APPENDIX 8.1A

Emissions and Operating Parameters

APPENDIX 8.1A

Emissions and Operating Parameters

The following tables are provided in this appendix:

Deleted: for District NSR

Deleted: Detailed Calculations for Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions for Federal PSD and CEQA

Table 8.1A-1
HBRP
Baseline Updated March 07 to include Humboldt Bay Power Plant emissions through September 28, 2006

Quarterly Emissions, tons

	HB 1					HB 2					MEPP 2					MEPP 3				
	NOx	**SO2**	**CO**	**ROC**	**PM-10**	**NOx**	**SO2**	**CO**	**ROC**	**PM-10**	**NOx**	**SO2**	**CO**	**ROC**	**PM-10**	**NOx**	**SO2**	**CO**	**ROC**	**PM-10**
Q3 2004 (1)	1.46	0.00	0.21	0.05	0.04	1.45	0.00	0.22	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q4 2004	121.12	0.19	12.35	2.69	2.35	105.53	0.19	12.54	2.73	2.38	2.53	0.19	0.30	0.08	0.38	0.04	0.00	0.00	0.00	0.01
Q1 2005	114.90	0.20	12.79	2.78	2.43	92.67	0.19	12.54	2.73	2.38	1.68	0.08	0.20	0.05	0.25	0.26	0.01	0.02	0.01	0.03
Q2 2005	99.37	0.17	10.86	2.36	2.06	85.52	0.16	10.40	2.26	1.98	9.01	0.45	1.07	0.28	1.36	11.42	0.45	1.07	0.28	1.36
Q3 2005	128.23	0.23	14.85	3.23	2.82	98.32	0.21	13.78	3.00	2.62	1.70	0.09	0.20	0.05	0.26	2.35	0.09	0.22	0.06	0.28
Q4 2005	148.99	0.24	15.93	3.46	3.03	142.25	0.27	17.94	3.90	3.41	2.02	0.10	0.24	0.06	0.31	12.71	0.50	1.19	0.31	1.51
Q1 2006	128.18	0.24	16.04	3.49	3.05	125.92	0.25	16.63	3.62	3.16	2.39	0.03	0.21	0.05	0.27	2.53	0.03	0.24	0.06	0.30
Q2 2006	97.43	0.17	11.08	2.41	2.11	87.49	0.18	11.76	2.56	2.23	11.82	0.13	1.05	0.27	1.34	7.07	0.08	0.66	0.17	0.84
Q3 2006 (2)	88.82	0.19	12.59	2.74	2.39	126.55	54.46	14.27	3.02	6.45	7.38	0.08	0.66	0.17	0.83	4.44	0.05	0.42	0.11	0.53

Notes: 1. Sept 29-30, 2004
2. Sept 1-28, 2006

Unit-specific Quarterly Averages, September 29, 2004 -- September 28, 2006

	HB 1					HB 2					MEPP 2					MEPP 3				
	NOx	**SO2**	**CO**	**ROC**	**PM-10**	**NOx**	**SO2**	**CO**	**ROC**	**PM-10**	**NOx**	**SO2**	**CO**	**ROC**	**PM-10**	**NOx**	**SO2**	**CO**	**ROC**	**PM-10**
Q1	121.54	0.22	14.42	3.14	2.74	109.30	0.22	14.59	3.17	2.77	2.04	0.06	0.21	0.05	0.26	1.39	0.02	0.13	0.03	0.17
Q2	98.40	0.17	10.97	2.39	2.08	86.51	0.17	11.08	2.41	2.10	10.41	0.29	1.06	0.27	1.35	9.25	0.27	0.86	0.22	1.10
Q3	109.25	0.21	13.83	3.01	2.63	113.16	27.34	14.13	3.03	4.56	4.54	0.08	0.43	0.11	0.55	3.40	0.07	0.32	0.08	0.40
Q4	135.05	0.22	14.14	3.08	2.69	123.89	0.23	15.24	3.31	2.90	2.27	0.15	0.27	0.07	0.34	6.38	0.25	0.60	0.15	0.76

Facilitywide Quarterly Averages, September 29, 2004 -- September 28, 2006

	NOx	**SO2**	**CO**	**ROC**	**PM-10**
Q1	234.27	0.52	29.34	6.40	5.94
Q2	204.56	0.90	23.97	5.29	6.64
Q3	230.35	27.70	28.71	6.23	8.13
Q4	267.59	0.85	30.25	6.61	6.68
Total	936.77	29.97	112.27	24.54	27.39

Table 8.1A-2
HBRP
Emissions and Operating Parameters for Wärtsilä Reciprocating Engines
Natural Gas Firing
PM10 em rate rev 8/13/07

