Centroid	9.1
4370	4166594	579065	Census Tract Centroid	15.2
4368	4167238	579631	Census Tract Centroid	22.8
4363	4168526	579786	Census Tract Centroid	36.6
4369	4168036	578344	Census Tract Centroid	12.2
4362	4168938	578138	Census Tract Centroid	13.7
4357	4169607	578140	Census Tract Centroid	18.3
4356	4169350	578859	Census Tract Centroid	28.9
4361	4169221	577159	Census Tract Centroid	10.7
4358	4169917	576799	Census Tract Centroid	9.1
4360	4168886	576052	Census Tract Centroid	4.6
4359	4169427	575357	Census Tract Centroid	4.6
4334	4169144	574172	Census Tract Centroid	1.5
4335	4169659	574662	Census Tract Centroid	3.1
4336	4169865	575074	Census Tract Centroid	4.6

Table 8.1D-4. Sensitive receptor impacts, 1-hour case 12.

Sensitive Receptor Impacts

Name	Emissions (g/s/turbine)	Nearest Residence	Child Family & Community Service	Cornerstone Pentecostal Church	Courtyard Care Center	Darwin Head Start	Debbie's Daycare	Eden Gardens Elementary	Eden-West Rehab & Convalescent	Lea's Christian School	Montessori Children's House	Ochoa Intermediate School
UTM X - Easting (m)		578064	577312	578663	578252	579298	578953	578850	578058	579242	579242	578800
UTM Y - Northing (m)		4165904	4167777	4167420	4166800	4165146	4165296	4165789	4166613	4165792	4165792	4165942
Dist(km) from Facility		1.49	2.74	2.97	2.23	2.47	2.14	2.14	1.96	2.52	2.52	2.15
Normalized Impacts for Emissions of 1 g/s/turbine												
1-Hr Case 12		2.40956	1.68758	1.35405	1.65919	1.90848	1.80425	1.90426	1.83213	1.63286	1.63286	1.79638
Acetaldehyde	1.88E-02	4.52E-02	3.16E-02	2.54E-02	3.11E-02	3.58E-02	3.38E-02	3.57E-02	3.44E-02	3.06E-02	3.06E-02	3.37E-02
Acrolein	1.76E-03	4.24E-03	2.97E-03	2.38E-03	2.92E-03	3.35E-03	3.17E-03	3.35E-03	3.22E-03	2.87E-03	2.87E-03	3.16E-03
Benzene	3.72E-03	8.96E-03	6.27E-03	5.03E-03	6.17E-03	7.09E-03	6.71E-03	7.08E-03	6.81E-03	6.07E-03	6.07E-03	6.68E-03
1,3-Butadiene	3.47E-05	8.37E-05	5.86E-05	4.70E-05	5.76E-05	6.63E-05	6.26E-05	6.61E-05	6.36E-05	5.67E-05	5.67E-05	6.24E-05
Ethylbenzene	4.89E-03	1.18E-02	8.26E-03	6.63E-03	8.12E-03	9.34E-03	8.83E-03	9.32E-03	8.96E-03	7.99E-03	7.99E-03	8.79E-03
Formaldehyde	3.01E-02	7.25E-02	5.07E-02	4.07E-02	4.99E-02	5.74E-02	5.43E-02	5.73E-02	5.51E-02	4.91E-02	4.91E-02	5.40E-02
Hexane	7.08E-02	1.71E-01	1.19E-01	9.59E-02	1.17E-01	1.35E-01	1.28E-01	1.35E-01	1.30E-01	1.16E-01	1.16E-01	1.27E-01
Naphthalene	4.54E-04	1.09E-03	7.66E-04	6.14E-04	7.53E-04	8.66E-04	8.19E-04	8.64E-04	8.31E-04	7.41E-04	7.41E-04	8.15E-04
PAHs (5)	1.80E-04	4.35E-04	3.04E-04	2.44E-04	2.99E-04	3.44E-04	3.26E-04	3.44E-04	3.31E-04	2.95E-04	2.95E-04	3.24E-04
Propylene	2.10E-01	5.07E-01	3.55E-01	2.85E-01	3.49E-01	4.02E-01	3.80E-01	4.01E-01	3.86E-01	3.44E-01	3.44E-01	3.78E-01
Propylene oxide	1.31E-02	3.15E-02	2.21E-02	1.77E-02	2.17E-02	2.49E-02	2.36E-02	2.49E-02	2.39E-02	2.13E-02	2.13E-02	2.35E-02
Toluene	1.94E-02	4.68E-02	3.28E-02	2.63E-02	3.22E-02	3.70E-02	3.50E-02	3.70E-02	3.56E-02	3.17E-02	3.17E-02	3.49E-02
Xylene	7.13E-03	1.72E-02	1.20E-02	9.66E-03	1.18E-02	1.36E-02	1.29E-02	1.36E-02	1.31E-02	1.16E-02	1.16E-02	1.28E-02
Ammonia	2.00E+00	4.82E+00	3.38E+00	2.71E+00	3.32E+00	3.82E+00	3.61E+00	3.81E+00	3.66E+00	3.27E+00	3.27E+00	3.59E+00

Table 8.1D-5. Sensitive receptor impacts, annual case 14.

Sensitive Receptor Impacts

Name	Emissions (g/s/turbine)	Nearest Residence	Child Family & Community Service	Cornerstone Pentecostal Church	Courtyard Care Center	Darwin Head Start	Debbie's Daycare	Eden Gardens Elementary	Eden-West Rehab & Convalescent	Lea's Christian School	Montessori Children's House	Ochoa Intermediate School
Normalized Impacts for Emissions of 1 g/s/turbine												
Annual Case 14		0.00655	0.00483	0.00436	0.00465	0.04611	0.03202	0.01389	0.00429	0.01722	0.01722	0.01079
Acetaldehyde	1.69E-02	1.11E-04	8.16E-05	7.36E-05	7.85E-05	7.79E-04	5.41E-04	2.35E-04	7.24E-05	2.91E-04	2.91E-04	1.82E-04
Acrolein	1.58E-03	1.04E-05	7.64E-06	6.90E-06	7.36E-06	7.30E-05	5.07E-05	2.20E-05	6.79E-06	2.73E-05	2.73E-05	1.71E-05
Benzene	3.35E-03	2.19E-05	1.62E-05	1.46E-05	1.56E-05	1.54E-04	1.07E-04	4.65E-05	1.44E-05	5.76E-05	5.76E-05	3.61E-05
1,3-Butadiene	3.13E-05	2.05E-07	1.51E-07	1.36E-07	1.45E-07	1.44E-06	1.00E-06	4.34E-07	1.34E-07	5.38E-07	5.38E-07	3.37E-07
Ethylbenzene	4.41E-03	2.89E-05	2.13E-05	1.92E-05	2.05E-05	2.03E-04	1.41E-04	6.12E-05	1.89E-05	7.59E-05	7.59E-05	4.75E-05
Formaldehyde	2.71E-02	1.77E-04	1.31E-04	1.18E-04	1.26E-04	1.25E-03	8.67E-04	3.76E-04	1.16E-04	4.66E-04	4.66E-04	2.92E-04
Hexane	6.38E-02	4.18E-04	3.08E-04	2.78E-04	2.96E-04	2.94E-03	2.04E-03	8.85E-04	2.73E-04	1.10E-03	1.10E-03	6.88E-04
Naphthalene	4.09E-04	2.68E-06	1.97E-06	1.78E-06	1.90E-06	1.88E-05	1.31E-05	5.68E-06	1.75E-06	7.04E-06	7.04E-06	4.41E-06
PAHs (5)	1.62E-04	1.06E-06	7.85E-07	7.08E-07	7.55E-07	7.49E-06	5.20E-06	2.26E-06	6.97E-07	2.80E-06	2.80E-06	1.75E-06
Propylene	1.90E-01	1.24E-03	9.15E-04	8.26E-04	8.81E-04	8.74E-03	6.07E-03	2.63E-03	8.13E-04	3.26E-03	3.26E-03	2.05E-03
Propylene oxide	1.18E-02	7.71E-05	5.68E-05	5.13E-05	5.47E-05	5.43E-04	3.77E-04	1.63E-04	5.05E-05	2.03E-04	2.03E-04	1.27E-04
Toluene	1.75E-02	1.14E-04	8.44E-05	7.62E-05	8.13E-05	8.06E-04	5.60E-04	2.43E-04	7.50E-05	3.01E-04	3.01E-04	1.89E-04
Xylene	6.42E-03	4.21E-05	3.10E-05	2.80E-05	2.99E-05	2.96E-04	2.06E-04	8.92E-05	2.76E-05	1.11E-04	1.11E-04	6.93E-05
Ammonia	1.88E+00	1.23E-02	9.07E-03	8.21E-03	8.74E-03	8.67E-02	6.02E-02	2.61E-02	8.06E-03	3.24E-02	3.24E-02	2.03E-02
Ammonia-Turbines Only												
1-hour		4.81E+00	3.37E+00	2.70E+00	3.31E+00	3.81E+00	3.60E+00	3.80E+00	3.66E+00	3.26E+00	3.26E+00	3.59E+00
Annual		1.23E-02	9.09E-03	8.20E-03	8.75E-03	8.67E-02	6.02E-02	2.61E-02	8.07E-03	3.24E-02	3.24E-02	2.03E-02

Table 8.1D-6, Summary of screening HRA results.

Turbines and Cooling Tower at the Maximum Impact Receptor

Acute Inhalation Hazard Index:

Pollutant	Resp	CV/BL	CNS	Eye	Repro	Kidn	GI/LV	Immun
Acrolein	0.1095			0.1095				
Ammonia	0.0074			0.0074				
Benzene		0.0001			0.0001			0.0001
Formaldehyde	0.0038			0.0038				0.0038
Propylene Oxide	0.0001			0.0001	0.0001			
Toluene	0.0001		0.0001	0.0001	0.0001			
Xylenes	0.0001			0.0001				
Total Acute	0.121	0.0001	0.0001	0.121	0.0003	0	0	0.0039

Chronic Inhalation Hazard Index:

Pollutant	Resp	CV/BL	CNS	Skin	Repro	Kidn	GI/LV	Immun
Acetaldehyde	0.0002							
Acrolein	0.0085			0.0085				
Ammonia	0.001							
Benzene					0.0001			
Ethyl Benzene		0.0001	0.0001		0.0001	0.0001	0.0001	
Formaldehyde	0.001			0.001				
Naphthalene	0.0001							
Propylene	0.0001							
Propylene Oxide	0.0001							
Toluene	0.0001		0.0001		0.0001			
Xylenes	0.0001		0.0001					
Total Chronic	0.0112	0.0001	0.0003	0.0095	0.0003	0.0001	0.0001	0

Chronic Non-Inhalation Exposure:

Pollutant	Avg Dose mg/kg-d	REL mg/kg-d	Avg Dose/REL
PAH: BaP	9.75E-09	NV	NV
Naphthalene	3.35E-08	NV	NV

NV=no value

MIR Individual Lifetime Cancer Risk:

44 Year Worker	0.158	per million
70 Year Residential	0.174	per million

MIR Total Population Cancer Burden

		Impact/Burden Area Radius:	3 miles
		Total Population:	332116
Total Burden	0.043	Worker Population:	104485

Attachment 8.1Da

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

ACUTE INHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

MAX. 1-HR EMISSION RATE INFORMATION

File: TURB.M96

Pollutant Name	Emission Rate (g/s)
ACROLEIN	2.080E-02
AMMONIA	2.370E+01
BENZENE	4.410E-02
FORMALDEHYDE	3.560E-01
PROPYLENE OXIDE	1.550E-01
TOLUENE	2.300E-01
XYLENES	8.460E-02

ACUTE INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Eye	Repro	Kidn	GI/LV	Immun
ACROLEIN	0.1095	--	--	0.1095	--	--	--	--
AMMONIA	0.0074	--	--	0.0074	--	--	--	--
BENZENE	--	<.0001	--	--	<.0001	--	--	<.0001
FORMALDEHYDE	0.0038	--	--	0.0038	--	--	--	0.0038
PROPYLENE OXIDE	<.0001	--	--	<.0001	<.0001	--	--	--
TOLUENE	<.0001	--	<.0001	<.0001	<.0001	--	--	--
XYLENES	<.0001	--	--	<.0001	--	--	--	--
Total Acute	0.1207	<.0001	<.0001	0.1207	<.0001	--	--	0.0038

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

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Version 2.0e

CHRONIC INHALATION EXPOSURE REPORT

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R.B.Booth

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Project : RCEC

May. 16, 2001

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Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: TURB.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	3.370E-06
ACETALDEHYDE	1.820E-03
ACROLEIN	1.700E-04
AMMONIA	2.020E-01
BENZENE	3.610E-04
ETHYL BENZENE	4.750E-04
FORMALDEHYDE	2.920E-03
NAPHTHALENE	4.400E-05
PAH:BENZO(A)PYRENE	1.750E-05
PROPYLENE (PROPENE)	2.040E-02
PROPYLENE OXIDE	1.270E-03
TOLUENE	1.880E-03
XYLENES	6.920E-04

CHRONIC INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Skin	Repro	Kidn	GI/LV	Immun
ACETALDEHYDE	0.0002	--	--	--	--	--	--	--
ACROLEIN	0.0085	--	--	0.0085	--	--	--	--
AMMONIA	0.0010	--	--	--	--	--	--	--
BENZENE	--	<.0001	<.0001	--	<.0001	--	--	--
ETHYL BENZENE	--	--	--	--	<.0001	<.0001	<.0001	--
FORMALDEHYDE	0.0010	--	--	0.0010	--	--	--	--
NAPHTHALENE	<.0001	--	--	--	--	--	--	--
PROPYLENE (PROP	<.0001	--	--	--	--	--	--	--
PROPYLENE OXIDE	<.0001	--	--	--	--	--	--	--
TOLUENE	<.0001	--	<.0001	--	<.0001	--	--	--
XYLENES	<.0001	--	<.0001	--	--	--	--	--
Total Chronic	0.0107	<.0001	<.0001	0.0095	<.0001	<.0001	<.0001	--

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CHRONIC NONINHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

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Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
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DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: TURB.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	3.370E-06
ACETALDEHYDE	1.820E-03
ACROLEIN	1.700E-04
AMMONIA	2.020E-01
BENZENE	3.610E-04
ETHYL BENZENE	4.750E-04
FORMALDEHYDE	2.920E-03
NAPHTHALENE	4.400E-05
PAH:BENZO(A)PYRENE	1.750E-05
PROPYLENE (PROPENE)	2.040E-02
PROPYLENE OXIDE	1.270E-03
TOLUENE	1.880E-03
XYLENES	6.920E-04

EXPOSURE ROUTE INFORMATION

File: TURB.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

CHRONIC NONINHALATION EXPOSURE

Pollutant	Avg. Dose (mg/kg-d)	REL (mg/kg-d)	Avg Dose/REL
1,3-BUTADIENE	---	---	---
ACETALDEHYDE	---	---	---
ACROLEIN	---	---	---
AMMONIA	---	---	---
BENZENE	---	---	---
ETHYL BENZENE	---	---	---
FORMALDEHYDE	---	---	---
NAPHTHALENE	3.35E-08	---	---
PAH:BENZO(A)PYRENE	9.75E-09	---	---
PROPYLENE (PROPENE)	---	---	---
PROPYLENE OXIDE	---	---	---
TOLUENE	---	---	---
XYLENES	---	---	---

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

INDIVIDUAL CANCER RISK REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: TURB.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	3.370E-06
ACETALDEHYDE	1.820E-03
ACROLEIN	1.700E-04
AMMONIA	2.020E-01
BENZENE	3.610E-04
ETHYL BENZENE	4.750E-04
FORMALDEHYDE	2.920E-03
NAPHTHALENE	4.400E-05
PAH:BENZO(A)PYRENE	1.750E-05
PROPYLENE (PROPENE)	2.040E-02
PROPYLENE OXIDE	1.270E-03
TOLUENE	1.880E-03
XYLENES	6.920E-04

EXPOSURE ROUTE INFORMATION

File: TURB.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

44 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	3.60E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	3.09E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BENZENE	6.58E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	1.10E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	1.21E-08	1.86E-08	1.18E-08	4.39E-08	4.77E-08	0.00E+00
PROPYLENE OXIDE	2.95E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	3.61E-08	1.86E-08	1.18E-08	4.39E-08	4.77E-08	0.00E+00

TOTAL RISK: 1.58E-07

70 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	5.73E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	4.91E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BENZENE	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	1.75E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	1.92E-08	2.88E-08	1.83E-08	6.99E-08	0.00E+00	0.00E+00
PROPYLENE OXIDE	4.70E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	5.74E-08	2.88E-08	1.83E-08	6.99E-08	0.00E+00	0.00E+00

TOTAL RISK: 1.74E-07

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CANCER BURDEN REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: TURB.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	3.370E-06
ACETALDEHYDE	1.820E-03
ACROLEIN	1.700E-04
AMMONIA	2.020E-01
BENZENE	3.610E-04
ETHYL BENZENE	4.750E-04
FORMALDEHYDE	2.920E-03
NAPHTHALENE	4.400E-05
PAH:BENZO(A)PYRENE	1.750E-05
PROPYLENE (PROPENE)	2.040E-02
PROPYLENE OXIDE	1.270E-03
TOLUENE	1.880E-03
XYLENES	6.920E-04

FACTORS USED IN CANCER BURDEN CALCULATIONS

Deposition Velocity (m/s) . . . . . :	0.02
Fraction of Produce Grown At Home . :	0.05
Fraction of Residents with Gardens :	0.25

RECEPTOR INFORMATION

File: TURB.R96

Receptor ID	X/Q	Residents	Workers
MIR	1.0E+00	332116	104485

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
MIR	332116	104485	2.06E-02	1.01E-02	6.56E-03	5.80E-03
Total	332116	104485	2.06E-02	1.01E-02	6.56E-03	5.80E-03

TOTAL BURDEN: 4.30E-02

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE
For 2588 Screening Purposes Only

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
MIR	332116	104485	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	332116	104485	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TOTAL BURDEN: 0.00E+00

Attachment 8.1Db

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ACUTE INHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 15, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

MAX. 1-HR EMISSION RATE INFORMATION

File: REMAKE.M96

Pollutant Name	Emission Rate (g/s)
BENZENE	5.610E-01
FORMALDEHYDE	1.210E+01
TOLUENE	6.150E-01
XYLENES	1.660E+00

ACUTE INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Eye	Repro	Kidn	GI/LV	Immun
BENZENE	--	0.0004	--	--	0.0004	--	--	0.0004
FORMALDEHYDE	0.1287	--	--	0.1287	--	--	--	0.1287
TOLUENE	<.0001	--	<.0001	<.0001	<.0001	--	--	--
XYLENES	<.0001	--	--	<.0001	--	--	--	--
Total Acute	0.1288	0.0004	<.0001	0.1288	0.0004	--	--	0.1292

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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CHRONIC INHALATION EXPOSURE REPORT

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DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: REMAKE.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	6.190E-04
ACETALDEHYDE	8.920E-04
ACROLEIN	9.950E-05
BENZENE	3.680E-04
ETHYL BENZENE	1.200E-04
FORMALDEHYDE	7.940E-03
NAPHTHALENE	4.230E-05
PAH:BENZ(A)ANTHRACENE	9.910E-08
PAH:BENZO(A)PYRENE	4.550E-09
PAH:BENZO(K)FLUORANTHENE	1.320E-08
PAH:CHRYSENE	2.410E-08
PAH:DIBENZ(A,H)ANTHRACENE	4.550E-09
PAH:INDENO(1,2,3-C,D)PYRENE	1.210E-08
PROPYLENE (PROPENE)	9.070E-03
TOLUENE	4.030E-04
XYLENES	1.090E-03

CHRONIC INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Skin	Repro	Kidn	GI/LV	Immun
ACETALDEHYDE	<.0001	--	--	--	--	--	--	--
ACROLEIN	0.0050	--	--	0.0050	--	--	--	--
BENZENE	--	<.0001	<.0001	--	<.0001	--	--	--
ETHYL BENZENE	--	--	--	--	<.0001	<.0001	<.0001	--
FORMALDEHYDE	0.0026	--	--	0.0026	--	--	--	--
NAPHTHALENE	<.0001	--	--	--	--	--	--	--
PROPYLENE (PROP	<.0001	--	--	--	--	--	--	--
TOLUENE	<.0001	--	<.0001	--	<.0001	--	--	--
XYLENES	<.0001	--	<.0001	--	--	--	--	--
Total Chronic	0.0077	<.0001	<.0001	0.0076	<.0001	<.0001	<.0001	--

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

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CHRONIC NONINHALATION EXPOSURE REPORT

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CHRONIC NONINHALATION EXPOSURE

Pollutant	Avg. Dose (mg/kg-d)	REL (mg/kg-d)	Avg Dose/REL
1,3-BUTADIENE	---	---	---
ACETALDEHYDE	---	---	---
ACROLEIN	---	---	---
BENZENE	---	---	---
ETHYL BENZENE	---	---	---
FORMALDEHYDE	---	---	---
NAPHTHALENE	3.22E-08	---	---
PAH:BENZ(A)ANTHRACENE	5.52E-11	---	---
PAH:BENZO(A)PYRENE	2.53E-12	---	---
PAH:BENZO(K)FLUORANTHENE	7.35E-12	---	---
PAH:CHRYSENE	1.34E-11	---	---
PAH:DIBENZ(A,H)ANTHRACEN	2.53E-12	---	---
PAH:INDENO(1,2,3-C,D)PYR	6.74E-12	---	---
PROPYLENE (PROPENE)	---	---	---
TOLUENE	---	---	---
XYLENES	---	---	---