Case	1) Hot Base	2) Hot Low	3) Hot Mid	4) Cold Mid	5) Cold Base	6) Cold Low
Engine Load, kW	16929	8634	12697	12825	17100	8550
Engine Load, bhp	22,702	11,578	17,027	17,198	22,931	11,466
Ambient Temp, F	87	87	87	21	21	21
Engine Load	100	50	75	75	100	50
Heat input, MMBtu/hr (HHV)	142.5	80.97	111.5	112.4	143.9	81.7
Stack flow, lb/hr	221,535	125,074	174,122	174,981	222,353	125,891
Stack flow, acfm	118,586	71,806	99,082	99,509	120,764	73,619
Stack temp, F	735	796	787	776	723	796
Stack exhaust, vol %						
O2 (dry)	11.50%	11.50%	11.60%	11.66%	11.56%	11.67%
CO2 (dry)	5.37%	5.37%	5.31%	5.28%	5.33%	5.27%
H2O	9.52%	9.52%	9.43%	9.31%	9.40%	9.30%
Emissions						
NOx, ppmvd @ 15% O2	6.0	6.0	6.0	6.0	6.0	6.0
NOx, lb/hr	3.10	1.76	2.43	2.45	3.13	1.78
NOx, lb/MMBtu	0.0218	0.0218	0.0218	0.0218	0.0218	0.0218
SO2, ppmvd @ 15% O2	0.55	0.55	0.55	0.55	0.55	0.55
SO2, lb/hr	0.40	0.23	0.31	0.31	0.40	0.23
SO2, lb/MMBtu	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028
CO, ppmvd @ 15% O2	13.0	13.0	13.0	13.0	13.0	13.0
CO, lb/hr	4.09	2.33	3.20	3.23	4.13	2.35
CO, lb/MMBtu	0.0287	0.0287	0.0287	0.0287	0.0287	0.0287
ROC, ppmvd @ 15% O2	28	28	28	28	28	28
ROC, lb/hr	5.05	2.87	3.95	3.98	5.10	2.90
ROC, lb/MMBtu	0.0354	0.0355	0.0355	0.0355	0.0354	0.0355
PM10, lb/hr	***3.6***	***3.6***	***3.6***	***3.6***	***3.6***	***3.6***
PM10, lb/MMBtu	***0.0253***	***0.0445***	***0.0323***	***0.0320***	***0.0250***	***0.0441***
PM10, gr/dscf	***0.00937***	***0.01649***	***0.01186***	***0.01168***	***0.00922***	***0.01605***
PM10, g/bhp-hr	***0.07193***	***0.14104***	***0.09591***	***0.09495***	***0.07121***	***0.14242***
NH3, ppmvd@15% O2	10.0	10.0	10.0	10.0	10.0	10.0
NH3, lb/hr	1.92	1.09	1.50	1.51	1.93	1.10

Table 8.1A-3
HBRP
Emissions and Operating Parameters for Wärtsilä Reciprocating Engines
Emergency Diesel Firing

Case	1) Hot Base	2) Hot Low	3) Hot Mid	4) Cold Mid	5) Cold Base	6) Cold Low
Engine Output, kW	17,100	8,550	12,825	12,825	17,100	8,550
Engine Output, bhp	22,931	11,466	17,198	17,198	22,931	11,466
Ambient Temp, F	87	87	87	21	21	21
Engine Load	100	50	75	75	100	50
Heat input, MMBtu/hr (HHV)	148.9	79.0	114.0	113.7	148.6	78.9
Stack flow, lb/hr	261,115	152,383	214,289	229,369	280,163	163,495
Stack flow, acfm	134,544	81,291	109,381	110,290	135,556	79,589
Stack temp, F	684	697	660	592	616	619
Stack exhaust, vol %						
O_2 (dry)	12.34%	13.24%	12.93%	13.63%	13.05%	13.82%
CO_2 (dry)	6.40%	5.73%	5.96%	5.45%	5.87%	5.30%
H_2O	7.85%	7.34%	7.52%	5.89%	5.12%	4.66%
Emissions						
NO_x, ppmvd @ 15% O_2	35.0	35.0	35.0	35.0	35.0	35.0
NO_x, lb/hr	19.92	10.57	15.25	15.21	19.87	10.55
NO_x, lb/MMBtu	0.134	0.134	0.134	0.134	0.134	0.134
NO_x, gm/kw-hr	0.53	0.56	0.54	0.54	0.53	0.56
SO_2, ppmvd @ 15% O_2	0.40	0.38	0.38	0.35	0.37	0.36
SO_2, lb/hr	0.22	0.12	0.17	0.17	0.22	0.12
SO_2, lb/MMBtu	0.0015	0.0016	0.0015	0.0015	0.0015	0.0016
CO, ppmvd @ 15% O_2	20.0	20.0	20.0	20.0	20.0	20.0
CO, lb/hr	6.93	3.68	5.31	5.29	6.91	3.67
CO, lb/MMBtu	0.047	0.047	0.047	0.047	0.047	0.047
ROC, ppmvd @ 15% O_2	40	40	40	40	40	40
ROC, lb/hr	7.94	4.21	6.08	6.06	7.92	4.21
ROC, lb/MMBtu	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533
PM_{10}, lb/hr	10.8	10.8	10.8	10.8	10.8	10.8
PM_{10}, lb/MMBtu	0.0725	0.1367	0.0947	0.0950	0.0727	0.1369
PM_{10}, gr/dscf	0.02330	0.03931	0.02834	0.02594	0.02141	0.03640
PM_{10}, g/bhp-hr	0.21	0.43	0.28	0.28	0.21	0.43
DPM, lb/hr	5.56	--	--	--	5.56	--
DPM, g/kw-hr	0.15	--	--	--	0.15	--
NH_3, ppmvd@15% O_2	10.0	10.0	10.0	10.0	10.0	10.0
NH_3, lb/hr	2.11	1.12	1.61	1.61	2.10	1.12

Table 8.1A-4
HBRP
Emergency Generator Performance and Emissions
Rev 8/07

Engine		
Manufacturer		***Caterpillar***
Model		***DM8149***
Capacity	kW	350
	bhp	469
Fuel		Diesel
Fuel Consumption (HHV)	Btu/bhp-hr	8,491
Fuel Consumption	gal/hr	***29.1***
Exhaust Flow	acfm	***3,366***
Stack Velocity	ft/sec	285.67
Exhaust Temperature	deg. F	***925.9***
Exhaust Pipe Diameter	in	***6***
Number of Exhaust Pipes		1
Exhaust Stack Height	ft	***10.00***
Operating Profile		
Annual operation	hrs	50
Emissions		
NOx	g/bhp-hr	***3.47***
CO	g/bhp-hr	***0.63***
ROC (non-methane HC)	g/bhp-hr	***0.4***
PM10	g/bhp-hr	***0.05***
NOx	lb/hr	3.59
CO	lb/hr	0.65
ROC	lb/hr	0.41
PM10	lb/hr	0.05
	gr/scf	0.00384
SO2	lb/hr	0.0061

Diesel fuel	6.95	lb/gal
	136,903	Btu/gal

Table 8.1A-5
HBRP
Diesel Fire Pump Performance and Emissions

Engine		
Fire Pump Mfr		Clarke
Engine Mfr		John Deere
Model		JU6H-UF50
Useable Horsepower	hp	210
Speed	rpm	2100
Fuel		CA Diesel
Specific Gravity		0.825
Fuel Sulfur Content	wt %	0.0015%
Fuel Consumption	gph	12.3
	Btu/bhp-hr	8,019
Exhaust Flow	acfm	1204
Stack Velocity	ft/sec	13.7
Exhaust Temperature	deg. F	1050
Exhaust Pipe Diameter	in	5
Exhaust Stack Height	ft	40
Pump		
Speed	rpm	2100
Capacity	gpm	2500
Discharge Pressure	psig	
Pump Efficiency	%	
Brake Horsepower	bhp	210.0
Operating Profile		
Annual Operation	hrs	50
Emissions		
NOx	g/bhp-hr	4.9
CO	g/bhp-hr	0.59
ROC	g/bhp-hr	0.5
PM10	g/bhp-hr	0.14
NOx	lb/hr	2.27
CO	lb/hr	0.27
ROC	lb/hr	0.23
PM10	lb/hr	0.06
	gr/scf	0.01680
SO2	lb/hr	0.0026

Table 8.1A-6
HBRP
Detailed Calculations for Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions
Rev. 8/07
Operating and Emissions Assumptions

	Base Load						
Equipment	max. hour	hrs/day	hrs/Q1	hrs/Q2	hrs/Q3	hrs/Q4	hrs/yr
ICE, NG, baseload hours per engine	0	0	1512	1528	1546	1546	6132
ICE, Diesel, baseload hours per engine	0	21	0	0	0	0	0
ICE, NG startups per engine	0	0	78	79	79	79	315
ICE, Diesel startups per engine	1	3	12	12	13	13	50
Black Start Generator, hours	0.75	0.75	12	12	13	13	50
Fire Pump Engine, hours	0	1	12	12	13	13	50

	NOx		SOx (1)		CO		ROC		PM10	
	Base Load	Startup (2)	Base Load	Annual	Base Load	Startup (2)	Base Load	Startup (2)	Base Load	Startup
Equipment	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
ICE, NG, baseload	3.13	--	0.403	0.13	4.13	--	5.10	--	***3.60***	--
ICE, Diesel, baseload	19.92	--	0.219	0.22	6.93	--	7.94	--	10.80	--
ICE, NG startups	--	23.6	--	--	--	24.07	--	17.9	--	***3.60***
ICE, Diesel startups	--	164.0	--	--	--	25.46	--	17.2	--	10.80

Table 8.1A-6 (cont'd)
Rev. 8/07
Emissions Calculations

	NOx Emissions						
Equipment	Max lb/hr	Max lb/day	Max lb/Q1	Max lb/Q2	Max lb/Q3	Max lb/Q4	Total tons/yr
ICE, NG, baseload, per engine	0.00	0.00	4,736.2	4,788.4	4,843.7	4,843.7	9.61
ICE, Diesel, baseload, per engine	0.0	418.3	0.0	0.0	0.0	0.0	0.00
ICE, startups, per engine	164.0	491.9	3,805.7	3,829.3	3,993.2	3,993.2	7.81
ICE Max, 10 engines	***392.0***	9,101.3	85,419	86,176	88,369	88,369	174.2
Black Start Generator	2.69	2.69	43.1	43.1	46.7	46.7	0.09
Fire Pump Engine	0.00	2.27	27.2	27.2	29.5	29.5	0.06
Project Total	***394.7***	9,106.3	85,489	86,247	88,446	88,446	174.3
	lb/hr	lb/day	lb/Q1	lb/Q2	lb/Q3	lb/Q4	tons/yr