EXPOSURE ROUTE INFORMATION

File: REMAKE.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

CHRONIC NONINHALATION EXPOSURE

Pollutant	Avg. Dose (mg/kg-d)	REL (mg/kg-d)	Avg Dose/REL
1,3-BUTADIENE	---	---	---
ACETALDEHYDE	---	---	---
ACROLEIN	---	---	---
BENZENE	---	---	---
ETHYL BENZENE	---	---	---
FORMALDEHYDE	---	---	---
NAPHTHALENE	3.22E-08	---	---
PAH:BENZ(A)ANTHRACENE	5.52E-11	---	---
PAH:BENZO(A)PYRENE	2.53E-12	---	---
PAH:BENZO(K)FLUORANTHENE	7.35E-12	---	---
PAH:CHRYSENE	1.34E-11	---	---
PAH:DIBENZ(A,H)ANTHRACEN	2.53E-12	---	---
PAH:INDENO(1,2,3-C,D)PYR	6.74E-12	---	---
PROPYLENE (PROPENE)	---	---	---
TOLUENE	---	---	---
XYLENES	---	---	---

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DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: REMAKE.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	6.190E-04
ACETALDEHYDE	8.920E-04
ACROLEIN	9.950E-05
BENZENE	3.680E-04
ETHYL BENZENE	1.200E-04
FORMALDEHYDE	7.940E-03
NAPHTHALENE	4.230E-05
PAH:BENZ(A)ANTHRACENE	9.910E-08
PAH:BENZO(A)PYRENE	4.550E-09
PAH:BENZO(K)FLUORANTHENE	1.320E-08
PAH:CHRYSENE	2.410E-08
PAH:DIBENZ(A,H)ANTHRACENE	4.550E-09
PAH:INDENO(1,2,3-C,D)PYRENE	1.210E-08
PROPYLENE (PROPENE)	9.070E-03
TOLUENE	4.030E-04
XYLENES	1.090E-03

EXPOSURE ROUTE INFORMATION

File: REMAKE.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

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44 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	6.61E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	1.51E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BENZENE	6.71E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	2.99E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZ(A)ANTH	6.85E-12	1.05E-11	6.70E-12	2.49E-11	2.70E-11	0.00E+00
PAH:BENZO(A)PYR	3.15E-12	4.84E-12	3.07E-12	1.14E-11	1.24E-11	0.00E+00
PAH:BENZO(K)FLU	9.13E-13	1.40E-12	8.92E-13	3.31E-12	3.60E-12	0.00E+00
PAH:CHRYSENE	1.67E-13	2.56E-13	1.63E-13	6.05E-13	6.57E-13	0.00E+00
PAH:DIBENZ(A,H)	3.43E-12	1.65E-12	1.05E-12	3.90E-12	4.24E-12	0.00E+00
PAH:INDENO(1,2,	8.37E-13	1.29E-12	8.18E-13	3.04E-12	3.30E-12	0.00E+00
Route Total	1.04E-07	2.00E-11	1.27E-11	4.71E-11	5.12E-11	0.00E+00

TOTAL RISK: 1.04E-07

70 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	1.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	2.41E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BENZENE	1.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	4.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZ(A)ANTH	1.09E-11	1.63E-11	1.04E-11	3.96E-11	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	5.00E-12	7.50E-12	4.76E-12	1.82E-11	0.00E+00	0.00E+00
PAH:BENZO(K)FLU	1.45E-12	2.17E-12	1.38E-12	5.27E-12	0.00E+00	0.00E+00
PAH:CHRYSENE	2.65E-13	3.97E-13	2.52E-13	9.62E-13	0.00E+00	0.00E+00
PAH:DIBENZ(A,H)	5.46E-12	2.56E-12	1.63E-12	6.21E-12	0.00E+00	0.00E+00
PAH:INDENO(1,2,	1.33E-12	1.99E-12	1.27E-12	4.83E-12	0.00E+00	0.00E+00
Route Total	1.66E-07	3.09E-11	1.96E-11	7.50E-11	0.00E+00	0.00E+00

TOTAL RISK: 1.66E-07

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CANCER BURDEN REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 15, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: REMAKE.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	6.190E-04
ACETALDEHYDE	8.920E-04
ACROLEIN	9.950E-05
BENZENE	3.680E-04
ETHYL BENZENE	1.200E-04
FORMALDEHYDE	7.940E-03
NAPHTHALENE	4.230E-05
PAH:BENZ(A)ANTHRACENE	9.910E-08
PAH:BENZO(A)PYRENE	4.550E-09
PAH:BENZO(K)FLUORANTHENE	1.320E-08
PAH:CHRYSENE	2.410E-08
PAH:DIBENZ(A,H)ANTHRACENE	4.550E-09
PAH:INDENO(1,2,3-C,D)PYRENE	1.210E-08
PROPYLENE (PROPENE)	9.070E-03
TOLUENE	4.030E-04
XYLENES	1.090E-03

FACTORS USED IN CANCER BURDEN CALCULATIONS

Deposition Velocity (m/s) . . . . . :	0.02
Fraction of Produce Grown At Home . :	0.05
Fraction of Residents with Gardens :	0.25

RECEPTOR INFORMATION

File: REMAKE.R96

Receptor ID	X/Q	Residents	Workers
MIR	1.0E+00	131213	55451

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
MIR	131213	55451	2.41E-02	4.35E-06	2.85E-06	2.46E-06
Total	131213	55451	2.41E-02	4.35E-06	2.85E-06	2.46E-06

TOTAL BURDEN: 2.41E-02

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE
For 2588 Screening Purposes Only

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
MIR	131213	55451	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	131213	55451	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TOTAL BURDEN: 0.00E+00

Attachment 8.1Dc

California Air Resources Board

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Health Risk Assessment Program

Version 2.0e

ACUTE INHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 15, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

MAX. 1-HR EMISSION RATE INFORMATION

File: FPUMP.M96

Pollutant Name	Emission Rate (g/s)
ARSENIC AND COMPOUNDS (INOR	4.670E-03
BENZENE	5.290E-01
COPPER AND COMPOUNDS	1.200E-02
FORMALDEHYDE	1.490E-01
MERCURY AND COMPOUNDS (INOR	5.840E-03
NICKEL AND COMPOUNDS	1.140E-02
TOLUENE	1.780E-01
XYLENES	6.100E-02

ACUTE INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Eye	Repro	Kidn	GI/LV	Immun
ARSENIC AND COM	--	--	--	--	0.0246	--	--	--
BENZENE	--	0.0004	--	--	0.0004	--	--	0.0004
COPPER AND COMP	0.0001	--	--	--	--	--	--	--
FORMALDEHYDE	0.0016	--	--	0.0016	--	--	--	0.0016
MERCURY AND COM	--	--	--	--	0.0032	--	--	--
NICKEL AND COMP	0.0019	--	--	--	--	--	--	0.0019
TOLUENE	<.0001	--	<.0001	<.0001	<.0001	--	--	--
XYLENES	<.0001	--	--	<.0001	--	--	--	--
Total Acute	0.0036	0.0004	<.0001	0.0016	0.0282	--	--	0.0039

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CHRONIC INHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 15, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: FPUMP.E96

Pollutant Name	Emission Rate (g/s)
ACETALDEHYDE	1.130E-06
ACROLEIN	3.470E-07
ARSENIC AND COMPOUNDS (INOR	5.190E-07
BENZENE	5.870E-05
CADMIUM AND COMPOUNDS	4.860E-07
CHROMIUM 6+	3.240E-08
COPPER AND COMPOUNDS	1.330E-06
ETHYL BENZENE	2.190E-06
FORMALDEHYDE	1.650E-05
LEAD AND COMPOUNDS	2.690E-06
MANGANESE AND COMPOUNDS	1.010E-06
MERCURY AND COMPOUNDS (INOR	6.490E-07
NAPHTHALENE	5.190E-06
NICKEL AND COMPOUNDS	1.260E-06
PAH:BENZ(A)ANTHRACENE	3.110E-08
PAH:BENZO(A)PYRENE	2.560E-08
PAH:BENZO(K)FLUORANTHENE	2.540E-08
PAH:CHRYSENE	4.220E-08
PAH:DIBENZ(A,H)ANTHRACENE	2.660E-08
PAH:INDENO(1,2,3-C,D)PYRENE	2.740E-08
PARTICULATE EMISSIONS FROM	2.690E-03
PROPYLENE (PROPENE)	1.110E-04
SELENIUM AND COMPOUNDS	7.130E-07
TOLUENE	1.980E-05
XYLENES	6.810E-06
ZINC COMPOUNDS	7.260E-06

CHRONIC INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Skin	Repro	Kidn	GI/LV	Immun
ACETALDEHYDE	<.0001	--	--	--	--	--	--	--
ACROLEIN	<.0001	--	--	<.0001	--	--	--	--
ARSENIC AND COM	<.0001	--	<.0001	<.0001	--	--	--	--
BENZENE	--	<.0001	<.0001	--	<.0001	--	--	--
CADMIUM AND COM	<.0001	--	--	--	--	<.0001	--	--
CHROMIUM 6+	<.0001	--	--	--	--	<.0001	<.0001	--
COPPER AND COMP	<.0001	--	--	--	--	--	--	--
ETHYL BENZENE	--	--	--	--	<.0001	<.0001	<.0001	--
FORMALDEHYDE	<.0001	--	--	<.0001	--	--	--	--
MANGANESE AND C	--	--	<.0001	--	--	--	--	--
MERCURY AND COM	--	--	<.0001	--	--	--	--	--
NAPHTHALENE	<.0001	--	--	--	--	--	--	--
NICKEL AND COMP	<.0001	<.0001	--	--	--	--	--	--
PARTICULATE EMI	0.0005	--	--	--	--	--	--	--
PROPYLENE (PROP	<.0001	--	--	--	--	--	--	--
SELENIUM AND CO	<.0001	--	--	--	--	--	--	--
TOLUENE	<.0001	--	<.0001	--	<.0001	--	--	--
XYLENES	<.0001	--	<.0001	--	--	--	--	--
ZINC COMPOUNDS	<.0001	<.0001	--	--	--	--	--	--
Total Chronic	0.0006	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	--

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CHRONIC NONINHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 15, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: FPUMP.E96

Pollutant Name	Emission Rate (g/s)
ACETALDEHYDE	1.130E-06
ACROLEIN	3.470E-07
ARSENIC AND COMPOUNDS (INOR	5.190E-07
BENZENE	5.870E-05
CADMIUM AND COMPOUNDS	4.860E-07
CHROMIUM 6+	3.240E-08
COPPER AND COMPOUNDS	1.330E-06
ETHYL BENZENE	2.190E-06
FORMALDEHYDE	1.650E-05
LEAD AND COMPOUNDS	2.690E-06
MANGANESE AND COMPOUNDS	1.010E-06
MERCURY AND COMPOUNDS (INOR	6.490E-07
NAPHTHALENE	5.190E-06
NICKEL AND COMPOUNDS	1.260E-06
PAH:BENZ(A)ANTHRACENE	3.110E-08
PAH:BENZO(A)PYRENE	2.560E-08
PAH:BENZO(K)FLUORANTHENE	2.540E-08
PAH:CHRYSENE	4.220E-08
PAH:DIBENZ(A,H)ANTHRACENE	2.660E-08
PAH:INDENO(1,2,3-C,D)PYRENE	2.740E-08
PARTICULATE EMISSIONS FROM	2.690E-03
PROPYLENE (PROPENE)	1.110E-04
SELENIUM AND COMPOUNDS	7.130E-07
TOLUENE	1.980E-05
XYLENES	6.810E-06
ZINC COMPOUNDS	7.260E-06

EXPOSURE ROUTE INFORMATION

File: FPUMP.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

CHRONIC NONINHALATION EXPOSURE

Pollutant	Avg. Dose (mg/kg-d)	REL (mg/kg-d)	Avg Dose/REL
ACETALDEHYDE	---	---	---
ACROLEIN	---	---	---
ARSENIC AND COMPOUNDS (I	1.57E-09	3.00E-04	5.22E-06
BENZENE	---	---	---
CADMIUM AND COMPOUNDS	1.77E-09	1.00E-03	1.77E-06
CHROMIUM 6+	1.13E-10	5.00E-03	2.27E-08
COPPER AND COMPOUNDS	---	---	---
ETHYL BENZENE	---	---	---
FORMALDEHYDE	---	---	---
LEAD AND COMPOUNDS	8.13E-09	---	---
MANGANESE AND COMPOUNDS	---	---	---
MERCURY AND COMPOUNDS (I	2.74E-09	3.00E-04	9.14E-06
NAPHTHALENE	3.95E-09	---	---
NICKEL AND COMPOUNDS	---	5.00E-02	---
PAH:BENZ(A)ANTHRACENE	1.73E-11	---	---
PAH:BENZO(A)PYRENE	1.43E-11	---	---
PAH:BENZO(K)FLUORANTHENE	1.42E-11	---	---
PAH:CHRYSENE	2.35E-11	---	---
PAH:DIBENZ(A,H)ANTHRACEN	1.48E-11	---	---
PAH:INDENO(1,2,3-C,D)PYR	1.53E-11	---	---
PARTICULATE EMISSIONS FR	---	---	---
PROPYLENE (PROPENE)	---	---	---
SELENIUM AND COMPOUNDS	---	---	---
TOLUENE	---	---	---
XYLENES	---	---	---
ZINC COMPOUNDS	---	---	---

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

INDIVIDUAL CANCER RISK REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 15, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: FPUMP.E96

Pollutant Name	Emission Rate (g/s)
ACETALDEHYDE	1.130E-06
ACROLEIN	3.470E-07
ARSENIC AND COMPOUNDS (INOR	5.190E-07
BENZENE	5.870E-05
CADMIUM AND COMPOUNDS	4.860E-07
CHROMIUM 6+	3.240E-08
COPPER AND COMPOUNDS	1.330E-06
ETHYL BENZENE	2.190E-06
FORMALDEHYDE	1.650E-05
LEAD AND COMPOUNDS	2.690E-06
MANGANESE AND COMPOUNDS	1.010E-06
MERCURY AND COMPOUNDS (INOR	6.490E-07
NAPHTHALENE	5.190E-06
NICKEL AND COMPOUNDS	1.260E-06
PAH:BENZ(A)ANTHRACENE	3.110E-08
PAH:BENZO(A)PYRENE	2.560E-08
PAH:BENZO(K)FLUORANTHENE	2.540E-08
PAH:CHRYSENE	4.220E-08
PAH:DIBENZ(A,H)ANTHRACENE	2.660E-08
PAH:INDENO(1,2,3-C,D)PYRENE	2.740E-08
PARTICULATE EMISSIONS FROM	2.690E-03
PROPYLENE (PROPENE)	1.110E-04
SELENIUM AND COMPOUNDS	7.130E-07
TOLUENE	1.980E-05
XYLENES	6.810E-06
ZINC COMPOUNDS	7.260E-06

EXPOSURE ROUTE INFORMATION

File: FPUMP.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

44 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
ACETALDEHYDE	1.92E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ARSENIC AND COM	1.08E-09	1.75E-09	3.70E-11	1.82E-10	0.00E+00	0.00E+00
BENZENE	1.07E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CADMIUM AND COM	1.28E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CHROMIUM 6+	3.05E-09	3.05E-11	6.46E-12	3.04E-12	0.00E+00	0.00E+00
FORMALDEHYDE	6.22E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LEAD AND COMPOU	2.03E-11	5.13E-11	1.09E-12	5.40E-12	0.00E+00	0.00E+00
NICKEL AND COMP	2.06E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZ(A)ANTH	2.15E-12	3.31E-12	2.10E-12	7.80E-12	8.48E-12	0.00E+00
PAH:BENZO(A)PYR	1.77E-11	2.72E-11	1.73E-11	6.42E-11	6.98E-11	0.00E+00
PAH:BENZO(K)FLU	1.76E-12	2.70E-12	1.72E-12	6.37E-12	6.92E-12	0.00E+00
PAH:CHRYSENE	2.92E-13	4.49E-13	2.85E-13	1.06E-12	1.15E-12	0.00E+00
PAH:DIBENZ(A,H)	2.01E-11	9.67E-12	6.14E-12	2.28E-11	2.48E-11	0.00E+00
PAH:INDENO(1,2,	1.89E-12	2.92E-12	1.85E-12	6.88E-12	7.47E-12	0.00E+00
PARTICULATE EMI	5.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	5.14E-07	1.87E-09	7.39E-11	3.00E-10	1.19E-10	0.00E+00

TOTAL RISK: 5.16E-07

70 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
ACETALDEHYDE	3.05E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ARSENIC AND COM	1.71E-09	2.03E-09	4.29E-11	2.81E-10	0.00E+00	0.00E+00
BENZENE	1.70E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CADMIUM AND COM	2.04E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CHROMIUM 6+	4.86E-09	3.54E-11	7.49E-12	4.75E-12	0.00E+00	0.00E+00
FORMALDEHYDE	9.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LEAD AND COMPOU	3.23E-11	5.95E-11	1.26E-12	8.33E-12	0.00E+00	0.00E+00
NICKEL AND COMP	3.28E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZ(A)ANTH	3.42E-12	5.12E-12	3.25E-12	1.24E-11	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	2.82E-11	4.22E-11	2.68E-11	1.02E-10	0.00E+00	0.00E+00
PAH:BENZO(K)FLU	2.79E-12	4.18E-12	2.66E-12	1.01E-11	0.00E+00	0.00E+00
PAH:CHRYSENE	4.64E-13	6.95E-13	4.41E-13	1.68E-12	0.00E+00	0.00E+00
PAH:DIBENZ(A,H)	3.19E-11	1.50E-11	9.51E-12	3.63E-11	0.00E+00	0.00E+00
PAH:INDENO(1,2,	3.01E-12	4.51E-12	2.87E-12	1.09E-11	0.00E+00	0.00E+00
PARTICULATE EMI	8.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	8.18E-07	2.19E-09	9.71E-11	4.68E-10	0.00E+00	0.00E+00

TOTAL RISK: 8.21E-07

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CANCER BURDEN REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 15, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: FPUMP.E96

Pollutant Name	Emission Rate (g/s)
ACETALDEHYDE	1.130E-06
ACROLEIN	3.470E-07
ARSENIC AND COMPOUNDS (INOR	5.190E-07
BENZENE	5.870E-05
CADMIUM AND COMPOUNDS	4.860E-07
CHROMIUM 6+	3.240E-08
COPPER AND COMPOUNDS	1.330E-06
ETHYL BENZENE	2.190E-06
FORMALDEHYDE	1.650E-05
LEAD AND COMPOUNDS	2.690E-06
MANGANESE AND COMPOUNDS	1.010E-06
MERCURY AND COMPOUNDS (INOR	6.490E-07
NAPHTHALENE	5.190E-06
NICKEL AND COMPOUNDS	1.260E-06
PAH:BENZ(A)ANTHRACENE	3.110E-08
PAH:BENZO(A)PYRENE	2.560E-08
PAH:BENZO(K)FLUORANTHENE	2.540E-08
PAH:CHRYSENE	4.220E-08
PAH:DIBENZ(A,H)ANTHRACENE	2.660E-08
PAH:INDENO(1,2,3-C,D)PYRENE	2.740E-08
PARTICULATE EMISSIONS FROM	2.690E-03
PROPYLENE (PROPENE)	1.110E-04
SELENIUM AND COMPOUNDS	7.130E-07
TOLUENE	1.980E-05
XYLENES	6.810E-06
ZINC COMPOUNDS	7.260E-06

FACTORS USED IN CANCER BURDEN CALCULATIONS

Deposition Velocity (m/s) . . . . . :	0.02
Fraction of Produce Grown At Home . :	0.05
Fraction of Residents with Gardens :	0.25

RECEPTOR INFORMATION

File: FPUMP.R96

Receptor ID	X/Q	Residents	Workers
MIR	1.0E+00	131213	55451

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
MIR	131213	55451	1.19E-01	3.08E-04	1.41E-05	1.54E-05
Total	131213	55451	1.19E-01	3.08E-04	1.41E-05	1.54E-05

TOTAL BURDEN: 1.19E-01

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE
For 2588 Screening Purposes Only

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
MIR	131213	55451	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	131213	55451	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TOTAL BURDEN: 0.00E+00

Attachment 8.1Dd

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

ACUTE INHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

MAX. 1-HR EMISSION RATE INFORMATION

File: RESMIR.M96

Pollutant Name	Emission Rate (g/s)
ACROLEIN	4.240E-03
AMMONIA	4.820E+00
BENZENE	8.960E-03
FORMALDEHYDE	7.250E-02
PROPYLENE OXIDE	3.150E-02
TOLUENE	4.680E-02
XYLENES	1.720E-02

ACUTE INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Eye	Repro	Kidn	GI/LV	Immun
ACROLEIN	0.0223	--	--	0.0223	--	--	--	--
AMMONIA	0.0015	--	--	0.0015	--	--	--	--
BENZENE	--	<.0001	--	--	<.0001	--	--	<.0001
FORMALDEHYDE	0.0008	--	--	0.0008	--	--	--	0.0008
PROPYLENE OXIDE	<.0001	--	--	<.0001	<.0001	--	--	--
TOLUENE	<.0001	--	<.0001	<.0001	<.0001	--	--	--
XYLENES	<.0001	--	--	<.0001	--	--	--	--
Total Acute	0.0246	<.0001	<.0001	0.0246	<.0001	--	--	0.0008

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CHRONIC INHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: RESMIR.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	2.050E-07
ACETALDEHYDE	1.110E-04
ACROLEIN	1.040E-05
AMMONIA	1.230E-02
BENZENE	2.190E-05
ETHYL BENZENE	2.890E-05
FORMALDEHYDE	1.770E-04
NAPHTHALENE	2.680E-06
PAH:BENZO(A)PYRENE	1.060E-06
PROPYLENE OXIDE	7.710E-05
TOLUENE	1.140E-04
XYLENES	4.210E-05