	SOx Emissions						
Equipment	Max lb/hr	Max lb/day	Max lb/Q1	Max lb/Q2	Max lb/Q3	Max lb/Q4	Total tons/yr
ICE, NG, baseload	0.0	8.5	609.1	615.8	622.9	622.9	0.4
ICE, Diesel, baseload	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ICE, startups	0.4	1.2	34.1	34.5	34.7	34.7	2.66E-02
ICE Total, 10 engines	4.0	96.7	6,431	6,503	6,576	6,576	4.4
Black Start Generator	0.00	0.00	0.07	0.07	0.08	0.08	1.52E-04
Fire Pump Engine	0.00	0.00	0.03	0.03	0.03	0.03	6.41E-05
Total	4.0	96.7	6,431	6,503	6,576	6,576	4.4
	lb/hr	lb/day	lb/Q1	lb/Q2	lb/Q3	lb/Q4	tons/yr

	CO Emissions						
Equipment	Max lb/hr	Max lb/day	Max lb/Q1	Max lb/Q2	Max lb/Q3	Max lb/Q4	Total tons/yr
ICE, NG, baseload	0.0	0.0	6,247.8	6,316.7	6,389.7	6,389.7	13
ICE, Diesel, baseload	0.0	145.5	0.0	0.0	0.0	0.0	0
ICE, startups	25.5	76.4	2,182.8	2,206.8	2,232.3	2,232.3	4
ICE Total, 10 engines	254.6	2,219.1	84,306	85,236	86,220	86,220	171.0
Black Start Generator	0.5	0.5	7.8	7.8	8.5	8.5	0.0
Fire Pump Engine	0.0	0.3	3.3	3.3	3.6	3.6	0.0
Total	255.1	2219.9	84,317	85,247	86,232	86,232	171.0
	lb/hr	lb/day	lb/Q1	lb/Q2	lb/Q3	lb/Q4	tons/yr

	ROC Emissions						
Equipment	Max lb/hr	Max lb/day	Max lb/Q1	Max lb/Q2	Max lb/Q3	Max lb/Q4	Total tons/yr
ICE, NG, baseload	0.0	0.0	7,707.6	7,792.6	7,882.6	7,882.6	16
ICE, Diesel, baseload	0.0	166.7	0.0	0.0	0.0	0.0	0
ICE, startups	***17.9***	***53.8***	1,606.1	1,624.0	1,641.2	1,641.2	3
ICE Total, 10 engines	***179.5***	***2,205.4***	93,137	94,166	95,238	95,238	188.9
Black Start Generator	***0.31***	0.31	4.96	4.96	5.38	5.38	1.03E-02
Fire Pump Engine	***0.00***	0.23	2.78	2.78	3.01	3.01	5.79E-03
Total	***179.8***	***2,206.0***	93,145	94,174	95,247	95,247	188.9
	lb/hr	lb/day	lb/Q1	lb/Q2	lb/Q3	lb/Q4	tons/yr

	PM10 Emissions						
Equipment	Max lb/hr	Max lb/day	Max lb/Q1	Max lb/Q2	Max lb/Q3	Max lb/Q4	Total tons/yr
ICE, NG, baseload	0.0	0.0	***5442.0***	***5502.0***	***5565.6***	***5565.6***	***11.04***
ICE, Diesel, baseload	0.0	226.8	0.0	0.0	0.0	0.0	0
ICE, startups	10.8	32.4	410.4	414	424.8	424.8	0.84
ICE Total, 10 engines	108.0	***2,203.0***	***58,524***	***59,160***	***59,904***	***59,904***	***118.7***
Black Start Generator	***0.00***	0.04	0.63	0.63	0.69	0.69	1.32E-03
Fire Pump Engine	***0.06***	0.06	0.78	0.78	0.84	0.84	1.62E-03
Total	108.1	***2,203.1***	***58,526***	***59,161***	***59,905***	***59,905***	***118.7***
	lb/hr	lb/day	lb/Q1	lb/Q2	lb/Q3	lb/Q4	tons/yr

Table 8.1A-8
HBRP
Annual and Maximum Hourly Non-Criteria Pollutant Emissions for Wärtsilä Reciprocating Engines
Rev 8/07

Pollutant	Natural Gas Emission Factor (1) lb/MMscf	Controlled Natural Gas Em Factor (2) lb/MMscf	Diesel Emission Factor (3) lb/Mgal	Controlled Diesel Em Factor (2) lb/Mgal	Maximum Hourly Emissions per Engine, lb/hr (5) Nat Gas Firing (5)	Maximum Hourly Emissions per Engine, lb/hr (5) Diesel Firing (6)	ICE Total Annual Emissions (7) tpy
Ammonia	(4)	n/a	(4)	n/a	1.93	2.11	62.84
Propylene	5.38E+00	3.23E+00	3.85E-01	2.31E-01	0.46	0.25	14.67
Hazardous Air Pollutants							
Acetaldehyde	5.29E-01	3.17E-01	3.47E-03	2.08E-03	0.04	2.26E-03	1.44
Acrolein	5.90E-02	3.54E-02	1.07E-03	6.42E-04	4.99E-03	6.98E-04	0.16
Benzene	2.18E-01	1.31E-01	1.01E-01	6.06E-02	0.02	6.59E-02	0.60
1,3-Butadiene	3.67E-01	2.20E-01	--	--	0.03	--	1.00
Diesel PM (8)	--		--	--	--	5.56	1.39
Ethylbenzene	7.11E-02	4.27E-02	--	--	0.01	--	0.19
Formaldehyde	2.36	inc	1.32E-02	inc	0.33	1.44E-02	10.70
Hexane	1.13E+00	6.80E-01	--	--	0.10	--	3.09
Naphthalene	2.51E-02	1.51E-02	1.63E-02	9.78E-03	2.22E-03	1.06E-02	0.07
PAHs (as B(a)P) (9)	1.71E-05	1.03E-05	6.21E-05	3.73E-05	1.81E-06	4.05E-05	4.89E-05
Toluene	2.39E-01	1.43E-01	3.74E-02	2.24E-02	2.04E-02	2.44E-02	0.65
Xylene	6.46E-01	3.88E-01	2.68E-02	1.61E-02	5.48E-02	1.75E-02	1.76
Total HAPs (excluding Diesel PM) =							19.66

Notes:

(1) All factors except hexane and formaldehyde are CATEF mean values for natural gas-fired IC engines. Hexane is from AP-42 Table 3.2-2; formaldehyde is based on vendor data.

(2) 40% control efficiency for oxidation catalyst applied for all TACs except formaldehyde. Source: BAAQMD PDOC for Eastshore Energy Center, April 30, 2007. Formaldehyde emission factor provided by vendor reflects ox cat control.

(3) All factors are CATEF mean values for large Diesel engines (SCC 20200102).

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

(5) Based on maximum ICE firing rate of 143.9 MMBtu/hr and fuel HHV of 1,021.1 Btu/scf of natural gas and 0.79 MMBtu/hr and fuel HHV of 136,903 Btu/gal for pilot Diesel fuel

0.14088	MMscf/hr natural gas
0.01	Mgal/hr Diesel fuel

(6) Based on maximum ICE firing rate of 148.9 MMBtu/hr and fuel HHV of 136,903 Btu/gal for Diesel fuel

1.09	Mgal/hr Diesel fuel

(7) Based on maximum ICE firing rate (from (3)) for 6447 hrs/yr on natural gas and pilot Diesel fuel.

908.3	MMscf/yr of natural gas
7.0	Mgal/yr Diesel fuel

(8) Based on 50 hrs/yr of backup Diesel fuel operation; Front half only, per ATCM.

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

	Mean EF		PEF Equiv.	PEF-Weighted EF	
	Nat Gas	Diesel		Nat Gas	Diesel
PAHs (as B(a)P)					
Benzo(a)anthracene	5.88E-05	5.03E-05	0.1	5.88E-06	5.03E-06
Benzo(a)pyrene	2.70E-06	1.81E-05	1	2.70E-06	1.81E-05
Benzo(b)fluoranthrene	4.09E-05	7.96E-05	0.1	4.09E-06	7.96E-06
Benzo(k)fluoranthrene	7.83E-06	1.56E-05	0.1	7.83E-07	1.56E-06
Chrysene	1.43E-05	1.06E-04	0.01	1.43E-07	1.06E-06
Dibenz(a,h)anthracene	2.70E-06	2.43E-05	1.05	2.84E-06	2.55E-05
Indeno(1,2,3-cd)pyrene	7.17E-06	2.89E-05	0.1	7.17E-07	2.89E-06

Table 8.1A-9
Humboldt Bay Power Plant
Fuel Use During the Baseline Period: Humboldt Bay Power Plant
Rev 08/07