CHRONIC INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Skin	Repro	Kidn	GI/LV	Immun
ACETALDEHYDE	<.0001	--	--	--	--	--	--	--
ACROLEIN	0.0005	--	--	0.0005	--	--	--	--
AMMONIA	<.0001	--	--	--	--	--	--	--
BENZENE	--	<.0001	<.0001	--	<.0001	--	--	--
ETHYL BENZENE	--	--	--	--	<.0001	<.0001	<.0001	--
FORMALDEHYDE	<.0001	--	--	<.0001	--	--	--	--
NAPHTHALENE	<.0001	--	--	--	--	--	--	--
PROPYLENE OXIDE	<.0001	--	--	--	--	--	--	--
TOLUENE	<.0001	--	<.0001	--	<.0001	--	--	--
XYLENES	<.0001	--	<.0001	--	--	--	--	--
Total Chronic	0.0007	<.0001	<.0001	0.0006	<.0001	<.0001	<.0001	--

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CHRONIC NONINHALATION EXPOSURE REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

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May. 16, 2001

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DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: RESMIR.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	2.050E-07
ACETALDEHYDE	1.110E-04
ACROLEIN	1.040E-05
AMMONIA	1.230E-02
BENZENE	2.190E-05
ETHYL BENZENE	2.890E-05
FORMALDEHYDE	1.770E-04
NAPHTHALENE	2.680E-06
PAH:BENZO(A)PYRENE	1.060E-06
PROPYLENE OXIDE	7.710E-05
TOLUENE	1.140E-04
XYLENES	4.210E-05

EXPOSURE ROUTE INFORMATION

File: RESMIR.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

CHRONIC NONINHALATION EXPOSURE

Pollutant	Avg. Dose (mg/kg-d)	REL (mg/kg-d)	Avg Dose/REL
1,3-BUTADIENE	---	---	---
ACETALDEHYDE	---	---	---
ACROLEIN	---	---	---
AMMONIA	---	---	---
BENZENE	---	---	---
ETHYL BENZENE	---	---	---
FORMALDEHYDE	---	---	---
NAPHTHALENE	2.04E-09	---	---
PAH:BENZO(A)PYRENE	5.91E-10	---	---
PROPYLENE OXIDE	---	---	---
TOLUENE	---	---	---
XYLENES	---	---	---

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

INDIVIDUAL CANCER RISK REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: RESMIR.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	2.050E-07
ACETALDEHYDE	1.110E-04
ACROLEIN	1.040E-05
AMMONIA	1.230E-02
BENZENE	2.190E-05
ETHYL BENZENE	2.890E-05
FORMALDEHYDE	1.770E-04
NAPHTHALENE	2.680E-06
PAH:BENZO(A)PYRENE	1.060E-06
PROPYLENE OXIDE	7.710E-05
TOLUENE	1.140E-04
XYLENES	4.210E-05

EXPOSURE ROUTE INFORMATION

File: RESMIR.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.050

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

44 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	2.19E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	1.88E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BENZENE	3.99E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	6.68E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	7.33E-10	1.13E-09	7.16E-10	2.66E-09	2.89E-09	0.00E+00
PROPYLENE OXIDE	1.79E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	2.19E-09	1.13E-09	7.16E-10	2.66E-09	2.89E-09	0.00E+00

TOTAL RISK: 9.58E-09

70 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	3.49E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	3.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BENZENE	6.35E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	1.06E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	1.17E-09	1.75E-09	1.11E-09	4.23E-09	0.00E+00	0.00E+00
PROPYLENE OXIDE	2.85E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	3.48E-09	1.75E-09	1.11E-09	4.23E-09	0.00E+00	0.00E+00

TOTAL RISK: 1.06E-08

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CANCER BURDEN REPORT

Run Made By

R.B.Booth

RTP Environmental Assoc.

Project : RCEC

May. 16, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: RESMIR.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	2.050E-07
ACETALDEHYDE	1.110E-04
ACROLEIN	1.040E-05
AMMONIA	1.230E-02
BENZENE	2.190E-05
ETHYL BENZENE	2.890E-05
FORMALDEHYDE	1.770E-04
NAPHTHALENE	2.680E-06
PAH:BENZO(A)PYRENE	1.060E-06
PROPYLENE OXIDE	7.710E-05
TOLUENE	1.140E-04
XYLENES	4.210E-05

FACTORS USED IN CANCER BURDEN CALCULATIONS

Deposition Velocity (m/s) . . . . . :	0.02
Fraction of Produce Grown At Home . :	0.05
Fraction of Residents with Gardens :	0.25

RECEPTOR INFORMATION

File: RESMIR.R96

Receptor ID	X/Q	Residents	Workers
Residential MIR	1.0E+00	131213	55451

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
Residentia	131213	55451	5.05E-04	2.45E-04	1.61E-04	1.39E-04
Total	131213	55451	5.05E-04	2.45E-04	1.61E-04	1.39E-04

TOTAL BURDEN: 1.05E-03

EXPOSED POPULATION AND CANCER BURDEN BY RECEPTOR AND ROUTE
For 2588 Screening Purposes Only

Rec ID	Residents	Workers	Air	Soil	Dermal	Garden
Residentia	131213	55451	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	131213	55451	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TOTAL BURDEN: 0.00E+00

(CO-99-2) County Population Estimates for July 1, 1999 and Population Change for April 1, 1990 to July 1, 1999
(includes revised April 1, 1990 Population Estimates Base)

Source: Population Estimates Program, Population Division, U.S. Census Bureau, Washington, DC 20233
Contact: Statistical Information Staff, Population Division, U.S. Census Bureau (301-457-2422)

Internet Release Date: March 9, 2000

FIPS State/County Code and Area Name	7/1/99 Estimate	4/1/90 Population Estimates Base	Numeric Population Change 1990-99	Percent Population Change 1990-99
06 California	33,145,121	29,811,427	3,333,694	11.2
06001 Alameda County, CA	1,415,582	1,304,347	111,235	8.5
06003 Alpine County, CA	1,161	1,113	48	4.3
06005 Amador County, CA	34,153	30,039	4,114	13.7
06007 Butte County, CA	195,220	182,120	13,100	7.2
06009 Calaveras County, CA	40,051	31,998	8,053	25.2
06011 Colusa County, CA	18,844	16,275	2,569	15.8
06013 Contra Costa County, CA	933,141	803,731	129,410	16.1
06015 Del Norte County, CA	26,477	23,460	3,017	12.9
06017 El Dorado County, CA	161,358	125,995	35,363	28.1
06019 Fresno County, CA	763,069	667,479	95,590	14.3
06021 Glenn County, CA	26,328	24,798	1,530	6.2
06023 Humboldt County, CA	121,358	119,118	2,240	1.9
06025 Imperial County, CA	145,287	109,303	35,984	32.9
06027 Inyo County, CA	17,958	18,281	-323	-1.8
06029 Kern County, CA	642,495	544,981	97,514	17.9
06031 Kings County, CA	123,241	101,469	21,772	21.5
06033 Lake County, CA	55,405	50,631	4,774	9.4

California

StCou	County Name	Census Tract/ BNA	1990 Population	Land Area (Square Miles)	Persons In Poverty	Percent Below Poverty Level
06001	Alameda	4001	2754	2.69	79	2.9
06001	Alameda	4002	2001	0.25	174	8.8
06001	Alameda	4003	5008	0.41	641	12.9
06001	Alameda	4004	3857	0.27	690	18.0
06001	Alameda	4005	3365	0.22	781	23.4
06001	Alameda	4006	1665	0.12	415	24.8
06001	Alameda	4007	4212	0.33	973	23.3
06001	Alameda	4008	3169	0.28	790	25.1
06001	Alameda	4009	2414	0.17	490	20.6
06001	Alameda	4010	5496	0.45	1583	28.9
06001	Alameda	4011	3922	0.34	696	17.5
06001	Alameda	4012	2474	0.26	431	17.8
06001	Alameda	4013	2472	0.33	548	26.6
06001	Alameda	4014	4182	0.29	1404	33.7
06001	Alameda	4015	1908	0.18	678	36.0
06001	Alameda	4016	1845	0.24	921	49.3
06001	Alameda	4017	1930	2.28	380	20.6
06001	Alameda	4018	1857	0.12	720	40.4
06001	Alameda	4019	775	1.71	110	14.4
06001	Alameda	4020	34	0.46	10	20.8
06001	Alameda	4021	1744	0.09	1065	58.7
06001	Alameda	4022	1576	0.12	793	51.7
06001	Alameda	4023	351	0.16	46	14.6
06001	Alameda	4024	2064	0.13	626	31.5
06001	Alameda	4025	2251	0.14	1404	58.8
06001	Alameda	4026	1333	0.11	228	18.6
06001	Alameda	4027	1547	0.14	409	26.0
06001	Alameda	4028	1184	0.15	320	28.6
06001	Alameda	4029	1035	0.15	164	15.8
06001	Alameda	4030	2043	0.13	507	23.8
06001	Alameda	4031	1300	0.13	258	37.2
06001	Alameda	4032	13	0.21	0	0.0
06001	Alameda	4033	2046	0.35	450	22.0
06001	Alameda	4034	3732	0.22	489	13.1
06001	Alameda	4035	6171	0.33	905	14.7
06001	Alameda	4036	4746	0.14	461	9.7
06001	Alameda	4037	4094	0.16	416	10.7
06001	Alameda	4038	3513	0.27	207	5.9
06001	Alameda	4039	3720	0.20	388	10.1
06001	Alameda	4040	2844	0.14	311	12.0
06001	Alameda	4041	5553	0.35	488	9.1
06001	Alameda	4042	2862	1.02	83	2.9
06001	Alameda	4043	3237	0.71	139	4.3
06001	Alameda	4044	4420	1.51	130	2.9
06001	Alameda	4045.01	1547	0.42	16	1.0
06001	Alameda	4045.02	5285	1.19	162	3.1
06001	Alameda	4046	4112	1.89	74	1.8
06001	Alameda	4047	1897	0.51	50	2.7
06001	Alameda	4048	2704	0.27	264	9.7
06001	Alameda	4049	4152	0.38	242	6.0

California

StCou	County Name	Census Tract/ BNA	1990 Population	Land Area (Square Miles)	Persons In Poverty	Percent Below Poverty Level
06001	Alameda	4050	3189	0.33	158	5.0
06001	Alameda	4051	4347	0.48	101	2.3
06001	Alameda	4052	4896	0.38	517	10.6
06001	Alameda	4053	5471	0.18	1074	19.8
06001	Alameda	4054	7829	0.26	2327	30.4
06001	Alameda	4055	4068	0.16	1016	25.0
06001	Alameda	4056	3580	0.16	815	22.8
06001	Alameda	4057	3430	0.21	742	21.9
06001	Alameda	4058	4367	0.21	1210	27.8
06001	Alameda	4059	7302	0.35	2427	33.4
06001	Alameda	4060	3114	0.84	741	23.9
06001	Alameda	4061	3407	0.72	699	21.9
06001	Alameda	4062	9192	0.31	3552	40.0
06001	Alameda	4063	3565	0.18	704	19.8
06001	Alameda	4064	2266	0.21	296	15.1
06001	Alameda	4065	5615	0.29	1272	22.9
06001	Alameda	4066	6788	0.45	969	14.3
06001	Alameda	4067	5014	0.64	225	4.6
06001	Alameda	4068	3566	0.38	147	4.1
06001	Alameda	4069	3480	0.34	303	8.7
06001	Alameda	4070	6040	0.33	790	13.5
06001	Alameda	4071	7522	0.40	1510	20.2
06001	Alameda	4072	6350	0.27	1410	22.9
06001	Alameda	4073	1980	0.86	395	20.7
06001	Alameda	4074	3571	0.20	986	27.3
06001	Alameda	4075	3812	0.19	920	25.1
06001	Alameda	4076	6201	0.41	1038	17.1
06001	Alameda	4077	4731	0.36	480	10.1
06001	Alameda	4078	2556	0.46	199	10.1
06001	Alameda	4079	2806	0.48	181	6.4
06001	Alameda	4080	2123	0.72	30	1.7
06001	Alameda	4081	5908	3.73	277	4.7
06001	Alameda	4082	4153	0.35	456	11.1
06001	Alameda	4083	4517	0.59	474	10.5
06001	Alameda	4084	3399	0.20	990	29.3
06001	Alameda	4085	4573	0.33	968	21.4
06001	Alameda	4086	4653	0.42	1102	23.9
06001	Alameda	4087	6602	0.44	1501	23.0
06001	Alameda	4088	4752	0.50	1835	38.7
06001	Alameda	4089	2809	0.31	732	25.5
06001	Alameda	4090	3116	6.39	754	25.1
06001	Alameda	4091	1938	0.19	214	11.1
06001	Alameda	4092	2734	0.27	721	26.6
06001	Alameda	4093	4605	0.42	1004	21.8
06001	Alameda	4094	3662	0.49	963	26.4
06001	Alameda	4095	2691	0.33	650	24.4
06001	Alameda	4096	4432	0.29	1389	31.4
06001	Alameda	4097	4499	0.31	1326	29.8
06001	Alameda	4098	3082	0.68	537	17.5
06001	Alameda	4099	4201	1.84	96	2.5

California

StCou	County Name	Census Tract/ BNA	1990 Population	Land Area (Square Miles)	Persons In Poverty	Percent Below Poverty Level
06001	Alameda	4100	2849	2.61	67	2.5
06001	Alameda	4101	2673	0.33	367	13.3
06001	Alameda	4102	3001	0.24	501	16.1
06001	Alameda	4103	3054	0.22	735	24.7
06001	Alameda	4104	2944	0.27	271	9.4
06001	Alameda	4201	2137	0.20	143	7.0
06001	Alameda	4202	2438	0.17	325	12.9
06001	Alameda	4203	4109	0.47	368	9.1
06001	Alameda	4204	2598	0.39	409	16.1
06001	Alameda	4205	2023	0.15	160	7.9
06001	Alameda	4206	3042	0.31	153	5.0
06001	Alameda	4211	2055	0.29	52	2.6
06001	Alameda	4212	3635	0.50	82	2.2
06001	Alameda	4213	3873	0.42	263	6.8
06001	Alameda	4214	1639	0.18	145	8.5
06001	Alameda	4215	3526	0.58	92	2.7
06001	Alameda	4216	3735	0.60	229	6.1
06001	Alameda	4217	2898	0.23	337	11.7
06001	Alameda	4218	2045	0.21	131	6.5
06001	Alameda	4219	3619	0.33	363	10.1
06001	Alameda	4220	1872	1.69	640	34.6
06001	Alameda	4221	2528	0.21	413	16.3
06001	Alameda	4222	3169	0.26	628	19.9
06001	Alameda	4223	2962	0.21	320	11.0
06001	Alameda	4224	3333	0.18	856	25.4
06001	Alameda	4225	3744	0.17	727	25.1
06001	Alameda	4226	1194	0.69	25	45.5
06001	Alameda	4227	4466	0.15	850	37.6
06001	Alameda	4228	6407	0.16	1280	42.2
06001	Alameda	4229	2104	0.21	586	27.8
06001	Alameda	4230	3983	0.27	576	15.0
06001	Alameda	4231	3785	0.29	614	16.3
06001	Alameda	4232	2491	0.18	543	21.9
06001	Alameda	4233	3324	0.28	425	12.9
06001	Alameda	4234	4517	0.29	789	17.7
06001	Alameda	4235	2938	0.24	469	16.7
06001	Alameda	4236	7483	0.35	2302	31.8
06001	Alameda	4237	3767	0.31	680	23.6
06001	Alameda	4238	3199	0.41	181	5.7
06001	Alameda	4239	3308	0.28	463	14.3
06001	Alameda	4240	5105	0.32	1309	26.0
06001	Alameda	4251	5753	1.22	857	14.9
06001	Alameda	4261	5971	1.14	90	1.5
06001	Alameda	4262	4631	0.55	101	2.2
06001	Alameda	4271	3313	0.38	130	4.0
06001	Alameda	4272	4155	0.52	406	10.2
06001	Alameda	4273	4067	0.78	372	9.2
06001	Alameda	4274	3668	0.71	317	8.7
06001	Alameda	4275	2068	2.56	113	9.1
06001	Alameda	4276	4562	0.23	711	15.6

California

StCou	County Name	Census Tract/ BNA	1990 Population	Land Area (Square Miles)	Persons In Poverty	Percent Below Poverty Level
06001	Alameda	4277	4744	0.38	281	5.9
06001	Alameda	4278	4668	0.33	311	6.7
06001	Alameda	4279	4419	0.34	229	5.2
06001	Alameda	4280	2671	0.21	269	10.1
06001	Alameda	4281	4141	0.38	180	4.3
06001	Alameda	4282	5894	0.53	345	5.9
06001	Alameda	4283	11254	2.41	361	3.2
06001	Alameda	4284	4313	0.32	318	8.1
06001	Alameda	4285	2974	0.26	144	4.9
06001	Alameda	4286	3273	0.35	175	5.5
06001	Alameda	4301	5795	39.26	209	3.6
06001	Alameda	4302	6608	1.87	189	2.9
06001	Alameda	4303	3428	0.92	85	2.5
06001	Alameda	4304	2000	1.15	10	0.5
06001	Alameda	4305	4807	0.62	241	5.0
06001	Alameda	4306	5070	0.89	96	1.9
06001	Alameda	4307	3721	0.51	47	1.3
06001	Alameda	4308	4865	0.71	338	7.0
06001	Alameda	4309	3884	0.43	261	6.9
06001	Alameda	4310	2106	0.36	132	6.2
06001	Alameda	4311	3019	0.37	133	4.5
06001	Alameda	4312	4869	0.77	255	5.3
06001	Alameda	4321	3307	0.40	201	6.1
06001	Alameda	4322	3429	0.39	187	5.5
06001	Alameda	4323	2738	0.40	162	5.9
06001	Alameda	4324	4768	2.36	185	3.9
06001	Alameda	4325	7152	0.83	408	5.7
06001	Alameda	4326	5010	0.65	237	4.9
06001	Alameda	4327	2403	0.32	94	3.8
06001	Alameda	4328	3585	0.89	280	7.8
06001	Alameda	4329	796	0.63	0	0.0
06001	Alameda	4330	3234	0.50	187	5.8
06001	Alameda	4331	9145	1.12	407	4.5
06001	Alameda	4332	5882	1.13	488	8.4
06001	Alameda	4333	6179	0.98	174	2.8
06001	Alameda	4334	3485	2.05	97	2.8
06001	Alameda	4335	3937	0.48	123	3.1
06001	Alameda	4336	5127	0.61	293	5.8
06001	Alameda	4337	2511	0.61	286	11.5
06001	Alameda	4338	5321	0.73	231	4.4
06001	Alameda	4339	4999	0.32	1029	20.6
06001	Alameda	4340	3857	0.45	403	11.0
06001	Alameda	4351.01	4592	21.91	434	9.5
06001	Alameda	4351.02	4901	1.63	192	4.1
06001	Alameda	4352	3986	0.95	243	6.4
06001	Alameda	4353	3778	0.50	440	12.0
06001	Alameda	4354	3287	0.52	455	14.4
06001	Alameda	4355	3057	0.39	253	8.4
06001	Alameda	4356	7714	0.79	1016	13.7
06001	Alameda	4357	3758	0.50	332	8.8

California

StCou	County Name	Census Tract/ BNA	1990 Population	Land Area (Square Miles)	Persons In Poverty	Percent Below Poverty Level
06001	Alameda	4358	4387	0.52	226	5.2
06001	Alameda	4359	4602	0.59	113	2.5
06001	Alameda	4360	4010	0.50	153	3.8
06001	Alameda	4361	4337	0.49	191	4.4
06001	Alameda	4362	2668	0.25	291	11.7
06001	Alameda	4363	4781	0.69	637	13.8
06001	Alameda	4364.01	6490	1.25	506	7.7
06001	Alameda	4364.02	2976	1.76	61	2.1
06001	Alameda	4365	3716	0.66	298	8.1
06001	Alameda	4366	8755	0.76	1467	16.8
06001	Alameda	4367	2499	0.31	206	8.7
06001	Alameda	4368	2817	0.39	258	9.0
06001	Alameda	4369	5713	0.45	693	12.2
06001	Alameda	4370	2968	0.63	57	1.9
06001	Alameda	4371	7873	19.27	547	7.0
06001	Alameda	4372	5004	1.00	336	6.8
06001	Alameda	4373	2948	0.41	181	6.1
06001	Alameda	4374	2968	0.36	172	5.8
06001	Alameda	4375	3914	0.24	516	13.4
06001	Alameda	4376	2702	0.29	291	11.9
06001	Alameda	4377	7464	0.34	2091	28.6
06001	Alameda	4378	3464	0.49	181	5.3
06001	Alameda	4379	2477	0.86	342	14.3
06001	Alameda	4380	2776	0.96	119	4.2
06001	Alameda	4381	5198	0.74	170	3.3
06001	Alameda	4382.01	3848	0.38	317	8.3
06001	Alameda	4382.02	6345	2.66	393	6.2
06001	Alameda	4383	3425	0.33	132	4.0
06001	Alameda	4384	1948	0.66	75	3.6
06001	Alameda	4401	2329	10.66	201	10.2
06001	Alameda	4402	5493	0.46	681	12.4
06001	Alameda	4403.01	4753	1.65	165	3.5
06001	Alameda	4403.02	5928	1.40	100	1.7
06001	Alameda	4403.04	4704	0.37	454	9.7
06001	Alameda	4403.05	4153	0.31	96	2.3
06001	Alameda	4403.06	4029	0.22	470	11.7
06001	Alameda	4403.07	4279	0.55	213	5.0
06001	Alameda	4403.08	4873	0.69	390	8.1
06001	Alameda	4403.09	4862	1.21	377	7.6
06001	Alameda	4403.31	2451	0.69	167	7.1
06001	Alameda	4403.32	9	1.34	0	0.0
06001	Alameda	4411	3944	5.79	179	4.6
06001	Alameda	4412	5426	1.24	273	5.0
06001	Alameda	4413	8117	2.07	461	5.7
06001	Alameda	4414	11448	1.33	647	5.7
06001	Alameda	4415.01	5014	0.62	80	1.6
06001	Alameda	4415.02	10656	1.13	397	3.7
06001	Alameda	4415.98	7853	32.41	122	1.6
06001	Alameda	4416	10662	1.14	421	4.0
06001	Alameda	4417	5048	0.83	491	9.8