		HB 1					HB 2					MEPP 2					MEPP 3				
Year	**Month**	**MMCF Gas Fuel**	**Eq. Bbl Gas Fuel**	**A Bbl Oil Fuel**	**Eq. Bbl Oil Fuel**	**MMBtu Fuel**	**MMCF Gas Fuel**	**Eq. Bbl Gas Fuel**	**A Bbl Oil Fuel**	**Eq. Bbl Oil Fuel**	**MMBtu Fuel**	**MMCF Gas Fuel**	**Eq. Bbl Gas Fuel**	**A Bbl Oil Fuel**	**Eq. Bbl Oil Fuel**	**MMBtu Fuel**	**MMCF Gas Fuel**	**Eq. Bbl Gas Fuel**	**A Bbl Oil Fuel**	**Eq. Bbl Oil Fuel**	**MMBtu Fuel**
2004	Sept 29-30	10.5	1,710.8	0.0	0.0	10,692.6	11.0	1,786.9	0.0	0.0	11,168.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	October	162.7	26,496.0	0.0	0.0	165,599.8	170.6	27,783.3	0.0	0.0	173,645.5	0.0	0.0	257.0	237.8	1,486.0	0.0	0.0	0.0	0.0	0.0
	November	226.2	36,921.8	0.0	0.0	230,761.0	227.1	37,061.3	0.0	0.0	231,633.1	0.0	0.0	693.0	643.0	4,018.8	0.0	0.0	34.0	31.5	196.7
	December	228.5	37,422.6	0.0	0.0	233,891.2	229.6	37,596.3	0.0	0.0	234,976.9	0.0	0.0	1,214.0	1,127.6	7,047.7	0.0	0.0	0.0	0.0	0.0
2005	January	240.6	39,253.9	0.0	0.0	245,336.6	239.0	39,001.1	0.0	0.0	243,757.0	0.0	0.0	1,007.0	933.8	5,836.4	0.0	0.0	10.0	10.0	62.4
	February	189.5	30,969.1	0.0	0.0	193,556.7	193.1	31,564.7	0.0	0.0	197,279.5	0.0	0.0	41.0	38.0	237.8	0.0	0.0	82.0	77.0	481.4
	March	209.6	34,187.2	0.0	0.0	213,669.7	195.1	31,835.3	0.0	0.0	198,970.8	0.0	0.0	391.0	362.0	2,262.5	0.0	0.0	81.0	76.2	476.1
	April	46.0	7,460.0	0.0	0.0	46,625.1	313.4	51,104.9	0.0	0.0	319,405.9	0.0	0.0	4,444.0	4,114.7	25,717.1	0.0	0.0	3,643.0	3,374.6	21,091.4
	May	296.8	48,160.9	0.0	0.0	301,005.9	78.1	12,743.7	0.0	0.0	79,648.4	0.0	0.0	2,375.0	2,200.7	13,754.6	0.0	0.0	3,490.0	3,228.5	20,178.0
	June	200.0	32,734.9	0.0	0.0	204,593.3	128.4	20,952.9	0.0	0.0	130,955.6	0.0	0.0	905.0	837.9	5,237.0	0.0	0.0	548.0	508.2	3,176.0
	July	241.8	39,383.3	0.0	0.0	246,145.5	184.8	30,093.0	0.0	0.0	188,081.2	0.0	0.0	455.0	422.6	2,641.1	0.0	0.0	150.0	140.5	878.1
	August	306.5	49,999.6	0.0	0.0	312,497.4	304.2	49,731.8	0.0	0.0	310,823.6	0.0	0.0	957.0	886.8	5,542.5	0.0	0.0	1,383.0	1,281.3	8,008.1
	Sept 1-28	176.6	28,895.5	0.0	0.0	180,597.2	182.2	29,811.5	0.0	0.0	186,321.9	0.0	0.0	44.0	41.2	257.7	0.0	0.0	46.0	43.1	269.5
	Sept 29-30	17.8	2,904.5	0.0	0.0	18,153.2	17.8	2,914.6	0.0	0.0	18,216.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	October	300.6	49,088.8	0.0	0.0	306,804.7	305.5	49,900.5	0.0	0.0	311,878.0	0.0	0.0	178.0	166.2	1,039.0	0.0	0.0	1,152.0	1,070.4	6,689.8
	November	278.9	45,509.0	0.0	0.0	284,431.0	292.9	47,772.9	0.0	0.0	298,580.4	0.0	0.0	163.0	152.1	950.9	0.0	0.0	3,680.0	3,405.9	21,287.0
	December	217.0	35,454.0	0.0	0.0	221,587.6	298.5	48,719.9	0.0	0.0	304,499.1	0.0	0.0	1,385.0	1,284.0	8,025.1	0.0	0.0	3,714.0	3,437.3	21,483.2
2006	January	301.6	49,071.2	0.0	0.0	306,694.9	309.7	50,399.5	0.0	0.0	314,996.9	0.0	0.0	1,330.0	1,234.2	7,713.4	0.0	0.0	1,343.0	1,244.7	7,779.4
	February	227.0	36,917.5	0.0	0.0	230,734.1	235.9	38,363.5	0.0	0.0	239,771.6	0.0	0.0	30.0	27.8	173.6	0.0	0.0	37.0	34.8	217.7
	March	273.6	44,583.8	0.0	0.0	278,648.9	286.0	46,595.8	0.0	0.0	291,223.8	0.0	0.0	166.0	154.6	966.4	0.0	0.0	315.0	292.5	1,827.9
	April	58.9	9,604.3	0.0	0.0	60,027.1	362.1	58,972.5	0.0	0.0	368,578.2	0.0	0.0	7,007.0	6,478.9	40,493.0	0.0	0.0	4,510.0	4,174.5	26,090.7
	May	219.3	35,793.8	0.0	0.0	223,711.3	176.7	28,836.0	0.0	0.0	180,225.2	0.0	0.0	217.0	202.2	1,263.6	0.0	0.0	47.0	43.8	273.9
	June	275.8	45,466.5	0.0	0.0	284,165.3	49.3	8,051.8	0.0	0.0	50,323.7	0.0	0.0	345.0	323.7	2,022.9	0.0	0.0	195.0	181.9	1,136.8
	July	213.5	34,998.4	0.0	0.0	218,739.7	210.8	34,526.0	0.0	0.0	215,787.3	0.0	0.0	29.0	27.3	170.9	0.0	0.0	437.0	416.8	2,604.8
	August	226.0	36,765.3	0.0	0.0	229,783.1	272.7	44,349.7	1,458.2	1,444.1	286,211.3	0.0	0.0	3,412.0	3,156.6	19,729.0	0.0	0.0	1,942.0	1,798.5	11,240.7
	Sept 1-28	190.1	30,947.2	0.0	0.0	193,420.1	167.4	27,245.2	10,468.7	10,330.2	234,845.7	0.0	0.0	1,287.0	1,192.0	7,450.1	0.0	0.0	594.0	551.9	3,449.3
	Sept 29-30	9.3	1,514.5	0.0	0.0	9,465.5	9.9	1,616.2	0.0	0.0	10,100.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	October	212.2	34,659.9	0.0	0.0	216,624.1	132.5	21,684.8	0.0	0.0	135,529.8	0.0	0.0	717.0	666.9	4,167.9	0.0	0.0	336.0	311.0	1,944.0
	November	266.7	43,468.5	0.0	0.0	271,678.1	199.2	32,446.3	0.0	0.0	202,789.6	0.0	0.0	1,326.0	1,228.0	7,675.1	0.0	0.0	2,535.0	2,344.5	14,653.0
	December	245.8	40,223.9	154.1	147.2	252,318.9	308.8	50,523.1	2,860.4	2,788.9	333,200.2	0.0	0.0	2,127.0	1,975.9	12,349.7	0.0	0.0	2,717.0	2,517.1	15,731.8
	2005 Total	2,535.3	413,595.5	0.0	0.0	2,584,971.8	2,456.5	401,066.8	0.0	0.0	2,506,667.3	0.0	0.0	12,783.0	11,846.3	74,039.2	0.0	0.0	9,467.0	8,770.9	54,817.9
	2006 Total	2,800.1	457,104.2	0.0	0.0	2,856,901.1	2,985.1	486,647.7	11,926.9	11,774.3	3,115,137.5	0.0	0.0	15,549.0	14,399.7	89,997.9	0.0	0.0	17,966.0	16,653.0	104,081.2

APPENDIX 8.1B

Modeling Analysis

APPENDIX 8.1B

Modeling Analysis

The following tables and figures are provided in this appendix:

Deleted: 1-Hour Average NOx Impacts

Deleted: 24-Hour Average PM_{10} Impacts

Deleted: Annual Average PM_{10} Impacts

TABLE 8.1B-1
Dimensions of On-Site Structures
HBRP and Humboldt Bay Power Plant

Feature	Height (feet)	Length (feet)	Width (feet)	Diameter (feet)
HBRP New Structures				
Wartsila ICEs				
Tier 1 (emission control systems and ducting)	27.0	169.1	284.8	--
Tier 2 (engine hall)	38.6	90.0	284.8	--
Tier 3 (engine hall vents)	44.8	16.1	110.2	--
Oil Water Tank	13.1	--	--	11.5
Clean Lube Oil Tank	19.0	--	--	16.4
Used Lube Oil Tank	18.4	--	--	11.5
Ammonia Tanks (2)	34.0	--	--	13.5
Fire Water Tank	32.0	--	--	30
Fire Pump Engine Enclosure	10.3	23.0	19.7	--
Oil Water Separator	13.8	13.1	44.3	--
Sludge Tank	21.9	--	--	11.5
Diesel Tank	40.0	--	--	51.9
Workshop/Control Room	21.9	40	120	--
Humboldt Bay Power Plant Existing Structures				
Power Building (Units 1 and 2)				
Tier 1 (Operating level)	15.0	84.0	66.0	--
Tier 2	18.8			--
Tier 3	27.0			--
Tier 4	70.0	57.0	28.0	--
Unit 3 Power Building	48.3	150.0	100.0	--
Admin. Annex	15.0	100.0	35.0	--
Rad Waste Pre-Engr Building	34.0	96.0	44.0	--
MEPPS Sound Enclosures	16.4	59.3	17.0	--
MEPPS Air Intake Structures	32.4		17.0	--
MEPPS Air Start Bldg	12.0	52.0	24.0	--
Fuel Storage Tanks (2)	48.0	--	--	15.0
Fuel Service Tanks (2)	24.0	--	--	24.0
Light Oil Tank	24.0	--	--	25.0
Relay Bldg	13.3	31.7	16.0	--
Fresh Water Tank	42.0	--	--	36.0
Distilled Water Tanks (4)	24.0	--	--	15.0
Tanks A and B (2)	48.3	--	--	100

Table 8.1B-2
HBRP
Emission Rates and Stack Parameters for Modeling Existing Humboldt Bay Power Plant Generating Units
Rev 8/07