California

StCou	County Name	Census Tract/ BNA	1990 Population	Land Area (Square Miles)	Persons In Poverty	Percent Below Poverty Level
06001	Alameda	4418	5929	0.80	315	5.3
06001	Alameda	4419.01	6171	1.96	312	5.1
06001	Alameda	4419.02	12101	1.30	1024	8.8
06001	Alameda	4420	2365	3.01	17	0.7
06001	Alameda	4421	4552	0.71	40	0.9
06001	Alameda	4422	5959	1.15	182	3.1
06001	Alameda	4423	6806	0.93	498	7.4
06001	Alameda	4424	5580	0.63	86	1.6
06001	Alameda	4425	6872	0.77	313	4.7
06001	Alameda	4426	7431	0.96	449	6.1
06001	Alameda	4427	2869	0.48	31	1.1
06001	Alameda	4428	2831	0.48	52	1.8
06001	Alameda	4429	5977	0.86	115	1.9
06001	Alameda	4430	8288	0.91	280	3.4
06001	Alameda	4431	15058	9.24	380	2.5
06001	Alameda	4432	2035	5.16	34	1.7
06001	Alameda	4433	9353	1.36	197	2.1
06001	Alameda	4441	7362	1.14	196	2.7
06001	Alameda	4442	6210	0.81	298	4.8
06001	Alameda	4443	6831	7.69	452	6.6
06001	Alameda	4444	4648	0.38	201	4.4
06001	Alameda	4445	5025	0.77	590	11.8
06001	Alameda	4446	7785	3.25	156	2.0
06001	Alameda	4501	3786	4.28	0	0.0
06001	Alameda	4502	3557	0.63	323	11.0
06001	Alameda	4503	4340	1.23	129	3.0
06001	Alameda	4504	5676	1.24	193	3.4
06001	Alameda	4505	5870	4.79	149	2.5
06001	Alameda	4506.01	1647	19.46	65	4.1
06001	Alameda	4506.02	6217	2.39	126	2.0
06001	Alameda	4506.03	4852	1.51	71	1.5
06001	Alameda	4506.04	4917	0.82	62	1.3
06001	Alameda	4506.05	3661	0.69	36	1.0
06001	Alameda	4506.06	5685	0.80	93	1.6
06001	Alameda	4506.07	2577	1.89	152	5.9
06001	Alameda	4507.01	2968	101.79	26	0.9
06001	Alameda	4507.03	4586	3.52	130	2.9
06001	Alameda	4507.04	8922	5.57	361	4.1
06001	Alameda	4507.21	157	11.49	0	0.0
06001	Alameda	4507.22	7038	2.63	176	2.5
06001	Alameda	4511	3569	213.92	93	2.7
06001	Alameda	4512	8697	19.26	473	5.5
06001	Alameda	4513	5512	4.95	139	2.5
06001	Alameda	4514	10726	2.61	890	8.4
06001	Alameda	4515	12599	5.12	759	6.0
06001	Alameda	4516	7938	2.69	387	5.0
06001	Alameda	4517	10338	1.93	311	3.0
06001	Alameda	4518.98	0	0.03	0	0.0
06001	Alameda	4519.98	0	0.00	0	0.0
06001	Alameda	4520.95	0	0.00	0	0.0

California

StCou	County Name	Census Tract/ BNA	1990 Population	Land Area (Square Miles)	Persons In Poverty	Percent Below Poverty Level
06001	Alameda	4520.96	0	0.00	0	0.0
06001	Alameda	4520.97	0	0.00	0	0.0
06001	Alameda	4520.98	0	0.00	0	0.0
06001	Alameda	4521.93	0	0.01	0	0.0
06001	Alameda	4521.94	0	0.00	0	0.0
06001	Alameda	4521.95	0	0.00	0	0.0
06001	Alameda	4521.96	0	0.00	0	0.0
06001	Alameda	4521.97	0	0.00	0	0.0
06001	Alameda	4521.98	0	0.00	0	0.0

Population Data:

3 mile radius adjusted 1999 population:		131,213
	worker:	55451
6 mile radius adjusted 1999 population:		332,116
	worker:	104,485

U.S. Census Bureau

State and County *QuickFacts*

Alameda County, California

More data for this area ▶

Select a county in California | Go | Select a state | USA QuickFacts

County Selection Map
Locate a county by place name

Follow the ? link for definition and source information.

People QuickFacts	Alameda County	California
Population, 1999 estimate	1,415,582	33,145,121
Population percent change, 1990-1999 estimate	8.5%	11.2%
Male population, 1999 estimate	698,354	16,579,707
Female population, 1999 estimate	717,228	16,565,414
Percent population under 18 years old, 1999 estimate	24.4%	26.9%
Percent population 65 years old and over, 1999 estimate	10.5%	11.0%
Percent white population, 1999 estimate	60.6%	79.4%
Percent Black population, 1999 estimate	19.0%	7.5%
Percent American Indian, Eskimo, or Aleut pop, 1999 estimate	0.8%	0.9%
Percent Asian or Pacific Islander population, 1999 estimate	19.6%	12.2%
Percent Hispanic population, 1999 estimate	18.6%	31.6%
Percent White non-Hispanic population, 1999 estimate	44.5%	49.9%
High school graduates, persons 25 years and over, 1990	682,698	14,244,971
College graduates, persons 25 years and over, 1990	241,487	4,366,674
Homeownership rate, 1990	53.3%	55.6%
Single family homes, number 1990	299,639	6,930,949
Households, 1990	480,079	10,399,700
Persons per household, 1990	2.59	2.79
Family households, 1990	311,888	7,218,877
Median household money income, 1997 model-based estimate	$46,795	$39,595
Persons below poverty, percent, 1997 model-based estimate	11.8%	16.0%
Children below poverty, percent, 1997 model-based estimate	17.6%	24.6%

Business QuickFacts	Alameda County	California
Private nonfarm establishments, 1998	35,137	773,925
Private nonfarm employment, 1998	598,220	12,026,989
Private nonfarm employment, percent change 1990-1998	18.3%	6.3%
Manufacturers shipments, 1997 ($1000)	22,337,780	379,612,443
Retail sales, 1997 ($1000)	12,404,947	263,118,346

Retail sales per capita 1997	$9,040	$8,167
Minority-owned firms, 1992	27,157	541,414
Women-owned firms, 1992	36,500	801,487
Housing units authorized by building permits, 1999	6,397	138,039
Federal funds and grants, 1999 ($1000)	8,052,789	166,049,702
Local government employment - full-time equivalent, 1997	59,236	1,194,169

Geography QuickFacts	Alameda County	California
Land area, 1990 (square miles)	738	155,973
Persons per square mile, 1999	1,919.4	212.5
Metropolitan Area	Oakland, CA PMSA	

FN: Footnote on this item for this area in place of data
NA: Not available
D: Suppressed to avoid disclosure of confidential information
X: Not applicable
S: Suppressed; does not meet publication standards
Z: Value greater than zero but less than half unit of measure shown

Percent worker population by census tract calculation:

(non-farm employment 1998) ÷ (county population 1999) = multiplier

Where: Non-farm employment for Alameda County 1998 = 598,200
County population for Alameda County 1999 = 1,415,582

(598,220) ÷ (1,415,582) = 0.4226

= 42.26%

Therefore, the worker population for each census tract evaluated in the HRA will be estimated by multiplying the 1990 census tract population (as adjusted per the 1999 data, i.e., 8.5% increase) by the above multiplier:

(1990 tract population) X (8.5% increase) X (.4226) = 1999 tract worker population

Russell City Energy Center

Appendix 8.1-E
Construction Emissions and Impact Analysis

May 2001

Russell City Energy Center AFC

May 2001

APPENDIX 8.1E CONSTRUCTION EMISSIONS AND IMPACT ANALYSIS

8.1E.1 Construction Phases

Construction of RCEC is expected to last approximately 21 months during the 2 year construction period. The construction will occur in the following four main phases:

- Site preparation;
- Foundation work;
- Installation of major equipment; and
- Construction/installation of major structures.

Site preparation includes clearing, grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence.

Fugitive dust emissions from the construction of RCEC will result from:

- Dust entrained during site preparation and grading/excavation at the construction site;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, grading, excavation, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from Diesel-powered welding machines, electric generators, air compressors, and water pumps;
- Exhaust from pickup trucks and Diesel trucks used to transport workers and materials around the construction site;
- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site;
- Exhaust from locomotives used to deliver mechanical equipment to the project area; and
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Worst-case daily dust emissions are expected to occur during the first one to two months of construction when site preparation occurs (i.e., 5 months after notice to proceed). The worst-case daily exhaust emissions are expected to occur during the middle of the construction schedule during the installation of the major mechanical equipment (i.e., 15 months after notice to proceed). Annual emissions are based on the average equipment mix during the 21-month construction period.

8.1E.2 Available Mitigation Measures

The following mitigation measures are proposed to control exhaust emissions from the Diesel heavy equipment used during construction of RCEC:

- Operational measures, such as limiting time spent with the engine idling by shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases due to engine problems;
- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle Diesel fuel; and
- Use of low-emitting Diesel engines meeting federal emissions standards for construction equipment.

The following mitigation measures are proposed to control fugitive dust emissions during construction of the project:

- Use either water application or chemical dust suppressant application to control dust emissions from unpaved road travel and unpaved parking areas;
- Use vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard;
- Limit traffic speeds on unpaved roads to 15 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;
- Replant vegetation in disturbed areas as quickly as possible;
- Use wheel washers or wash off tires of all trucks exiting construction site; and
- Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant.

8.1E.3 Estimation of Emissions with Mitigation Measures

Tables 8.1E-1 through 8.1E-3 show the estimated maximum daily and annual heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures. Detailed emission calculations are included in Tables 8.1E-5 through 8.1E-12.

Table 8.1E-1. Maximum Daily Emissions During Construction (Month 5; maximum dust emissions), pounds per day.

	NO_x	CO	POC	SO_x	PM_{10}
Onsite					
Construction Equipment, Fugitive Dust	310.93	93.31	25.1	8.72	43.25
Offsite					
Worker Travel, Truck/Rail Deliveries	40.28	291.08	23.91	0.71	1.42
Total =	**351.21**	**384.39**	**49.01**	**9.43**	**44.67**

Table 8.1E-2. Maximum Daily Emissions During Construction (Month 15; maximum exhaust emissions), pounds per day.

	NO_x	CO	POC	SO_x	PM_{10}
Onsite					
Construction Equipment, Fugitive Dust	230.06	76.71	20.08	6.45	23.63
Offsite					
Worker Travel, Truck/Rail Deliveries	152.66	736.76	62.01	5.07	4.84
Total =	**382.72**	**813.47**	**82.09**	**11.52**	**28.47**

Table 8.1E-3. Annual Emissions During Construction, tons per year.

	NO_x	CO	POC	SO_x	PM_{10}
Onsite					
Construction Equipment, Fugitive Dust	15.25	4.95	1.28	0.44	2.87
Offsite					
Worker Travel, Truck/Rail Deliveries	7.70	58.87	4.81	0.14	0.23
Total =	**22.95**	**63.82**	**6.09**	**0.58**	**3.10**

8.1E.4 Analysis of Ambient Impacts from Facility Construction

Ambient air quality impacts from emissions during the construction of RCEC were estimated using an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

8.1E.4.1 Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 8.1.4.1.2), monitoring stations delineated in Section 8.1.3 were used to establish the ambient background levels for the construction impact modeling analysis. Table 8.1-26 showed the maximum concentrations of NO_x, SO_2, CO and PM_{10} recorded for 1997 through 2000 at those monitoring stations.

8.1E.4.2 Dispersion Model

As in the analysis of project operating impacts, the USEPA-approved Industrial Source Complex Short Term (ISCST3) model was used to estimate ambient impacts from construction activities. A detailed discussion of the ISCST3 dispersion model is included in Section 8.1.5.1.2.

The emission sources for the construction site were grouped into two categories: exhaust emissions and dust emissions. An effective emission plume height of 2.0 meters was used for all exhaust emissions. For construction dust emissions, an effective plume height of 0.5 meters was used in the modeling analysis. The exhaust and dust emissions were modeled as a single area source that covered

the total area of the construction site. The construction impacts modeling analysis used the same receptor locations as used for the project operating impact analysis. A detailed discussion of the receptor locations is included in Section 8.1.5.1.2.

To determine the construction impacts on short-term ambient standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Tables 8.1E-1 and 8.1E-2 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Table 8.1E-3 were used. As with the project operating impact analysis, the meteorological data set used for the construction emission impacts analysis is data collected from the Union City met station for 1990-1994.

8.1E.4.3 Modeling Results

Based on the emission rates of NO_x, SO_2, CO, and PM_{10} and the meteorological data, the ISCST3 model calculates hourly and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, 3-hour 8-hour, and 24-hour ambient impacts are based on the worst-case daily emission rates of NO_x, SO_2, CO, and PM_{10}. The annual impacts are based on the annual emission rates of these pollutants.

The one-hour and annual average concentrations of NO_2 were computed following the revised USEPA guidance for computing these concentrations (August 9, 1995 Federal Register, 60 FR 40465). The one-hour average was adjusted using the Ozone Limiting Method. The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average NO_2/NO_x ratio.

The modeling analysis results are shown in Table 8.1E-4. Also included in the table are the maximum background levels that have occurred in the last three years and the resulting total ambient impacts. As shown in Table 8.1E-4, with the exception of 1-hour NO_2 impacts, construction impacts for all modeled pollutants are expected to be below the most stringent state and national standards. However, the state 24-hour average PM_{10} standard is exceeded in the absence of the construction emissions for RCEC.

The ISCST3 model over predicts construction emission impacts due to the cold plume (i.e., ambient temperature) effect of dust emissions. Most of the plume dispersion characteristics in the ISCST3 model are derived from observations of hot plumes associated with typical smoke stacks. The ISCST3 model does compensate for plume temperature; however, for ambient temperature plumes the model assumes negligible buoyancy and dispersion. Consequently, the ambient concentrations in cold plumes remain high even at significant distances from a source. RCEC construction site impacts are not unusual in comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards. The input and output modeling files are being provided electronically.

Table 8.1E-4. Modeled Maximum Construction Impacts

Pollutant	Averaging Time	Maximum Construction Impacts ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2[a]	1-hour	340.96[d]	206.8	549.8	470	-
	Annual	61.25	41.5	102.7	-	100
SO_2	1-hour	82.12[d]	104.8	186.9	650	-
	3-hour	50.05	52	102	-	1300
	24-hour	14.18[d]	18.4	32.6	109	365
	Annual	2.335	5.3	7.64	-	80
CO	1-hour	977[d]	6440	7417	23,000	40,000
	8-hour	506.23[d]	3617	4123.2	10,000	10,000
PM_{10}	24-hour	119.1[e]	88	207	50	150
	Annual[b]	19.74	24.3	44	30	-
	Annual[c]	19.74	21.9	41.6	-	50

Notes:
[a]Ozone limiting method applied for 1-hour average, using maximum background O_3 and NO_2 level during the period from 1995 to 1997. ARM applied for annual average, using national default 0.75 ratio.
[b]Annual Arithmetic Mean.
[c]Annual Geometric Mean.
[d]Based on maximum daily emissions during Month 15.
[e]Based on maximum daily emissions during Month 5.

Table 8.1E-5. Notes on fugitive dust emission calculations and assumptions- Russell City Energy Center.

(1) Paved Road Travel - Delivery Trucks and Workers - Source: AP-42, Section 13.2.1, 10/97

E = k(sL/2)^0.65*(W/3)^1.5

k = particle size constant =	0.016	lb/VMT - PM10
sL = silt loading =	0.015	g/m2 (AP-42, page 13.2.1-5, limited access roads)
W = auto/pickup truck avg. vehicle weight =	2.4	tons (CARB Area Source Manual, 9/97)
W = delivery truck avg. vehicle weight =	27.50	tons (for heavy duty Diesel trucks)
E = auto/pick truck emission factor =	0.0005	lb/VMT - PM10
E = delivery truck emission factor =	0.0185	lb/VMT - PM10

(2) Wind erosion of active construction area - 'Source: South Coast AQMD CEQA Manual, Table A-9-9-F.

E = ([0.45*({[G]^1.5}/{[H]^1.4})]*I)*J = 3.68 lbs/day = E

E = Pm10 lbs/day 612763 site area, sq.ft.

G = Silt content of soil (overburden value, 7.5%)

H = Soil moisture condition (overburden-moist, 15%)

I = 2.2046 (conversion factor kg/hr to lbs/hr)

J = hours/day (value used, 8) EF 0.000006 lbs/sqft/day

(3) Finish Grading - Source: AP-42, Table 11.9-2, 1/95

E = (0.60)(0.051)(S^2.0)

S = mean vehicle speed =	3.0	mph (estimated)
E = emission factor =	0.2754	lb/VMT

(4) Bulldozer Operation and Scraper Excavation - Source: AP-42, Table 11.9.2, 1/95

E = (0.75)(s^1.5)/(M^1.4)

s = silt content =	7.5%	SCAQMD CEQA Manual, Table A-9-9-F
M = moisture content =	15.0%	SCAQMD CEQA Manual, Table A-9-9-F
E = emission factor =	0.35	lb/hr

(5) Scraper Travel

W = mean vehicle weight =	73.4	tons empty (651E scraper, Caterpillar Performance Handbook, 10/89)
=	125.4	tons loaded (651E scraper, Caterpillar Performance Handbook, 10/89)
=	99.4	tons mean weight
Daily Scraper Haul Tonnage =	4,992	ton/day (estimated)
Scraper Load =	52.0	ton (651E scraper, Caterpillar Performance Handbook, 10/89)
Daily Scraper Loads =	96.00	loads/day
Daily Scraper Hauling Distance =	0.08	miles/load (estimated)
Daily Scraper Travel =	14.81	miles/day

(6) Material Unloading - Source: AP-42, p. 13.2.4-3, 1/95

E = (k)(0.0032)[(U/5)^1.3]/[(M/2)^1.4]

k = particle size constant =	0.35	for PM10
U = average wind speed =	2.94	m/sec (based on onsite wind data)
=	6.58	mph
M = moisture content =	15.0%	SCAQMD CEQA Manual, Table A9-9-F
E = emission factor =	0.0001	lb/ton

(7) Loader Unpaved Road Travel - Source: AP-42, Section 13.2.2, 1/95

E = (k)[(s/12)^0.8][(W/3)^0.4]/[(M/0.2)^0.3]

k = particle size constant =	2.6	
s = surface silt content =	7.5%	SCAQMD CEQA Manual, Table A9-9-F

Notes - Fugitive Dust Emission Calculations (cont.)

M = surface moisture content =	15.0%	SCAQMD CEQA Manual, Table A9-9-F
W = avg. vehicle weight =	18.50	tons (avg. of loaded and unloaded weights, 966E loader, Caterpillar Performance Handbook, 10/89)
E = emission factor =	0.10	lb PM10/VMT
Soil Density =	1.05	ton/yd3 (Caterpillar Performance Handbook, 10/89)
Loader Bucket Capacity =	4.75	yd3 (966E loader, Caterpillar Performance Handbook, 10/89)
=	4.99	ton/load
Daily Soil Transfer Rate =	480	ton/day (estimated)
Daily Loader Trips =	96	loading trips/day
Loading Travel Distance =	203.7	ft/load (estimated)
Daily Loader Travel Distance =	19,555	ft/day
=	3.7	mi/day

(8) Backhoe Trenching - Source: AP-42, Table 11.9-2 (dragline operations), 1/95

E = (0.75)(0.0021)(d^0.7)/(M^0.3)

d = drop height =	3	ft (estimated)
M = moisture content =	15.0%	SCAQMD CEQA Manual, Table A9-9-F
E = emission factor =	0.0015	lb/yd3
Backhoe Excavating Rate =	49.8	yd3/hr (E70B backhoe, Caterpillar Performance Handbook, 10/89)
=	398	yd3/day for 1 backhoe @ 8 hr/day

(9) Excavator Trenching - Source: AP-42, Table 11.9-2 (dragline operations), 1/95

E = (0.75)(0.0021)(d^0.7)/(M^0.3)

d = drop height =	3	ft (estimated)
M = moisture content =	15.0%	SCAQMD CEQA Manual, Table A9-9-F
E = emission factor =	0.0015	lb/yd3
Excavator Excavating Rate =	427.2	yd3/hr (225D excavator, Caterpillar Performance Handbook, 10/89)
=	3,418	yd3/day for 1 excavator @ 8 hr/day

(10) Unpaved Road Travel - Source: AP-42, Section 13.2.2, 9/98.

E = (k)[(s/12)^0.8][(W/3)^0.4]/[(M/0.2)^0.3]

k = particle size constant =	2.6	
s = silt fraction =	7.5%	SCAQMD CEQA Manual, Table A9-9-F
M = surface moisture content =	15.0%	SCAQMD CEQA Manual, Table A9-9-F
W = water truck avg. veh. weight =	10.0	tons empty (estimated)
=	39.4	tons loaded (estimated with 8,000 gallon water capacity)
=	24.7	tons average
W = fuel truck avg. veh. weight =	8.0	tons empty (estimated)
=	18.2	tons loaded (estimated with 3,000 gallons Diesel fuel capacity)
=	13.1	tons average
W = service truck avg. veh. weight =	5.0	tons (estimated)
W = dump truck avg. veh. weight =	15.0	tons (for heavy duty Diesel trucks)
=	40.0	tons (for heavy duty Diesel trucks)
=	27.5	tons (for heavy duty Diesel trucks)
W = concrete pumper truck avg. veh. wt. =	15.0	tons (for heavy duty Diesel trucks)
=	40.0	tons (for heavy duty Diesel trucks)
=	27.5	tons (for heavy duty Diesel trucks)
W = forklift avg. veh. weight =	8.0	tons empty (estimated)
W = auto/pickup avg. vehicle weight =	2.4	tons (CARB Area Source Manual, 9/97)
W = delivery truck avg. veh. wt. =	27.5	tons (for heavy duty Diesel trucks)
W = scraper avg. veh. wt. =	73.4	tons empty (651E scraper, Caterpillar

Notes - Fugitive Dust Emission Calculations (cont.)

	Performance Handbook, 10/89)
	125.4 tons loaded (651E scraper, Caterpillar
	Performance Handbook, 10/89)
	99.4 tons mean weight

E = water truck emission factor =	0.11 lb PM10/VMT
E = fuel truck emission factor =	0.09 lb PM10/VMT
E = service truck emission factor =	0.06 lb PM10/VMT
E = dump truck emission factor =	0.12 lb PM10/VMT
E = concrete pumper truck emiss. factor =	0.12 lb PM10/VMT
E = forklift emiss. factor =	0.07 lb PM10/VMT
E = 5th wheel truck emiss. factor =	0.07 lb PM10/VMT
E = auto/pickup emiss. factor =	0.04 lb PM10/VMT
E = delivery truck emiss. factor =	0.12 lb PM10/VMT
E = scraper emiss. factor =	0.20 lb PM10/VMT

(11) Unpaved Road Travel and Active Excavation Area Control - Source: Control of Open Fugitive Dust Sources, U.S EPA, 9/88

$C = 100 - (0.8)(p)(d)(t)/(i)$

p = potential average hourly daytime evaporation rate =	0.4225 mm/hr (EPA document, Figure 3-2, summer)
d = average hourly daytime traffic rate =	291.6 vehicles/hr (estimated)
t = time between watering applications =	0.25 hr/application (estimated)
i = application intensity =	0.7 L/m2 (typical level in EPA document, page 3-23)
C = average watering control efficiency =	66.2%

(3) Wind Errosion of Storage Piles - Source: EPA's "Control of Open Fugitive Dust Sources", 9/88, Chapter 4.

Max. Hourly Ave. WS @ 10m(1) (m/s)	Fastest(2) Mile @ 10m (m/s)	Threshold Friction Velocity(3) (m/s)	Roughness Height(3) (m)	Threshold Fastest Mile @ 10m (m/s)	TSP Emission Factor(4) (g/m^2)	PM10 Factor(5)	PM10 Emission Factor (g/m^2)	PM10 Emission Factor (lbs/ft^2)
8.90	10.18	0.53	0.0003	13.79	0.000	0.50	0.000	0.000000

Notes:
1- maximum hourly average wind speed based on onsite wind data.
2 - calculated based on fastest mile conversion factor.
3 - from Table 4-4 of EPA document (construction site).
4- from equation 4-4 of EPA document.
5 - from equation 4-3 of EPA document.

Notes - Fugitive Dust Emission Calculations

(1) Paved road travel emission factors for delivery trucks and worker automobiles are based on AP-42, Section 13.2.1, 10/97.
(2) Wind erosion emission factor for active construction area is based on "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996.
(3) Finish grading emission factor is based on AP-42, Table 11.9-2, 1/95.
(4) Bulldozer and scraper excavation emission factors are based AP-42, Table 11.9.2, 1/95.
(5) Material unloading emission factors are based on AP-42, p. 13.2.4-3, 1/95.
(6) Loader unpaved road travel emission factor is based on AP-42, Section 13.2.2, 1/95.
(7) Backhoe trenching emission factor is based on AP-42, Table 11.9-2 (dragline operations), 1/95.
(8) Unpaved road travel emission factors for water trucks, fuel trucks, service trucks, dump trucks, scrapers, forklifts, pickup trucks, delivery trucks, 5th wheel tractor trucks, and concrete trucks are based on AP-42, Section 13.2.2, 9/98.
(9) Dust control efficiency for unpaved road travel and active excavation area is based on "Control of Open Fugitive Dust Sources", U.S. EPA, 9/88.

Table 8.1E-6. Construction equipment emission factors

Construction Equipment

	Emission Factors (1)				
	NOx (lbs/1000 gals)	CO (lbs/1000 gals)	POC (lbs/1000 gals)	SOx (lbs/1000 gals)	PM10 (lbs/1000 gals)
Crawler Crane- Greater than 300 ton	270.01	39.13	15.65	7.10	15.65
Crawler Crane- Greater than200 ton	270.01	39.13	15.65	7.10	15.65
Crane-Mobile 65 ton	270.01	39.13	15.65	7.10	15.65
Cranes -Mobile 45 ton	270.01	39.13	15.65	7.10	15.65
Cranes - Mobile 35 ton	270.01	39.13	15.65	7.10	15.65
Bulldozer D6H	270.01	39.13	15.65	7.10	15.65
Bulldozer D4C	270.01	39.13	15.65	7.10	15.65
Excavator- Trencher	270.01	39.13	15.65	7.10	15.65
Excavator- Earth Scraper	270.01	39.13	15.65	7.10	15.65
Excavator-Motor Grader	270.01	39.13	15.65	7.10	15.65
Excavator- Backhoe/loader	270.01	39.13	15.65	7.10	15.65
Excavator - loader	270.01	39.13	15.65	7.10	15.65
Vibratory Roller	270.01	39.13	15.65	7.10	15.65
Portable Compaction roller	270.01	39.13	15.65	7.10	15.65
Truck- Water	170.68	106.79	15.33	7.10	9.59
Loader/Forklift	270.01	39.13	15.65	7.10	15.65
10/12 cubic yd Dump Truck	170.68	106.79	15.33	7.10	9.59
Service Truck- 1 ton	74.40	59.47	5.57	7.10	4.83
Truck- Fuel/Lube	170.68	106.79	15.33	7.10	9.59
Concrete Pumper Truck	170.68	106.79	15.33	7.10	9.59
Tractor Truck 5th Wheel	270.01	39.13	15.65	7.10	15.65
Trucks- Pickup 3/4 ton	74.40	59.47	5.57	7.10	4.83
Trucks- 3 ton	74.40	59.47	5.57	7.10	4.83
Diesel Powered Welder	313.05	195.66	46.96	7.10	39.13
Light Plants	313.05	195.66	46.96	7.10	39.13
Portable Compaction- Vibratory Plate	313.05	195.66	46.96	7.10	39.13
Portable Compaction- Vibratory Ram	313.05	195.66	46.96	7.10	39.13
Articulating Boom Platforms	313.05	195.66	46.96	7.10	39.13
Pumps	313.05	195.66	46.96	7.10	39.13
Air Compressor 185 CFM	313.05	195.66	46.96	7.10	39.13
Air Compressor 750 CFM	313.05	195.66	46.96	7.10	39.13
Concrete Vibrators	313.05	195.66	46.96	7.10	39.13
Concrete Trowel Machine	313.05	195.66	46.96	7.10	39.13
Fusion Welder	313.05	195.66	46.96	7.10	39.13
Portable Power Generators	313.05	195.66	46.96	7.10	39.13

Notes:

(1) For heavy Diesel construciton equipment, emission factors based on equipment meeting EPA 1996 off-road Diesel standards and uses CARB low-sulfur fue
For trucks, depending on size of truck, emissions factors based on MVE17G version 1.0c for heavy-heavy duty or medium duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin.
For portable equipment, emission factors based on EPA's "Non-road Engine and Vehicle Emission Study Report", 11/91, Table 2-07, for generator sets, welders, pumps, air compressors, etc., less than 50 bhp.

	NOx	CO	POC	SO2	PM10	
Large Equipment(1)	6.90	1.00	0.40	0.18	0.40	
Small Equipment(2)	8.00	5.00	1.20	0.18	1.00	
	(lb/1000 gal @ 0.4 lb/HP-hr & 7.1 lb/gal)					

	NOx	CO	HC	SO2	PM	
Large Equipment(1)	270.01	39.13	15.65	7.10	15.65	
Small Equipment(2)	313.05	195.66	46.96	7.10	39.13	

Notes:

(1) Equipment meeting EPA 1996 off-road Diesel standards and uses CARB low-sulfur fuel.

(2) From EPA's "Non-road Engine and Vehicle Emission Study Report", 11/91, Table 2-07, for generator sets, welders, pumps, and air compressors less than 5

	Emission Factors (1)				
	NOx	CO	POC	SOx	PM10
Truck Hauling (lbs/vmt)	0.02802	0.01753	0.00252	0.00116	0.00157
Truck Hauling (lbs/1000 gals)	170.68	106.79	15.33	7.06	9.59

Notes:

(1) From MVE17G version 1.0c, heavy-heavy duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin.

Table 8.1E-6. (continued).

	Emission Factors NOx (lbs/vmt)	CO (lbs/vmt)	POC (lbs/vmt)	SOx (lbs/vmt)	PM10 (lbs/vmt)
Worker Travel (lbs/vmt)(1)	0.00287	0.03434	0.00274	0.00000	0.00006
Medium Duty Trucks (lbs/1000 gals)(2)	74.40	59.47	5.57	7.03	4.83

Notes:
(1) From MVE17G version 1.0c, average of light duty automobiles and light duty trucks, fleet average for calendar year 2000, San Franciso Air Basin.
(2) From MVE17G version 1.0c, medium duty trucks (Diesel), fleet average for calendar year 2000, San Franciso Air Basin.

	Emission Factors (1) NOx (lbs/1000 gals)	CO (lbs/1000 gals)	POC (lbs/1000 gals)	SOx (lbs/1000 gals)	PM10 (lbs/1000 gals)
Rail Hauling	595	59	22	38	15

Notes:
(1) NOx, CO, POC, and PM10 emission factors from EPA's "Technical Highlights - Emissions Factors for Locomotives", December 1997.
SOx emission factor from Booz-Allen & Hamilton "Locomotive Emission Study", prepared for CARB, January 1991.

Notes - Combustion Emission Calculations

(1) For Construction Equipment
For heavy Diesel construction equipment, emission factors based on equipment meeting EPA 1996 off-road Diesel standards and use of CARB low-sulfur fu
For trucks, depending on size of truck, emissions factors based on MVE17G version 1.0c for heavy-heavy duty or medium duty Diesel trucks, fleet average
calendar year 2000, San Francisco Air Basin.

(2) For Delivery Trucks
From MVE17G version 1.0c, heavy-heavy duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin.

(3) For Worker Travel
From MVE17G version 1.0c, average of light duty automobiles and light duty trucks, fleet average for calendar year 2000, San Francisco Air Basin.

(4) For Rail Deliveries
NOx, CO, POC, and PM10 emission factors from EPA's "Technical Highlights - Emissions Factors for Locomotives", December 1997.
SOx emission factor from Booz-Allen & Hamilton "Locomotive Emission Study", prepared for CARB, January 1991.

Table 8.1E-7
CONSTRUCTION EQUIPMENT USEAGE- RUSSELL CITY ENERGY CENTER

Construction Equipment	Use %	hrs / mo /mach.	Months After Notice to Proceed																				Annual Average Number of Units
			5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Crawler Crane- Greater than 300 ton	80	139	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.25
Crawler Crane- Greater than200 ton	75	130	0	0	0	0	0	0	1	2	3	3	3	3	3	2	2	2	1	0	0	0	1.25
Crane-Mobile 65 ton	70	121	0	0	0	0	0	1	1	1	2	2	2	2	2	2	1	1	1	1	1	0	1
Cranes -Mobile 45 ton	75	130	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0.6
Cranes - Mobile 35 ton	75	130	2	1	0	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1.25
Bulldozer D6H	70	121	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Bulldozer D4C	70	121	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Excavator- Trencher	80	139	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Excavator- Earth Scraper	80	139	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Excavator-Motor Grader	70	121	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0.45
Excavator- Backhoe/loader	75	130	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.8
Excavator - loader	70	121	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Vibratory Roller	70	121	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Portable Compaction roller	70	121	2	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.55
Truck- Water	65	113	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1
Loader/Forklift	65	113	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1.8
10/12 cubic yd Dump Truck	75	130	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Service Truck- 1 ton	65	113	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	0	0	1.35
Truck- Fuel/Lube	65	113	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	0	1.8
Concrete Pumper Truck	85	147	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.45
Tractor Truck 5th Wheel	70	121	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1.9
Trucks- Pickup 3/4 ton	75	130	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	4	2	1	4
Trucks- 3 ton	70	121	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1.65
Welders	85	147	1	1	2	2	2	2	4	5	9	11	13	13	13	9	9	9	4	4	2	0	5.75
Diesel Powered Welder	65	113	0	0	0	1	2	2	2	2	2	2	2	2	3	3	3	2	1	1	1	1	1.6
Light Plants	50	87	2	2	2	2	3	4	4	4	2	2	1	1	1	1	1	0	0	0	0	0	1.6
Portable Compaction- Vibratory Plate	70	121	1	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	1.25
Portable Compaction- Vibratory Ram	70	121	0	0	3	3	3	3	3	3	3	3	3	2	2	0	0	0	0	0	0	0	1.55
Articulating Boom Platforms	80	139	0	0	0	0	0	0	1	2	2	5	5	5	5	6	6	2	2	2	2	0	2.25
Pumps	50	87	5	5	5	5	5	4	4	4	4	4	4	3	3	3	2	2	1	1	0	0	3.2
Air Compressor 185 CFM	85	147	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	0	0	1.6
Air Compressor 750 CFM	85	147	1	1	1	1	1	1	2	2	3	3	4	4	4	4	3	3	3	3	1	0	2.25
Concrete Vibrators	50	87	0	0	4	10	10	10	8	8	4	4	2	2	2	0	0	0	0	0	0	0	3.2
Concrete Trowel Machine	50	87	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Fusion Welder	80	139	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3
Asphalt Paver	85	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.15
Asphalt Roller	85	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.15
Portable Power Generators	50	87	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	0	2.85
TOTAL			**51**	**46**	**48**	**55**	**55**	**56**	**60**	**65**	**64**	**68**	**68**	**65**	**65**	**54**	**51**	**44**	**35**	**32**	**18**	**6**	

RUSSELL CITY ENERGY CENTER
TRUCK DELIVERY OF EQUIPMENT AND MATERIALS
(Number of Deliveries)

	Month of Construction																				
Equipment and Material	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**Total**
Major Equipment																					
Heat Recovery Steam Generators (HRSG)							5	25	45	65	70	70	65	45	25	5					420
Combustion Turbine Generator (CTG)									5	15	35	50	50	35	15	10	5				220
Steam Turbine Generator (STG)										10	20	20	20	10	10						90
Mechanical Equipment								7	22	48	48	28	21								174
Electrical Equipment and Material		4	6	6	6	10	20	30	40	40	40	30	30	20	10	5	5				302
Piping, Supports and Valves		2	4	10	10	20	30	50	55	55	55	50	40	20	10	5	5				421
Concrete and Reinforcing Steel		5	4	72	207	234	284	208	124	65											1203
Miscellaneous Steel, Roofing and Siding					10	10	38	75	57	20	10	10									230
Administration/Warehouse Buildings							5	10	10	10	5	5	5								50
Construction Consumables	20	20	30	30	30	35	35	35	40	40	45	45	45	45	40	30	30	20	5	2	622
Office Supplies	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	2	2	2	2		93
Contractor Mobilization/Demobilization	20	20	10	5													10	10	15	15	105
Construction Equipment-delivery/pickup	12	5	9	6	4	16	24	29	17	2	3	16	2	14	16	13	14	7	5	2	216
TOTAL	57	66	73	134	272	330	446	474	420	375	336	329	283	194	131	70	71	39	27	19	4146

HEAVY EQUIPMENT DELIVERY FOR RUSSELL CITY ENERGY CENTER

(Number of Deliveries)

	Months After Notice-to-Proceed																							
Equipment	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**#**	**Total**
Heat Recovery Steam Generators (HRSG)								22	22															44
Combustion Turbine Generator (CTG)									3	3														6
Steam Turbine Generator (STG)											3													3
AuxilaryBoilers												1												1
Main Transformers										4														4
TOTAL								22	25	7	3	1												58

RUSSELL CITY ENERGY CENTER CONSTRUCTION STAFFING

	Months After Notice-to-Proceed																							
Discipline	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**#**	**24**
Insulation Workers	0	0	0	0	0	0	0	0	0	0	0	6	12	24	30	36	36	36	36	24	12	0	0	0
Boilermakers	0	0	0	8	16	24	36	45	48	48	48	48	48	48	45	40	30	16	8	4	2	0	0	0
Bricklayers/Masons	0	1	4	4	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0
Carpenters	2	12	24	36	36	36	36	30	20	20	20	20	20	20	20	20	20	20	16	8	2	0	0	0
Electricians	1	4	8	10	10	10	20	30	45	60	75	80	80	80	80	75	60	50	40	30	10	0	0	0
Ironworkers	0	4	16	30	30	30	35	40	45	45	35	30	24	16	12	8	8	8	8	4	0	0	0	0
Laborers	4	8	16	24	24	24	24	24	20	20	20	20	20	20	20	20	20	16	12	8	8	0	0	0
Millwrights	0	0	0	0	0	2	12	24	30	30	30	24	24	24	20	16	12	8	6	4	4	0	0	0
Operating Engineers	2	4	8	10	12	14	14	14	14	14	12	12	12	12	12	10	10	8	6	4	2	0	0	0
Painters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	0	0	0
Pipefitters	1	6	12	12	12	16	20	30	45	70	100	110	110	110	110	110	100	80	60	30	12	0	0	0
Sheetmetal Workers	0	0	0	0	0	0	0	0	0	0	0	4	12	24	36	36	36	36	36	36	24	0	0	0
Surveyors	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0				
Teamsters	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0
TOTAL MANUAL STAFF	13	42	91	137	147	163	204	244	274	314	347	361	369	385	388	378	339	283	233	157	81	0	0	0
TOTAL CONTRACTOR-STARTUP STAFF	6	12	18	24	30	36	39	42	46	46	47	51	55	57	57	57	54	48	42	32	24	18	#	6
TOTAL SITE STAFF	**19**	**54**	**109**	**161**	**177**	**199**	**243**	**286**	**320**	**360**	**394**	**412**	**424**	**442**	**445**	**435**	**393**	**331**	**275**	**189**	**105**	**18**	**#**	**6**

Table 8.1E-8

Construction Equipment Daily Exhaust Emissions (Month 5)
Russell City Energy Center

Equipment	Number of Units	Hrs/Day Per Unit	Gals/Hr Per Unit	Total Fuel Use (Gals/day)	Emission Factors (lbs/1000 gals)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10	Useage (%)
Crawler Crane- Greater than 300 ton	0	6.40	7.50	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	80
Crawler Crane- Greater than 200 ton	1	6.00	5.00	30.00	270.01	39.13	15.65	7.10	15.65	8.10	1.17	0.47	0.21	0.47	75
Crane - Mobile 65 ton	2	5.60	4.00	44.80	270.01	39.13	15.65	7.10	15.65	12.10	1.75	0.70	0.32	0.70	70
Cranes -Mobile 45 ton	2	6.00	4.00	48.00	270.01	39.13	15.65	7.10	15.65	12.96	1.88	0.75	0.34	0.75	75
Cranes - Mobile 35 ton	3	6.00	4.00	72.00	270.01	39.13	15.65	7.10	15.65	19.44	2.82	1.13	0.51	1.13	75
Bulldozer D6H	1	5.60	5.50	30.80	270.01	39.13	15.65	7.10	15.65	8.32	1.21	0.48	0.22	0.48	70
Bulldozer D4C	1	5.60	3.00	16.80	270.01	39.13	15.65	7.10	15.65	4.54	0.66	0.26	0.12	0.26	70
Excavator- Trencher	0	6.40	2.00	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	80
Excavator- Earth Scraper	3	6.40	9.00	172.80	270.01	39.13	15.65	7.10	15.65	46.66	6.76	2.70	1.23	2.70	80
Excavator-Motor Grader	1	5.60	5.00	28.00	270.01	39.13	15.65	7.10	15.65	7.56	1.10	0.44	0.20	0.44	70
Excavator- Backhoe/loader	3	6.00	2.50	45.00	270.01	39.13	15.65	7.10	15.65	12.15	1.76	0.70	0.32	0.70	75
Excavator - loader	1	5.60	2.50	14.00	270.01	39.13	15.65	7.10	15.65	3.78	0.55	0.22	0.10	0.22	70
Vibratory Roller	4	5.60	10.00	224.00	270.01	39.13	15.65	7.10	15.65	60.48	8.77	3.51	1.59	3.51	70
Portable Compaction roller	0	5.60	10.00	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	70
Truck- Water	1	5.20	3.13	16.28	170.68	106.79	15.33	7.10	9.59	2.78	1.74	0.25	0.12	0.16	65
Forklift	2	5.20	2.50	26.00	270.01	39.13	15.65	7.10	15.65	7.02	1.02	0.41	0.18	0.41	65
Dump Truck	2	6.00	3.13	37.56	170.68	106.79	15.33	7.10	9.59	6.41	4.01	0.58	0.27	0.36	75
Service Truck- 1 ton	5	5.20	1.56	40.56	74.40	59.47	5.57	7.10	4.83	3.02	2.41	0.23	0.29	0.20	65
Truck- Fuel/Lube	2	5.20	3.13	32.55	170.68	106.79	15.33	7.10	9.59	5.56	3.48	0.50	0.23	0.31	65
Concrete Pumper Truck	3	6.80	3.13	63.85	170.68	106.79	15.33	7.10	9.59	10.90	6.82	0.98	0.45	0.61	85
Tractor Truck 5th Wheel	2	5.60	3.13	35.06	270.01	39.13	15.65	7.10	15.65	9.47	1.37	0.55	0.25	0.55	70
Trucks- Pickup 3/4 ton	6	6.00	0.78	28.08	74.40	59.47	5.57	7.10	4.83	2.09	1.67	0.16	0.20	0.14	75
Trucks- 3 ton	1	5.60	1.56	8.74	74.40	59.47	5.57	7.10	4.83	0.65	0.52	0.05	0.06	0.04	70
Diesel Powered Welder	7	5.20	1.27	46.23	313.05	195.66	46.96	7.10	39.13	14.47	9.04	2.17	0.33	1.81	65
Light Plants	4	4.00	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80	50
Portable Compaction- Vibratory Plate	3	5.60	0.25	4.20	313.05	195.66	46.96	7.10	39.13	1.31	0.82	0.20	0.03	0.16	70
Portable Compaction- Vibratory Ram	5	5.60	0.25	7.00	313.05	195.66	46.96	7.10	39.13	2.19	1.37	0.33	0.05	0.27	70
Articulating Boom Platforms	7	6.40	0.25	11.20	313.05	195.66	46.96	7.10	39.13	3.51	2.19	0.53	0.08	0.44	80
Pumps	4	4.00	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80	50
Air Compressor 185 CFM	4	6.80	1.27	34.54	313.05	195.66	46.96	7.10	39.13	10.81	6.76	1.62	0.25	1.35	85
Air Compressor 750 CFM	4	6.80	1.27	34.54	313.05	195.66	46.96	7.10	39.13	10.81	6.76	1.62	0.25	1.35	85
Concrete Vibrators	0	4.00	0.25	0.00	313.05	195.66	46.96	7.10	39.13	0.00	0.00	0.00	0.00	0.00	50
Concrete Trowel Machine	0	4.00	1.27	0.00	313.05	195.66	46.96	7.10	39.13	0.00	0.00	0.00	0.00	0.00	50
Fusion Welder	0	6.40	1.27	0.00	313.05	195.66	46.96	7.10	39.13	0.00	0.00	0.00	0.00	0.00	80
Portable Power Generators	7	4.00	1.27	35.56	313.05	195.66	46.96	7.10	39.13	11.13	6.96	1.67	0.25	1.39	50
Total =										310.93	93.31	25.10	8.72	22.51	

Notes:
(1) See notes for combustion emissions.

Construction Equipment Daily Exhaust Emissions (Month 15)
Russell City Energy Center

Equipment	Number of Units	Hrs/Day Per Unit	Gals/Hr Per Unit	Total Fuel Use (Gals/day)	Emission Factors (lbs/1000 gals)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10	Useage (%)
Crawler Crane- Greater than 300 ton	1	6.40	7.50	48.00	270.01	39.13	15.65	7.10	15.65	12.96	1.88	0.75	0.34	0.75	80
Crawler Crane- Greater than 200 ton	3	6.00	5.00	90.00	270.01	39.13	15.65	7.10	15.65	24.30	3.52	1.41	0.64	1.41	75
Crane - Mobile 65 ton	2	5.60	4.00	44.80	270.01	39.13	15.65	7.10	15.65	12.10	1.75	0.70	0.32	0.70	70
Cranes - Mobile 45 ton	3	6.00	4.00	72.00	270.01	39.13	15.65	7.10	15.65	19.44	2.82	1.13	0.51	1.13	75
Cranes - Mobile 35 ton	3	6.00	4.00	72.00	270.01	39.13	15.65	7.10	15.65	19.44	2.82	1.13	0.51	1.13	75
Bulldozer D6H	0	5.60	5.50	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	70
Bulldozer D4C	0	5.60	3.00	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	70
Excavator- Trencher	0	6.40	2.00	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	80
Excavator- Earth Scraper	0	6.40	9.00	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	80
Excavator-Motor Grader	1	5.60	5.00	28.00	270.01	39.13	15.65	7.10	15.65	7.56	1.10	0.44	0.20	0.44	70
Excavator- Backhoe/loader	1	6.00	2.50	15.00	270.01	39.13	15.65	7.10	15.65	4.05	0.59	0.23	0.11	0.23	75
Excavator - loader	0	5.60	2.50	0.00	270.01	39.13	15.65	7.10	15.65	0.00	0.00	0.00	0.00	0.00	70
Vibratory Roller	1	5.60	10.00	56.00	270.01	39.13	15.65	7.10	15.65	15.12	2.19	0.88	0.40	0.88	70
Portable Compaction roller	1	5.60	10.00	56.00	270.01	39.13	15.65	7.10	15.65	15.12	2.19	0.88	0.40	0.88	70
Truck- Water	1	5.20	3.13	16.28	170.68	106.79	15.33	7.10	9.59	2.78	1.74	0.25	0.12	0.16	65
Forklift	2	5.20	2.50	26.00	270.01	39.13	15.65	7.10	15.65	7.02	1.02	0.41	0.18	0.41	65
Dump Truck	0	6.00	3.13	0.00	170.68	106.79	15.33	7.10	9.59	0.00	0.00	0.00	0.00	0.00	75
Service Truck- 1 ton	4	5.20	1.56	32.45	74.40	59.47	5.57	7.10	4.83	2.41	1.93	0.18	0.23	0.16	65
Truck- Fuel/Lube	2	5.20	3.13	32.55	170.68	106.79	15.33	7.10	9.59	5.56	3.48	0.50	0.23	0.31	65
Concrete Pumper Truck	2	6.80	3.13	42.57	170.68	106.79	15.33	7.10	9.59	7.27	4.55	0.65	0.30	0.41	85
Tractor Truck 5th Wheel	1	5.60	3.13	17.53	270.01	39.13	15.65	7.10	15.65	4.73	0.69	0.27	0.12	0.27	70
Trucks- Pickup 3/4 ton	6	6.00	0.78	28.08	74.40	59.47	5.57	7.10	4.83	2.09	1.67	0.16	0.20	0.14	75
Trucks- 3 ton	2	5.60	1.56	17.47	74.40	59.47	5.57	7.10	4.83	1.30	1.04	0.10	0.12	0.08	70
Diesel Powered Welder	5	5.20	1.27	33.02	313.05	195.66	46.96	7.10	39.13	10.34	6.46	1.55	0.23	1.29	65
Light Plants	9	4.00	1.27	45.72	313.05	195.66	46.96	7.10	39.13	14.31	8.95	2.15	0.32	1.79	50
Portable Compaction- Vibratory Plate	1	5.60	0.25	1.40	313.05	195.66	46.96	7.10	39.13	0.44	0.27	0.07	0.01	0.05	70
Portable Compaction- Vibratory Ram	1	5.60	0.25	1.40	313.05	195.66	46.96	7.10	39.13	0.44	0.27	0.07	0.01	0.05	70
Articulating Boom Platforms	18	6.40	0.25	28.80	313.05	195.66	46.96	7.10	39.13	9.02	5.63	1.35	0.20	1.13	80
Pumps	0	4.00	1.27	0.00	313.05	195.66	46.96	7.10	39.13	0.00	0.00	0.00	0.00	0.00	50
Air Compressor 185 CFM	4	6.80	1.27	34.54	313.05	195.66	46.96	7.10	39.13	10.81	6.76	1.62	0.25	1.35	85
Air Compressor 750 CFM	3	6.80	1.27	25.91	313.05	195.66	46.96	7.10	39.13	8.11	5.07	1.22	0.18	1.01	85
Concrete Vibrators	2	4.00	0.25	2.00	313.05	195.66	46.96	7.10	39.13	0.63	0.39	0.09	0.01	0.08	50
Concrete Trowel Machine	0	4.00	1.27	0.00	313.05	195.66	46.96	7.10	39.13	0.00	0.00	0.00	0.00	0.00	50
Fusion Welder	0	6.40	1.27	0.00	313.05	195.66	46.96	7.10	39.13	0.00	0.00	0.00	0.00	0.00	80
Portable Power Generators	8	4.00	1.27	40.64	313.05	195.66	46.96	7.10	39.13	12.72	7.95	1.91	0.29	1.59	50
Total =										230.06	76.71	20.08	6.45	17.83	

Notes:
(1) See notes for combustion emissions.

Construction Equipment Annual Exhaust Emissions
Russell City Energy Center

Equipment	Average Number of Units Per Year(1)	Average Operating Hrs/Day Per Unit	Gals/Hr Per Unit	Average Operating Days per Year	Total Fuel Use (Gals/yr)	Emission Factors (lbs/1000 gals)(2) NOx	CO	POC	SOx	PM10	Annual Emissions (tons/yr) NOx	CO	POC	SOx	PM10	Useage (%)
Crawler Crane- Greater than 300 ton	0.25	6.40	7.50	250.00	3000.00	270.01	39.13	15.65	7.10	15.65	0.41	0.06	0.02	0.01	0.02	80
Crawler Crane- Greater than 200 ton	1.25	6.00	5.00	250.00	9375.00	270.01	39.13	15.65	7.10	15.65	1.27	0.18	0.07	0.03	0.07	75
Crane - Mobile 65 ton	1.00	5.60	4.00	250.00	5600.00	270.01	39.13	15.65	7.10	15.65	0.76	0.11	0.04	0.02	0.04	70
Cranes -Mobile 45 ton	0.60	6.00	4.00	250.00	3600.00	270.01	39.13	15.65	7.10	15.65	0.49	0.07	0.03	0.01	0.03	75
Cranes - Mobile 35 ton	1.25	6.00	4.00	250.00	7500.00	270.01	39.13	15.65	7.10	15.65	1.01	0.15	0.06	0.03	0.06	75
Bulldozer D6H	0.20	5.60	5.50	250.00	1540.00	270.01	39.13	15.65	7.10	15.65	0.21	0.03	0.01	0.01	0.01	70
Bulldozer D4C	0.30	5.60	3.00	250.00	1260.00	270.01	39.13	15.65	7.10	15.65	0.17	0.02	0.01	0.00	0.01	70
Excavator- Trencher	0.30	6.40	2.00	250.00	960.00	270.01	39.13	15.65	7.10	15.65	0.13	0.02	0.01	0.00	0.01	80
Excavator- Earth Scraper	0.20	6.40	9.00	250.00	2880.00	270.01	39.13	15.65	7.10	15.65	0.39	0.06	0.02	0.01	0.02	80
Excavator-Motor Grader	0.45	5.60	5.00	250.00	3150.00	270.01	39.13	15.65	7.10	15.65	0.43	0.06	0.02	0.01	0.02	70
Excavator- Backhoe/loader	0.80	6.00	2.50	250.00	3000.00	270.01	39.13	15.65	7.10	15.65	0.41	0.06	0.02	0.01	0.02	75
Excavator - loader	0.30	5.60	2.50	250.00	1050.00	270.01	39.13	15.65	7.10	15.65	0.14	0.02	0.01	0.00	0.01	70
Vibratory Roller	0.50	5.60	10.00	250.00	7000.00	270.01	39.13	15.65	7.10	15.65	0.95	0.14	0.05	0.02	0.05	70
Portable Compaction roller	0.55	5.60	10.00	250.00	7700.00	270.01	39.13	15.65	7.10	15.65	1.04	0.15	0.06	0.03	0.06	70
Truck- Water	1.00	5.20	3.13	250.00	4069.00	170.68	106.79	15.33	7.10	9.59	0.35	0.22	0.03	0.01	0.02	65
Forklift	1.80	5.20	2.50	250.00	5850.00	270.01	39.13	15.65	7.10	15.65	0.79	0.11	0.05	0.02	0.05	65
Dump Truck	0.40	6.00	3.13	250.00	1878.00	170.68	106.79	15.33	7.10	9.59	0.16	0.10	0.01	0.01	0.01	75
Service Truck- 1 ton	1.35	5.20	1.56	250.00	2737.80	74.40	59.47	5.57	7.10	4.83	0.10	0.08	0.01	0.01	0.01	65
Truck- Fuel/Lube	1.80	5.20	3.13	250.00	7324.20	170.68	106.79	15.33	7.10	9.59	0.63	0.39	0.06	0.03	0.04	65
Concrete Pumper Truck	0.45	6.80	3.13	250.00	2394.45	170.68	106.79	15.33	7.10	9.59	0.20	0.13	0.02	0.01	0.01	85
Tractor Truck 5th Wheel	1.90	5.60	3.13	250.00	8325.80	270.01	39.13	15.65	7.10	15.65	1.12	0.16	0.07	0.03	0.07	70
Trucks- Pickup 3/4 ton	4.00	6.00	0.78	250.00	4680.00	74.40	59.47	5.57	7.10	4.83	0.17	0.14	0.01	0.02	0.01	75
Trucks- 3 ton	1.65	5.60	1.56	250.00	3603.60	74.40	59.47	5.57	7.10	4.83	0.13	0.11	0.01	0.01	0.01	70
Diesel Powered Welder	1.60	5.20	1.27	250.00	2641.60	313.05	195.66	46.96	7.10	39.13	0.41	0.26	0.06	0.01	0.05	65
Light Plants	1.60	4.00	1.27	250.00	2032.00	313.05	195.66	46.96	7.10	39.13	0.32	0.20	0.05	0.01	0.04	50
Portable Compaction- Vibratory Plate	1.25	5.60	0.25	250.00	437.50	313.05	195.66	46.96	7.10	39.13	0.07	0.04	0.01	0.00	0.01	70
Portable Compaction- Vibratory Ram	1.55	5.60	0.25	250.00	542.50	313.05	195.66	46.96	7.10	39.13	0.08	0.05	0.01	0.00	0.01	70
Articulating Boom Platforms	2.25	6.40	0.25	250.00	900.00	313.05	195.66	46.96	7.10	39.13	0.14	0.09	0.02	0.00	0.02	80
Pumps	3.20	4.00	1.27	250.00	4064.00	313.05	195.66	46.96	7.10	39.13	0.64	0.40	0.10	0.01	0.08	50
Air Compressor 185 CFM	1.60	6.80	1.27	250.00	3454.40	313.05	195.66	46.96	7.10	39.13	0.54	0.34	0.08	0.01	0.07	85
Air Compressor 750 CFM	2.25	6.80	1.27	250.00	4857.75	313.05	195.66	46.96	7.10	39.13	0.76	0.48	0.11	0.02	0.10	85
Concrete Vibrators	3.20	4.00	0.25	250.00	800.00	313.05	195.66	46.96	7.10	39.13	0.13	0.08	0.02	0.00	0.02	50
Concrete Trowel Machine	0.30	4.00	1.27	250.00	381.00	313.05	195.66	46.96	7.10	39.13	0.06	0.04	0.01	0.00	0.01	50
Fusion Welder	0.30	6.40	1.27	250.00	609.60	313.05	195.66	46.96	7.10	39.13	0.10	0.06	0.01	0.00	0.01	80
Portable Power Generators	2.85	4.00	1.27	250.00	3619.50	313.05	195.66	46.96	7.10	39.13	0.57	0.35	0.08	0.01	0.07	50
Total =											15.25	4.95	1.28	0.44	1.14	

Notes:
(1) Based on average number of units operating over 20-month construction period.
(2) See notes on combustion emissions.

Delivery Truck Daily Emissions (Month 5)
Russell City Energy Center

Number of Deliveries Per Day(1)	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Day	Emission Factors (lbs/vmt)(2)					Daily Emissions (lbs/day)				
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
10	60	600	0.0280	0.0175	0.0025	0.0012	0.0016	16.81	10.52	1.51	0.70	0.94

Notes:
(1) Based on average number of truck deliveries during this month and a scaling factor of 5 to account for the maximum number of deliveries expected on a single day.
(2) See notes for combustion emissions.

Delivery Truck Daily Emissions (Month 15)
Russell City Energy Center

Number of Deliveries Per Day(1)	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Day	Emission Factors (lbs/vmt)(2)					Daily Emissions (lbs/day)				
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
25	60	1500	0.0280	0.0175	0.0025	0.0012	0.0016	42.03	26.29	3.77	1.74	2.36

Notes:
(1) Based on average number of truck deliveries during this month and a scaling factor of 1.5 to account for the maximum number of deliveries expected on a single day.
(2) See notes for combustion emissions.

Delivery Truck Annual Emissions
Russell City Energy Center

Average Number of Deliveries Per Year(1)	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Year	Emission Factors (lbs/vmt)(2)					Annual Emissions (tons/yr)				
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
2369.14	60	142148.57	0.0280	0.0175	0.0025	0.0012	0.0016	1.99	1.25	0.18	0.08	0.11

Notes:
(1) Based on total of 4,146 truck deliveries over the 21-month construction period.
(2) See notes for combustion emissions.

Rail Delivery Daily Emissions (Month 15)
Russell City Energy Center

Inbound						Outbound					
Number of Railcars per day	Loaded Weight of Railcar (tons)	Total Gross Weight of Railcars (tons)	One-Way Haul Distance(1) (miles)	Unit Fuel Use Factor(2) (gal/KGTM)	Fuel Use (gals)	Number of Railcars per day	Tare Weight of Railcar (tons)	Total Gross Weight of Railcars (tons)	One-Way Haul Distance(1) (miles)	Unit Fuel Use Factor(2) (gal/KGTM)	Fuel Use (gals)
4	221.5	886	62	1.37	75	4	34	136	62	1.37	12

Total Fuel Use (gals)	Emission Factors (lbs/1000 gals)(3)					Daily Emissions (lbs/day)				
	NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
87	594.71	58.59	22.03	38.00	14.76	51.63	5.09	1.91	3.30	1.28

Notes:
(1) Distance within BAAQMD for Union Pacific Railroad line through Altamont.
(2) Based on Union Pacific Railroad system wide average fuel use factor.
(3) See notes for combustion emissions.

Rail Delivery Annual Emissions
Russell City Energy Center

Average Number of Rail Deliveries per Year(1)	Emissions per Delivery (lbs/rail delivery)					Annual Emissions (tons/yr)				
	NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
34.8	51.63	5.09	1.91	3.30	1.28	0.90	0.09	0.03	0.06	0.02

Notes:
(1) Based on total of 58 rail deliveries over the 20-month construction period.

Worker Travel Daily Emissions (Month 5)
Russell City Energy Center

Number of Workers Per Day(1)	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Vehicle Miles Traveled Per Day (Miles)	Emission Factors (lbs/vmt)(2)					Daily Emissions (lbs/day)				
					NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
177	1.3	136	60	8169	0.0029	0.0343	0.0027	0.0000	0.0001	23.47	280.57	22.40	0.02	0.48

Notes:
(1) Based expected number of construction workers during this phase of construction.
(2) See notes for combustion emissions.

Worker Travel Daily Emissions (Month 15)
Russell City Energy Center

Number of Workers Per Day(1)	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Vehicle Miles Traveled Per Day (Miles)	Emission Factors (lbs/vmt)(2)					Daily Emissions (lbs/day)				
					NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
445	1.3	342	60	20538	0.0029	0.0343	0.0027	0.0000	0.0001	59.00	705.38	56.33	0.04	1.20

Notes:
(1) Based expected number of construction workers during this phase of construction.
(2) See notes for combustion emissions.

Worker Travel Annual Emissions
Russell City Energy Center

Average Number of Workers Per Day(1)	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Days per Year	Vehicle Miles Traveled Per Year	Emission Factors (lbs/vmt)(2)					Annual Emissions (tons/yr)				
						NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
290.4	1.3	223	60	250	3,350,769	0.0029	0.0343	0.0027	0.0000	0.0001	4.81	57.54	4.59	0.00	0.10

Notes:
(1) Based on total of 5807 workers over the 20-month construction period.
(2) See notes for combustion emissions.

Table 8.1E-9
Russell City Energy Center (Month 5)

Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM10 Emissions (lbs/day)
Bulldozer D6H	1	5.6	5.6	hours	0.3476		1.95
Bulldozer D4C	1	5.6	5.6	hours	0.3476		1.95
Excavator- Trencher Excavation							
Excavator- Earth Scraper Excavation	3	6.4	19.2	hours	0.3476		6.67
Excavator- Earth Scraper Unpaved Road Trave	3	4.9	14.8	vmt	0.1983	66%	0.99
Excavator-Motor Grader	1	16.8	16.8	vmt	0.2754		4.63
Excavator- Backhoe Excavation							
Excavator - Loader Excavation	1	480.0	480.0	tons	0.0001		0.05
Excavator - Loader Unpaved Road Travel	1	3.7	3.7	vmt	0.1012	66%	0.13
Water Truck Unpaved Road Travel	1	13.0	13.0	vmt	0.1136	66%	0.50
Forklift Unpaved Road Travel	1	10.4	10.4	vmt	0.0724	66%	0.25
Dump Truck Unpaved Road Travel	2	10.1	20.1	vmt	0.1186	66%	0.81
Dump Truck Unloading	2	1,371.5	2,743.0	tons	0.0001		0.26
Service Truck Unpaved Road Travel							
Fuel/Lube Truck Unpaved Road Travel	1	3.1	3.1	vmt	0.0881	66%	0.09
Concrete Pumper Truck Unpaved Road Travel							
Tractor Truck 5th Wheel Unpaved Road Travel							
Pickup Truck Unpaved Road Travel	2	15.4	30.9	vmt	0.0447	66%	0.47
3 ton Truck Unpaved Road Travel	1	7.7	7.7	vmt	0.0600	66%	0.16
Windblown Dust (active construction area)	N/A	612,763.0	612,763.0	sq.ft.	0.000006	66%	1.24
Worker Paved Road Travel	177	0.5	87.2	vmt	0.0005		0.04
Worker Unpaved Road Travel	177	0.2	27.3	vmt	0.0447	66%	0.41
Delivery Truck Paved Road Travel	10	0.5	4.9	vmt	0.0185		0.09
Delivery Truck Unpaved Road Travel	10	0.2	1.5	vmt	0.1186	66%	0.06
Total =							20.74

Notes:
(1) See notes for fugitive dust emission calculations.

Daily Fugitive Dust Emissions (Month 15)
Russell City Energy Center

Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM10 Emissions (lbs/day)
Bulldozer D6H							
Bulldozer D4C							
Excavator- Trencher Excavation							
Excavator- Earth Scraper Excavation							
Excavator- Earth Scraper Unpaved Road Travel							
Excavator-Motor Grader							
Excavator- Backhoe Excavation	1	398.4	398.4	cu. yds.	0.0015		0.60
Excavator - Loader Excavation							
Excavator - Loader Unpaved Road Travel							
Water Truck Unpaved Road Travel	1	13.0	13.0	vmt	0.1136	66%	0.50
Forklift Unpaved Road Travel	1	10.4	10.4	vmt	0.0724	66%	0.25
Dump Truck Unpaved Road Travel							
Dump Truck Unloading							
Service Truck Unpaved Road Travel	1	7.7	7.7	vmt	0.0600	66%	0.16
Fuel/Lube Truck Unpaved Road Travel	1	3.1	3.1	vmt	0.0881	66%	0.09
Concrete Pumper Truck Unpaved Road Travel							
Tractor Truck 5th Wheel Unpaved Road Travel	1	7.7	7.7	vmt	0.0724	66%	0.19
Pickup Truck Unpaved Road Travel	4	15.4	61.7	vmt	0.0447	66%	0.93
3 Ton Truck Unpaved Road Travel	2	7.7	15.4	vmt	0.0600	66%	0.31
Windblown Dust (active construction area)	N/A	612,763.0	612,763.0	sq.ft.	0.000006	66%	1.24
Worker Paved Road Travel	445	0.5	219.1	vmt	0.0005		0.10
Worker Unpaved Road Travel	445	0.2	68.7	vmt	0.0447	66%	1.04
Delivery Truck Paved Road Travel	25	0.5	12.3	vmt	0.0185		0.23
Delivery Truck Unpaved Road Travel	25	0.2	3.9	vmt	0.1186	66%	0.15
Total =							5.80

Notes:
(1) See notes for fugitive dust emission calculations.

Annual Fugitive Dust Emissions
Russell City Energy Center

Activity	Average Daily PM10 Emissions(1) (lbs/day)	Days per Year	Annual PM10 Emissions (tons/yr)
Construction Activities	12.03	250	1.50
Windblown Dust	1.24	365	0.23
Total =			1.73

Notes:
(1) Based on average of daily emissions during Months 5 and 15.

Table 8.1E-10. Daily construction emissions, Russell City Energy Center.

Daily Construction Emissions (Month 5)					
Daily Emissions (lbs/day)					
	NOx	**CO**	**POC**	**SOx**	**PM10**
Onsite					
Construction Equipment	310.93	93.31	25.10	8.72	22.51
Fugitive Dust					20.74
Subtotal =	310.93	93.31	25.10	8.72	43.25
Offsite					
Worker Travel	23.47	280.57	22.40	0.02	0.48
Truck Deliveries	16.81	10.52	1.51	0.70	0.94
Rail Deliveries	0.00	0.00	0.00	0.00	0.00
Subtotal =	40.28	291.08	23.91	0.71	1.42
Total =	351.21	384.39	49.01	9.43	44.67
Daily Construction Emissions (Month 15)					
Daily Emissions (lbs/day)					
	NOx	**CO**	**POC**	**SOx**	**PM10**
Onsite					
Construction Equipment	230.06	76.71	20.08	6.45	17.83
Fugitive Dust					5.80
Subtotal =	230.06	76.71	20.08	6.45	23.63
Offsite					
Worker Travel	59.00	705.38	56.33	0.04	1.20
Truck Deliveries	42.03	26.29	3.77	1.74	2.36
Rail Deliveries	51.63	5.09	1.91	3.30	1.28
Subtotal =	152.66	736.76	62.01	5.07	4.84
Total =	382.72	813.47	82.09	11.52	28.47
Annual Construction Emissions					
Annual Emissions (tons/yr)					
	NOx	**CO**	**POC**	**SOx**	**PM10**
Onsite					
Construction Equipment	15.25	4.95	1.28	0.44	1.14
Fugitive Dust					1.73
Subtotal =	15.25	4.95	1.28	0.44	2.87
Offsite					
Worker Travel	4.81	57.54	4.59	0.00	0.10
Truck Deliveries	1.99	1.25	0.18	0.08	0.11
Rail Deliveries	0.90	0.09	0.03	0.06	0.02
Subtotal =	7.70	58.87	4.81	0.14	0.23
Total =	22.95	63.82	6.09	0.58	3.10

Table 8.1E-11	gals/hr	% Usage	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Crawler Crane- Greater than 300 ton	7.50	80								1	1	1	1	1								
Crawler Crane- Greater than 200 ton	5.00	75								1	2	3	3	3	3	2	2	2	1			
Crane - Mobile 65 ton	4.00	70						1	1	1	2	2	2	2	2	2	1	1	1	1	1	
Cranes -Mobile 45 ton	4.00	75								1	1	1	1	1	1	1	1	1				
Cranes - Mobile 35 ton	4.00	75				1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1
Bulldozer D6H	5.50	70	1	1	1																	
Bulldozer D4C	3.00	70	1	1	1	1																
Excavator- Trencher	2.00	80			1	1	1	1	1	1												
Excavator- Earth Scraper	9.00	80	3																			
Excavator-Motor Grader	5.00	70	1	1	1	1	1												1	1		
Excavator- Backhoe/loader	2.50	75			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Excavator - loader	2.50	70	1	1	1	1																
Vibratory Roller	10.00	70	1	1	1	1	1	1	1	1												
Portable Compaction roller	10.00	70				1	1	1	1	1	1	1	1									
Truck- Water	3.13	65	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Forklift	2.50	65	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dump Truck	3.13	75	2	2	2																	
Service Truck- 1 ton	1.56	65								1	1	1	1	1	1	1	1	1				
Truck- Fuel/Lube	3.13	65	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Concrete Pumper Truck		85			1	1	1	1	1													
Tractor Truck 5th Wheel	3.13	70			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Trucks- Pickup 3/4 ton	0.78	75	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	2	1
Trucks- 3 ton	1.56	70	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
		85						1	4	4	8	10	12	12	12	8	8	8	4	4	2	
Diesel Powered Welder	1.27	65			1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1
Light Plants	1.27	50	2	2	2	2	2	2	2	2												
Portable Compaction- Vibratory Plate	0.25	70			2	2	2	2	2	2	2	2	2	2	2							
Portable Compaction- Vibratory Ram	0.25	70			2	2	2	2	2	2	2	2	2	2	2							
Articulating Boom Platforms	0.25	80							1	2	2	5	5	5	5	6	6	2	2	2	2	
Pumps	0.25	50	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1		
Air Compressor 185 CFM	1.27	85	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Air Compressor 750 CFM	1.27	85							1	1	2	2	3	3	3	3	2	2	2	2		
Concrete Vibrators	0.25	50			4	10	10	10	8	8	4	4	2	2	2							
Concrete Trowel Machine	1.27	50			1	1	1	1	1	1												
Fusion Welder	1.27	80				1	1	1	1	1	1											
Asphalt Paver	10.00	85																		1	1	
Asphalt Roller	10.00	85																		1	1	
Portable Power Generators	1.27	50	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1				

RUSSELL CITY ENERGY CENTER-FUGITVE DUST AND COMBUSTION EMISSIONS RANKING

	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	6.00	6.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.75	7.50	11.25	11.25	11.25	11.25	7.50	7.50	7.50	3.75	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	2.80	2.80	2.80	5.60	5.60	5.60	5.60	5.60	5.60	2.80	2.80	2.80	2.80	2.80	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	3.00	3.00	3.00	3.00	3.00	6.00	6.00	6.00	6.00	6.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	3.85	3.85	3.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.10	2.10	2.10	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	1.60	1.60	1.60	1.60	1.60	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	21.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3.50	3.50	3.50	3.50	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	3.50	0.00	0.00
	0.00	0.00	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	0.00	0.00
	1.75	1.75	1.75	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	0.00	0.00
	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
	4.70	4.70	4.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	0.00	0.00	0.00	0.00
	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19
	1.17	1.17	1.17	1.17	1.17	1.17	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	1.17	0.59
	1.09	1.09	1.09	1.09	1.09	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	1.09	1.09
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.83	0.83	0.83	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	0.83	0.83	0.83	0.83
	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.40	0.40	1.00	1.00	1.00	1.00	1.20	1.20	0.40	0.40	0.40	0.40	0.00
	0.38	0.38	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.13	0.13	0.00	0.00
	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	1.08	1.08	2.16	2.16	3.24	3.24	3.24	3.24	2.16	2.16	2.16	2.16	0.00	0.00
	0.00	0.00	0.50	1.25	1.25	1.25	1.00	1.00	0.50	0.50	0.25	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.64	0.64	0.64	0.64	0.64	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	1.02	1.02	1.02	1.02	1.02	1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.50	8.50	0.00
	1.27	1.27	1.27	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.00	0.00	0.00	0.00
Total =	**56.45**	34.85	43.05	45.63	41.78	43.00	45.20	59.16	58.79	62.12	**62.95**	55.95	49.95	42.45	38.57	37.77	31.92	43.14	30.10	9.32
	(Maximum Dust Generating Equipment)										(Maximum Onsite Combustion)									

Russell City Energy Center
Short Term Impacts (24 hours and less)

Table 8.1E-12. Long-term impacts (annual).

	Month 15 NOx	Month 15 CO	Month 15 POC	Month 15 SOx	Month 5 PM10
Combustion (lbs/day)	230.06	76.71	20.08	6.45	22.51
Combustion (hrs/day)	8	8	8	8	8
Combustion (lbs/hr)	28.76	9.59	2.51	0.81	2.81
Combustion (g/sec)	3.63	1.21	0.32	0.10	0.35
Construction Dust (lbs/day)					19.50
Construction Dust (hrs/day)					8
Construction Dust (lbs/hr)					2.44
Construction Dust (g/sec)					0.31
Windblown Dust (lbs/day)					1.24
Windblown Dust (hrs/day)					24
Windblown Dust (lbs/hr)					0.05
Windblown Dust (g/sec)					0.01

	NOx	CO	POC	SOx	PM10
Combustion (tons/yr)	15.25	4.95	1.28	0.44	1.14
Combustion (days/yr)	250	250	250	250	250
Combustion (hrs/day)	8	8	8	8	8
Combustion (lbs/hr)	15.25	4.95	1.28	0.44	1.14
Combustion (g/sec)	1.92	0.62	0.16	0.05	0.14
Construction Dust (tons/yr)					1.50
Construction Dust (days/yr)					250
Construction Dust (hrs/day)					8
Construction Dust (lbs/hr)					1.50
Construction Dust (g/sec)					0.19
Windblown Dust (tons/yr)					0.23
Windblown Dust (days/yr)					365
Windblown Dust (hrs/day)					24
Windblown Dust (lbs/hr)					0.05
Windblown Dust (g/sec)					0.01

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Appendix 8.1-F
Evaluation of Best Available Control Technology

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APPENDIX 8.1F
EVALUATION OF BEST AVAILABLE CONTROL TECHNOLOGY

To evaluate BACT for the proposed turbine, the guideline for large gas turbines (heat input rating greater than 23 MMBtu/hr) in the BAAQMD BACT/TBACT Workbook was reviewed. The relevant BACT determinations for this analysis are shown in Table 8.1F-1.

Table 8.1F-1. BAAQMD BACT guideline for large gas turbines.

Pollutant	BACT	Typical Technology
Nitrogen Oxides	1. <5 ppm dry @ 15% O_2	1. SCR + Combustion Modifications
	2. 5 ppm dry @ 15% O_2	2. SCR + Combustion Modifications
Sulfur Dioxide	1. Natural gas fuel	1. Fuel selection
Carbon Monoxide	1. 10 ppm dry @ 15% O_2	1. Catalytic oxidation
	2. 10 ppm dry @ 15% O_2	2. Catalytic oxidation
POC	1. >50% reduction by weight	1. Catalytic oxidation
	2. 50% reduction by weight	2. Catalytic oxidation
PM_{10}	1. Natural gas fuel	1. Fuel selection

1. Technologically feasible and cost effective
2. Achieved in practice

The USEPA RACT-BACT-LAER Clearinghouse (RBLC) was also consulted to review recent USEPA BACT decisions for gas-fired gas turbines. These recent BACT decisions are summarized in Table 8.1F-2. NO_x levels shown in these BACT determinations are very high, although USEPA has recently stated that the SCONOx technology has demonstrated that 2.5 ppm is achievable in practice. CO levels in this listing are also relatively high, and do not indicate that oxidation catalysts have been considered BACT for CO or POCs.

Additionally, the ARB's BACT Clearinghouse Database was reviewed for recent BACT decisions regarding large gas turbine projects in California. Relevant BACT decisions are summarized in Table 8.1F-3. NO_x levels shown in these determinations are generally around 5 ppm. None of these recent BACT decisions include a determination for CO, and the determinations for POC include extremely low catalyst destruction efficiencies (5 to 10 percent).

Finally, EPA Region XI has recently published a series of BACT determinations for gas turbine based power plant facilities. These determinations can be found in the Federal Register (66 FR 19480, April 16, 2001). These determinations are summarized in Table 8.1F-4.

RCEC proposes to use dry low-NO_x combustors with selective catalytic reduction that will achieve a NO_x exhaust concentration of 2.0 ppmv or less (annual average) and 2.5 ppm short term average, and a CO exhaust concentrations of 6 ppmv or less. The turbines will be fueled with natural gas to minimize SO_2 and PM_{10} emissions. These pollutant levels will achieve emission levels consistent with the BAAQMD, CARB, and EPA Region XI BACT guidelines.

Table 8.1F-2. Gas Turbine BACT Determinations for USEPA RBLC Clearinghouse.

Facility/Location	Date Permit Issued	Equipment/Rating	NO_x Limit/Control Technology	CO Limit/Control Technology
Alabama Power Company McIntosh, AL	7/10/97	100 MW combustion turbine w/duct burner	15 ppm (dry low-NO_x burners)	N/A
Lordsburg L.P. Lordsburg, NM	6/18/97	100 MW combustion turbine	15 ppm (dry low-NO_x technology)	50 ppm (dry low-NO_x technology)
Mead Coated Board, Inc. Phoenix City, AL	3/12/97	25 MW combustion turbine w/fired HRSG	25 ppm (dry low-NO_x combustor)	28 ppm (proper design and good combustion practices)
Northern California Power Agency Lodi, CA	10/02/97	GE Frame 5 gas turbine	25 ppm	N/A
Portside Energy Corp. Portage, IN	5/13/96	63 MW gas turbine w/unfired HRSG	N/A	10 ppm (good combustion)
Southwestern Public Service Hobbs, NM	2/15/97	gas turbine	15 ppm w/o power augmentation 25 ppm w/augmentation	good combustion practices

Table 8.1F-3. Summary of BACT determinations from ARB BACT Clearinghouse

Facility/District	Permit No.	Equipment/Rating	NO_x Limit/Control Technology	VOC/HC Limit/Control Technology
Sacramento Cogeneration Authority Sacramento Metropolitan AQMD	A330-849-98 A330-850-98 A330-851-98	GE LM6000 combined cycle gas turbine w/supplemental firing (42 MW each)	5 ppm (dry low-NO_x combustion and SCR)	oxidation catalyst (10% destruction efficiency)
Sacramento Power Authority Sacramento Metropolitan AQMD	A330-852-98	Siemens V84.2 combined cycle gas turbine w/supplemental firing (103 MW)	3 ppm (water injection and SCR)	oxidation catalyst (5% destruction efficiency)
Carson Energy Sacramento Metropolitan AQMD	A330-854-98	GE LM6000 combined cycle gas turbine w/supplemental firing (42 MW)	5 ppm (water injection and SCR)	oxidation catalyst (10% destruction efficiency)

Table 8.1F-3. Summary of BACT determinations from ARB BACT Clearinghouse

SEPCO	A330-855-98	GE Frame 7EA gas turbine w/supplemental firing (82 MW)	5 ppm (dry low-NO_x combustion and SCR)[a]	oxidation catalyst (5% destruction efficiency)

[a] District indicates that applicant proposed 2.6 ppm to lower offset liability.

Table 8.1F-4. Gas Turbine BACT determinations per EPA Region XI (66 FR 19480, 4-16-01).

Facility/Location	Decision Date	Rating/Fuel	NO_x Limit/Control Technology	CO Limit/Control Technology
Elk Hills Power LLC California	2/5/01	500 MW, Natural Gas	2.5 ppm (dry low-NO_x burners w/ SCR or SCONOX)	4 ppm w/Catalytic Oxidation and Good Combustion Practices
Pastoria Energy Facility California	2/12/01	750 MW, Natural Gas	2.5 ppm (dry low-NO_x technology w/SCR or Xonon Catalyst)	6 ppm w/Catalytic Oxidation and Good Combustion Practices
Blythe Energy Project LLC California	3/5/01	520 MW, Natural Gas	2.5 ppm (dry low-NO_x combustor w/SCR)	5 ppm (Proper Design and Good Combustion Practices)

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Appendix 8.1-G
Offset Listing

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APPENDIX 8.1-G OFFSET LISTING

The Calpine/Bechtel Joint Development has purchased sufficient emission reduction credits to offset project emissions and has dedicated those offsets to the Russell City Energy Center project. Because the assignment of offset credits is proprietary information, proof that Calpine/Bechtel has obtained these offset credits has been filed under separate cover, with a request for confidentiality.

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Table 8.1G-1. BAAQMD Emission Bank Status Emission Reduction Credits Available, (tons/year) March 15, 2001.

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
11	Hewlett-Packard Co; Printed Circuit Divsn						159.5	
16	Hunt-Wesson Foods; Inc	1.0		21.0		1.8		
17	Allied Corporation				182.9			
18	National Can Corporation		31.1					
28	Carnation Company	3.7						
29	Stauffer Chemical Company	0.2		1.2		0.2		
36	United Airlines; Maintenance Operations Ctr						1.8	
37	Morton International Inc			0.4		0.4		
38	FMC Corporation						53.7	
39	FMC Corporation		5.8					
40	Stauffer Chemical Co; San Jose	0.7	0.7	28.5		9.1	0.4	
47	United Airlines; Maintenance Operations Ctr		6.4					
49	Owens Corning			22.3				
51	Continental Can Company		71.0					
53	A O Smith Corporation		10.8					
57	Tosco Refining Company	3.6				4.9		
59	Continental Can Company		4.5					
68	FMC Corporation		0.4					
69	FMC Corporation		1.0					
70	Chevron Products Company		29.3					
96	U.S. Navy		1.018					
110	Myers Container Corporation		20.03				7.39	
112	Owens Corning	1.3	14.4	0.22		0.15		0.7
117	Chevron Products Company	0.5	20.7	10.6	0.1	2.1		
118	Chevron Products Company	0.25	9.63	5.04	0.05	1.0		
131	Tosco Refining Company		0.38					
132	U.S. Navy			0.39		0.34		
135	Gallagher & Burk; Inc							6.23
141	Tosco Refining Company		0.373					
142	Tosco Refining Company		0.34					
149	Varian Oncology Systems						12.25	
151	Lawrence Livermore National Laboratory						1.66	
155	U.S. Navy		0.065	1.878	10.66	0.939		0.375
160	National Semiconductor Corporation		1.747					
168	Martinez Refining Company		11.62					
172	Chevron Products Company							0.384
173	Varian Oncology Systems		0.235				4.469	

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
177	Gilroy Foods; Inc		0.338					
180	United Technologies Corporation		0.076				4.397	
181	Advanced Micro Devices Inc		10.88					
182	Chevron Research and Technology Co	0.07	0.039	0.7	0.008	0.003		
183	Chevron Research and Technology Co		0.31					
194	RMC Lonestar	0.73						0.44
195	RMC Lonestar	0.4						0.24
205	U.S. Navy						6.034	
207	Owens Corning	17.9	23.3	9.5		3.9		
215	Monsanto Company							0.067
218	New United Motor Manufacturing; Inc		78.83					
223	Chevron Products Company		60.122	20.674	1.047	9.129		5.37
227	HMT Technology Corporation		0.2				2.24	
232	American Lithographers Inc.		6.164	0.095		0.1		
239	IBM Corporation						24.37	
241	Dexter Hysol Aerospace; Inc		4.7					
243	United Can Company		0.002					
248	Chevron Products Company		3.56					
251	Triangle Wire & Cable; Inc			0.594				
252	General Electric Co		0.003					
259	Burke Industries; Inc		3.026				24.85	
262	Lawrence Livermore National Laboratory						1.05	
265	Solectron Corporation		3.71				3.35	
266	Santa Rosa Memorial Hospital			0.97				0.3
270	Stanford University			17.3				
280	California Canners & Growers	0.8				6.0		
287	Philips Semiconductor		2.61					
288	Philips Semiconductor		9.039				0.32	
302	Chevron Products Company		7.948					
310	Trumbull Asphalt Company		8.9	0.4	25.9	24.2		4.2
312	North American Refractories Co		0.017	1.026				
315	Chevron Research and Technology Co		0.747					
316	United Airlines; Maintenance Operations Ctr		0.5					
325	New United Motor Manufacturing; Inc		20.79					
328	Crockett Cogeneration; A Cal Ltd Partnership		11.05	0.84		0.2		
329	Advanced Micro Devices Inc		9.615					
332	Rexam Beverage Can Company		15.55					
333	U.S. Navy		13.49					

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
337	American Lithographers Inc.		4.23					
341	Pacific Lithograph Company		5.862	1.3				
344	Chevron Products Company		8.992					
345	Chevron Products Company		94.6					
350	Hewlett-Packard Company		3.29					
351	U.S. Navy		22.786				54.6	
353	Chevron Products Company		8.55					
360	Gallagher & Burk; Inc		0.2	0.17	0.17	0.53		0.18
366	Amdahl Corporation		0.046				7.528	
367	Amdahl Corporation		0.977				5.12	
368	Amdahl Corporation		0.143				2.26	
370	Pacific Refining Company			1.0				
371	Zanker Road Resource Management;Ltd		0.65	10.7	0.77			
372	Pacific Refining Company		0.44	0.224				
376	George Rice & Sons		45.0					
381	Laidlaw Environmental Services (San Jose); Inc		1.4				1.46	
382	California Oils Corporation		0.195					
385	Quantum Corporation						3.2	
387	Martinez Refining Company		0.096					
392	Richard Mariani	0.6				3.3		
393	Anacomp Inc		7.13					
408	Rexam Beverage Can Company		36.526					
410	IBM Corporation						13.98	
412	Amdahl Corporation		0.13				2.03	
414	Intel Corporation		13.92				2.14	
415	Martinez Refining Company				15.1			8.92
419	Phoenix Iron Works							1.197
423	Ciba Corning Diagnostics Corp		0.53					
424	Chevron Products Company		1.608					
425	Beckman Coulter						3.11	
428	Martinez Refining Company		6.288					
434	Genentech; Inc		0.384	6.646		7.798		2.66
443	Lawrence Livermore National Laboratory						0.121	
445	Stanford University		3.79	14.84				
446	Red Wing Co /California Div	0.07	0.052	0.419	0.002	0.083		0.091
452	Solectron Corporation		2.674					
462	Intel Corporation			30.0				
465	Ball Metal Beverage Container Corporation			0.275				

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
471	Container Management Service-LLC		10.787	0.559		0.11	4.85	0.028
475	U.S. Navy		0.3	0.13		0.42		0.3
477	U.S. Navy		7.911					
478	Central Contra Costa Sanitary District		0.581	2.243		30.937		
483	The Glidden Company		4.7					
486	U.S. Navy		3.44	1.21	1.2	2.71		0.98
487	Chevron Chemical Company	3.504		3.028				5.254
489	Chevron Products Company			71.4				
491	U.S. Navy		1.62	5.762	0.46	1.241	1.03	0.405
495	Tosco Refining Company	0.4	0.527		2.15	42.7		
500	San Francisco Energy Company		102.6					
501	U.S. Navy		0.315	8.432	0.135	9.001		0.563
503	U.S. Navy		0.354	4.342	0.347	0.935		0.305
504	Chevron Products Company		1.995	1.027	0.06	0.537		0.312
505	New United Motor Manufacturing; Inc		18.47					
510	U.S. Navy		3.49	2.43	0.21	0.58	0.22	0.59
512	IBM Corporation			0.059				
514	Owens Corning		6.457					
520	New United Motor Manufacturing; Inc		112.76					
521	UCSF/Parnassus			0.5		0.13		
525	Central Contra Costa Sanitary District		0.153	1.12		8.158		
529	U.S. Navy		2.88	14.75	1.43	11.47		3.71
531	Crown Cork & Seal Company		20.249	4.595		0.965		0.345
532	Martinez Cogen Limited Partnership			50.2				
538	New United Motor Manufacturing; Inc		131.9					
540	New United Motor Manufacturing; Inc		0.218					
541	Chevron Chemical Company		0.047				1.6	
543	Hanson Permanente Cement							25.074
545	U.S. Navy		2.495					
546	Alameda Reuse & Redevelopment Authority		29.97					
547	Cirrus Logic		1.34	0.34				
550	Chevron Products Company		43.402	36.225	133.81	485.47		31.134
554	Lawrence Livermore National Laboratory			0.051			2.4	
555	U.S. Navy			1.05	0.02	0.89		0.11
557	U.S. Navy		0.65	9.09	0.14	8.16		0.7
559	U.S. Navy		0.34	2.11				
560	Criterion Catalysts Company LP		0.34					
561	Pechiney Plastic Packaging; Inc		1.249					

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
562	United Technologies Corporation		2.432	0.623				
563	Owens Corning		1.245					
566	Shell Martinez Catalyst Plant		11.62					
570	Quebecor World San Jose Inc		6.11	1.81				
571	Huntway Refining Company		0.657					
573	LSI Logic Corporation		15.856					
577	Lockheed Martin Corporation		0.308					
578	Chevron Chemical Company		0.212	1.802	0.046	0.357		0.57
580	Tosco Refining Company		1.29	21.23	4.19	16.14		6.45
581	Tosco Refining Company		3.17	6.88	0.01	5.78		0.2
583	WinCup Holdings;L P		0.426					
584	Chevron Products Company		1.265					
588	Chevron Chemical Company			31.771		2.069		
593	Dow Chemical Company		15.34					
598	USS-POSCO Industries				0.14	0.79		0.7
600	U.S. Navy		0.55	3.21	0.06	8.43		0.76
602	Calpine Corporation	0.2	40.97	2.143		0.357		
603	Port of Oakland			2.45				
605	Owens-Brockway Glass Container Inc	11.2	0.4			0.74		
609	Martinez Refining Company				50.61			
613	Martinez Refining Company			89.783				
617	Chevron Products Company		68.898	8.79	0.473	7.449		1.514
619	Raisch Products					0.84		
622	Huntway Refining Company		0.898					
623	Huntway Refining Company		1.526					
625	Quebecor World San Jose Inc		356.0					
628	Owens Brockway Glass Containers		10.78			10.78		
630	USS-POSCO Industries			14.821	0.09	2.51		0.36
633	Crown Cork & Seal Co.		0.086	1.564	0.009	1.308	0.036	0.119
635	Calpine Corp. & Bechtel Enterprises Hold		0.1	1.31				7.7
637	Huntway Refining Company		0.174					
640	New United Motor Manufacturing; Inc		27.94					13.63
643	Homestake Mining Company	87.53				86.97		
644	USS-POSCO Industries	3.0	1.1	3.8	0.2	2.4		
645	Calpine Corporation			107.9				
648	Emerald Packaging Inc						40.0	
652	Shore Terminals - Selby		10.802	11.352				
656	Duke Energy Oakland LLC		324.81					

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
658	Calpine Corporation		10.0	32.9		14.38		
659	Calpine Construction Finance Co.;L.P.				30.4			
660	Calpine Corporation			39.55	5.92			
661	Calpine Corporation		31.75					
662	Calpine Corporation			73.62	46.3			
665	Calpine Corp. & Bechtel Enterprises Hold		22.778					
666	Calpine Corp. & Bechtel Enterprises Hold		15.518					
671	Calpine Corp. & Bechtel Enterprises Hold		2.7	468.0	90.0	33.0		28.0
674	Calpine Corp. & Bechtel Enterprises Hold					9.797	0.669	
675	Calpine Corp. & Bechtel Enterprises Hold				18.285			
679	Calpine Corp. & Bechtel Enterprises Hold		45.8					
680	Calpine Corp. & Bechtel Enterprises Hold		4.4					
682	Valero Refining Company - California		14.769					
684	Stapleton - Spence		0.028	0.312	0.006	0.008	0.03	0.14
685	Calpine Corp. & Bechtel Enterprises Hold	0.21	0.91	6.42	0.03	1.65		7.64
686	Calpine Corp. & Bechtel Enterprises Hold			6.5				12.33
687	Calpine Corp. & Bechtel Enterprises Hold		43.819	0.601				
688	Calpine Corp. & Bechtel Enterprises Hold		52.27					
689	SFPP; LP		2.358					
691	Burns Philip Food Inc.		0.001					
692	Chevron Products Company		1.608					
693	Southern Energy California		125.88	437.56	321.9	450.6		209.9
694	Southern Energy California		5.3	299.0	158.2	114.0		25.0
695	Southern Energy California	4.2	0.39	1.173	0.179	14.602		6.443
696	Siliconix; Incorporated		1.362				0.001	
697	Calpine Corp. & Bechtel Enterprises Hold		85.863					
698	Chevron Products Company		0.319					
699	Calpine Corporation			20.9				
703	Valero Refining Company - California			31.418				
704	Enron North America Corp.		5.868					
705	Enron North America Corp.		7.08					
706	Martinez Refining Company		35.51	13.8	0.1			
707	Chevron Products Company		2.426					
708	Exar Corporation						4.689	
709	Enron North America Corp.		17.367					
710	Midway Power; LLC		5.14					
711	Tosco Distribution Company		119.25					
712	Enron North America Corp.		8.816					

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
713	Enron North America Corp.		6.153					
714	Enron North America Corp.		1.0					
715	Louis Roesch Company		0.716					
716	Calpine Corporation		0.2	11.66	0.04	1.13		0.67
717	Calpine Corporation		0.46	32.24	0.09	2.61		1.54
718	Midway Power; LLC		44.995					
719	Midway Power; LLC		4.9					
720	Midway Power; LLC			48.962				
721	C & H Sugar Company; Inc		2.353			37.282		0.094
722	Catalytica Combustion Systems Inc		0.011					
723	Catalytica Combustion Systems Inc			0.015		1.632		
724	Calpine Corporation			7.1				
725	United Airlines; Maintenance Operations Ctr		49.601					
726	New United Motor Manufacturing; Inc			0.343				
727	Calpine Corp. & Bechtel Enterprises Hold			142.21	436.47	54.34		
728	Calpine Corp. & Bechtel Enterprises Hold		88.04	57.19	1.03	33.32		9.97
729	Valero Refining Company - California		28.326					
	Total Emission Reduction Credits Available	**142**	**3120**	**2473**	**1541**	**1596**	**459**	**435**

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Appendix 8.1-H
Cumulative Impacts Analysis Protocol

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APPENDIX 8.1H. CUMULATIVE IMPACTS ANALYSIS PROTOCOL

Potential cumulative air quality impacts that might be expected to occur resulting from RCEC and other reasonably foreseeable projects are both regional and localized in nature. These cumulative impacts were evaluated as follows.

Regional Impacts

Regional air quality impacts are possible for pollutants such as ozone, which involve photochemical processes that can take hours to occur. RCEC will provide emissions offsets (mitigation) for ozone precursors at a 1.15 to 1.0 ratio for NOx and 1.0 to 1.0 for POC. Additional mitigation for other pollutants will be required by the CEC.

Although the relative importance of POC and NO_x emissions in ozone formation differs from region to region, and from day to day, most air pollution control plans in California require roughly equivalent controls (on a ton per year basis) for these two pollutants. The change in emissions of the sum of these pollutants, equally weighted, will be used to provide a reasonable estimate of the impact of RCEC on ozone levels. The net change in emissions of ozone precursors from RCEC will be compared with emissions from all sources within Alameda County (Table 8.1H-1), and within the Bay Area Air Basin (Table 8.1H-2) as a whole.

Table 8.1H-1. Estimated Alameda County emissions inventory for 2000 (tons/day).

Source Category	TOG	ROG	CO	NOx	SOx	PM	PM10
Total Stationary Sources	189.62	27.93	2.12	7.74	1.53	5.92	3.54
Total Area Sources	29.10	18.48	30.91	3.49	0.21	43.14	23.11
Total Mobile Sources	74.12	67.91	605.33	102.32	8.47	4.42	4.37
Total Natural Sources	0.07	0.04	0.66	0.02	-	0.12	0.12
County Total	292.91	114.36	639.02	113.57	10.21	53.61	31.13

Source: CARB

Table 8.1H-2. Estimated Bay Area Air Basin Emissions Inventory for 2000 (tons/day).

Source Category	TOG	ROG	CO	NOx	SOx	PM	PM10
Total Stationary Sources	734.96	125.16	35.36	89.16	54.67	26.09	17.31
Total Area Sources	160.60	90.21	169.04	17.09	1.35	238.26	130.12
Total Mobile Sources	346.51	318.87	2662.88	451.67	35.32	21.19	20.85
Total Natural Sources	0.53	0.30	6.11	0.23	-	1.19	1.15
Basin Total	1242.60	534.55	2873.39	558.15	92.33	286.73	169.43

Source: CARB

Air quality impacts of fine particulate, or PM_{10}, have the potential to be either regional or localized in nature. On a regional basis, an analysis similar to that presented above for ozone was performed, looking at the three pollutants that can form PM_{10} in the atmosphere, i.e., POC, SO_x, and NO_x as well as at directly emitted particulate matter. BAAQMD regulations do not require offsets to be provided for PM_{10} emissions from the project, as facility emissions do not exceed 100 tons per year. However, full mitigation will be required by the CEC.

As in the case of ozone precursors, emissions of PM_{10} precursors are expected to have approximately equivalent ambient impacts in forming PM_{10}, per ton of emissions on a regional basis. Table 8.1H-3 provides the comparison of emissions of the criteria pollutants from RCEC with emissions from all sources within Alameda County, and within the Bay Area Air Basin as a whole.

Table 8.1H-3. Comparison of RCEC Project Emissions to Estimated Inventory for 2000.

Category	TOG	ROG[1]	CO	NOx	SOx	PM	PM10
RCEC Emissions (tons/yr)	-	28.5	610.2	134.6	12.4	-	86.3
RCEC Emissions (tons/day)	-	0.078	1.67	0.37	0.034	-	0.24
County Total (tons/day)	292.91	114.36	639.02	113.57	10.21	53.61	31.13
Air Basin Total (tons/day)	1242.60	534.55	2873.39	558.15	92.33	286.73	169.43
RCEC % of County Total	-	0.068	0.26	0.325	0.33	-	0.77
RCEC % of Air Basin Total	-	0.015	0.058	0.066	0.037	-	0.14

[1] RCEC POC emissions compared to inventory ROG emissions.

Localized Impacts

Localized impacts from RCEC could result from emissions of carbon monoxide, oxides of nitrogen, sulfur oxides, and directly emitted PM_{10}. A dispersion modeling analysis of potential cumulative air quality impacts has been performed for all four of these pollutants.

In evaluating the potential cumulative localized impacts of RCEC in conjunction with the impacts of existing facilities and facilities not yet in operation but that are reasonably foreseeable, a potential impact area in which cumulative localized impacts could occur was identified by CEC staff as an area with a radius of 8 miles around the plant site. Based on the results of the air quality modeling analyses described above, "significant" air quality impacts, as that term is defined in federal air quality modeling guidelines, were determined. If the project's impacts do not exceed the significance levels, no cumulative impacts will be expected to occur, and no further analysis will be required. Otherwise, in order to ensure that other projects that might have significant cumulative impacts in conjunction with RCEC are identified, a search area with a radius of 8 miles beyond the project's impact area will be used for the cumulative impacts analysis. Within this search area, three categories of projects with combustion sources will be used as criteria for identification:

- Projects that are existing and have been in operation since at least 1-1-98 (emissions are included in the overall background air quality assessment).
- Projects for which air pollution permits to construct have been issued and that began operation after 1-1-98.
- Projects for which air pollution permits to construct have not been issued, but that are reasonably foreseeable.

Projects that are existing and have been in operation since at least 1-1-98 will be reflected in the ambient air quality data that has been used to represent background concentrations; consequently, no further analysis of the emissions from this category of facilities will be performed. The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

Projects for which air pollution permits to construct have been issued but that were not operational by 1-1-98 will be identified through a request of permit records from the Bay Area Air Quality Management District. The search will be requested to be performed at two levels. For permits that are considered "major modifications" (i.e., emissions increases greater than 40 tons/year of NO_x or SO_2, 25 tons/year of total suspended particulate, 15 tons/year of PM_{10}), a region within 8 miles of the proposed project site was evaluated. For projects that had smaller emissions changes, but still greater than 15 tons/year, a region within 8 miles of the proposed project site was also evaluated. Projects that satisfy either of these criteria and that had a permit to construct issued after January 1, 1998, were included in the cumulative air quality impacts analysis. The January 1, 1998 date was selected based on the typical length of time a permit to construct is valid and typical project construction times, to ensure that projects that are not reflected in the 2000 ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 15 tons/year will be assumed to be *de minimus*, and will not be included in the dispersion modeling analysis.

A list of projects within the project region meeting the above noted criteria has been requested from the BAAQMD staff. (As of May 18, 2001 the requested data has not been received.)

Given the potentially wide geographic area over which the dispersion modeling analysis is to be performed, the ISCST3 model will be used to evaluate cumulative localized air quality impacts. The detailed modeling procedures, ISCST3 options, and meteorological data used in the cumulative impacts dispersion analysis were the same as those described above. The receptor grid was spaced at the same distance as for the RCEC analysis and covered the area in which the detailed modeling analysis (described above) indicated that the project will have impacts that exceed the PSD significance levels.

Cumulative Impacts Dispersion Modeling

The dispersion modeling analysis of cumulative localized air quality impacts for the proposed project was evaluated in combination with other reasonably foreseeable projects and air quality levels attributable to existing emission sources, and the impacts were compared to state or federal air quality standards for significant impact. As discussed above, the highest second-highest modeled concentrations will be used to demonstrate compliance with standards based on short-term averaging periods (24 hours or less).

Supporting information used in the analysis includes the following:

- 2000 estimated emissions inventory for Alameda County (Table 8.1H-1) and for the San Francisco Bay Area Air Basin (Table 8.1H-2);
- List of projects resulting from the screening analysis of permit files by the BAAQMD (Table 8.1H-4);
- Map showing locations of sources included in the cumulative air quality impacts dispersion modeling analysis (Figure 8.1H-1);
- Stack parameters for sources included in the cumulative air quality impacts dispersion modeling analysis (Table 8.1H-5); and
- Output files for the dispersion modeling analysis.

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Appendix 8.1-I
Calculation of Reasonable Worst-Case Day Emissions for Mitigation

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Table 8.1I-1. Reasonable maximum daily and annual emissions.

Maximum Hourly, Daily and Annual Emissions								NOx		
		Base Load		Cold Start		Hot Start		Base Load	Cold Start	Hot Start
	max. hour	hrs/day	hrs/yr	hrs/day	hrs/yr	hrs/day	hrs/yr	lb/hr	lb/hr	lb/hr
Turbine 1, no DB	1	4	6844	3	156	1	260	19.5	80	80
Turbine 2, no DB	0	2	6844	3	156	1	260	19.5	80	80
Turbine 1, w/ DB&PA	0	16	1500	0	0	0	0	21.4	0	0
Turbine 2, w/ DB&PA	1	16	1500	0	0	0	0	21.4	0	0
Emergency generator	1	1	200	0	0	0	0	1.77	0	0
Fire pump engine	1	1	30	0	0	0	0	3.9	0	0
Cooling tower	1	24	8760	0	0	0	0	0	0	0

	SO2	CO			POC			
		Base Load	Cold Start	Hot Start	Base Load	Cold Start	Hot Start	PM10
	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Turbine 1, no DB	1.4	28.8	838	902	2.6	16	16	9
Turbine 2, no DB	1.4	28.8	838	902	2.6	16	16	9
Turbine 1, w/ DB&PA	1.5	31.7	0	0	2.8	0	0	12
Turbine 2, w/ DB&PA	1.5	31.7	0	0	2.8	0	0	12
Emergency generator	0.004	3.02	0	0	1.42	0	0	0.0006
Fire pump engine	0.106	2.35	0	0	0.48	0	0	0.13
Cooling tower	0	0	0	0	0	0	0	0.69

	NOx			SO2			CO			POC			PM10		
	Max	Max	Total	Max	Max	Total	Max	Max	Total	Max	Max	Total	Max	Max	Total
	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy
Turbine 1, no DB	80	398	83.4	1.4	11.2	5.1	902	3,531.20	281.2	16	74.2	12.1	9	72	32.7
Turbine 2, no DB	0	359	83.4	0	8.4	5.1	0	3,473.60	281.2	0	69.1	12.1	0	54	32.7
Turbine 1, w/ DB	0	342.4	16.1	0	24	1.1	0	507.2	23.8	0	44.8	2.1	0	192	9
Turbine 2, w/ DB	21.4	342.4	16.1	1.5	24	1.1	31.7	507.2	23.8	2.8	44.8	2.1	12	192	9
Emergency generator	0	0	0.18	0	0	0.0004	3	3	0.3	1.4	1.4	0.142	0	0	0.0001
Fire pump engine	3.9	3.9	0.0585	0.106	0.106	0.0016	0	0	0.0353	0	0	0.0072	0	0	0.0019
Cooling tower	0	0	0	0	0	0	0	0	0	0	0	0	0.7	16.4	3
Total	105.3	1445.7	134.6	3	67.7	12.4	936.7	8,022.20	610.2	20.2	234.3	28.5	21.7	526.4	86.3
	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy

Assumptions:

Each turbine has one cold start and one hot start on worst case day; startups lag by two hours.

Emergency generator and fire pump will not both be tested on the same day.

Fire pump will not be tested more than 30 hours per year.

Emergency generator will not be tested over 200 hours per year.

Notes for Table 8.1I-1
Calculation of Reasonable Maximum Daily and Annual Emissions for Mitigation

Calculation of Maximum Daily Emissions

a. Turbines/HRSGs

Hourly NO_x, CO and POC emissions are highest during startup. The operating conditions having the next highest hourly emissions are full load operation at 94 degF with power augmentation and duct firing, followed by full load operation at 34 degF. Duct burner operation will not exceed 16 hours a day. On a reasonable worst-case day one turbine will have a cold start and one turbine will have a hot start, and then both turbines will operate at full load with power augmentation and duct firing for 16 hours, and at full load without power augmentation and duct burning for the rest of the day.

b. Auxiliary Boiler

No auxiliary boiler is proposed for the RCEC facility.

c. Emergency Generator and Fire Pump

The emergency generator and fire pump will operate a maximum of one hour per day for testing, and the two units will not be tested on the same day. Therefore maximum daily emissions correspond to one hour of operation of the unit that has the higher emissions.

d. Cooling Tower

Maximum daily cooling tower emissions will occur while the cooling tower is in operation for 24 hours.

Maximum Annual Emissions

Maximum annual emissions are based upon the proposed operations scenarios as delineated in Section 8.1.