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	PM10 Emission Rates, g/s
24-Hour Averaging Period, Full Load, Gas Firing in Boilers						
Boiler 1	3.150	36.576	408.000	110.07	14.128	0.600
Boiler 2	3.150	36.576	408.000	110.07	14.128	0.600
MEPP2	3.767	6.528	723.000	256.67	23.026	1.745
MEPP3	3.767	6.528	723.000	256.67	23.026	1.745
24-Hour Averaging Period, Part Load, Gas Firing in Boilers						
Boiler 1	3.150	36.576	408.000	96.86	12.432	0.528
Boiler 2	3.150	36.576	408.000	96.86	12.432	0.528
MEPP2	3.767	6.528	723.000	256.67	23.026	1.745
MEPP3	3.767	6.528	723.000	256.67	23.026	1.745
24-Hour Averaging Period, Full Load, Oil Firing in Boilers						
Boiler 1	3.150	36.576	422.500	106.16	13.626	8.274
Boiler 2	3.150	36.576	422.500	106.16	13.626	8.720
MEPP2	3.767	6.528	723.000	256.67	23.026	1.745
MEPP3	3.767	6.528	723.000	256.67	23.026	1.745
24-Hour Averaging Period, Part Load, Oil Firing in Boilers						
Boiler 1	3.150	36.576	422.500	93.42	11.991	7.281
Boiler 2	3.150	36.576	422.500	93.42	11.991	7.673
MEPP2	3.767	6.528	723.000	256.67	23.026	1.745
MEPP3	3.767	6.528	723.000	256.67	23.026	1.745
Annual Averaging Period						
Boiler 1	3.150	36.576	408.000	88.06	11.302	0.292
Boiler 2	3.150	36.576	408.000	88.06	11.302	0.355
MEPP2	3.767	6.528	723.000	256.67	23.026	0.072
MEPP3	3.767	6.528	723.000	256.67	23.026	0.070

Table 8.1B-3
HBRP
Emissions and Stack Parameters for Screening Modeling
Rev 8/07

Turbine Case	Load/ Ambient Temp	Stack Diam (m)	Stack Ht (m)	Exhaust Temp (deg K)	Exhaust Velocity (m/s)
1G	full/87	1.620	30.480	663.556	27.152
2G	low/87	1.620	30.480	697.444	16.441
3G	mid/87	1.620	30.480	692.444	22.686
4G	mid/21	1.620	30.480	686.333	22.784
5G	full/21	1.620	30.480	656.889	27.651
6G	low/21	1.620	30.480	697.444	16.856
1D	full/87	1.620	30.480	635.222	30.806
2D	low/87	1.620	30.480	642.444	18.613
3D	mid/87	1.620	30.480	621.889	25.044
4D	mid/21	1.620	30.480	584.111	25.252
5D	full/21	1.620	30.480	597.444	31.037
6D	low/21	1.620	30.480	599.111	18.223

Note: PM10 emission rate for Diesel mode cases reflect 1542 lb/day PM

Table 8.1B-4
HBRP
Results of the Screening Analysis for the Wärtsilä Reciprocating Engines
Revised 08/07

Screening Modeling Results (ug/m3 per 1.0 g/s, each engine)					
Operating Case	**AERMOD Results**				
	1-hr	3-hr	8-hr	24-hr*	annual
1G	501.91	361.21	214.35	72.59	6.71
2G	635.42	467.08	260.98	n/a	n/a
3G	549.37	381.47	233.73	79.24	n/a
4G	549.98	381.70	233.97	79.33	n/a
5G	499.85	359.51	212.86	72.08	6.66
6G	629.75	461.10	258.45	n/a	n/a
1D	481.18	345.04	200.74	67.95	6.32
2D	620.80	451.16	254.57	n/a	n/a
3D	545.77	379.96	231.97	78.63	n/a
4D	559.54	385.17	237.56	80.56	n/a
5D	492.80	353.73	207.78	70.35	6.52
6D	640.12	471.66	262.62	n/a	n/a

Emission Rates for Screening Modeling (g/s per engine)							
Operating Case	NOx		SO2		CO	PM10	
	1-hr	annual	short-term	annual	all	24-hr	annual
1G	0.391	0.501	0.050	0.013	0.516	0.454	0.342
2G	0.222	0.501	0.029	0.013	0.293	0.454	0.342
3G	0.306	0.501	0.039	0.013	0.404	0.454	0.342
4G	0.308	0.501	0.040	0.013	0.407	0.454	0.342
5G	0.395	0.501	0.051	0.013	0.521	0.454	0.342
6G	0.224	0.501	0.029	0.013	0.296	0.454	0.342
1D	2.510	n/a	0.027	n/a	0.873	***0.810***	n/a
2D	1.332	n/a	0.016	n/a	0.463	***0.810***	n/a
3D	1.921	n/a	0.021	n/a	0.668	***0.810***	n/a
4D	1.917	n/a	0.022	n/a	0.667	***0.810***	n/a
5D	2.504	n/a	0.028	n/a	0.871	***0.810***	n/a
6D	1.330	n/a	0.016	n/a	0.463	***0.810***	n/a

Operating Case	**Load/ Ambient Temp**	**Modeled Impacts, ug/m3, by Pollutant and Averaging Period**									
		NOx		SO2				CO		PM10	
		1-hr	Annual	1-hr	3-hr	24-hr	Annual	1-hr	8-hr	24-hr	Annual
1G	full/87	196.30	**3.361**	25.245	18.168	3.651	**0.0845**	258.96	110.59	32.93	**2.292**
2G	low/87	141.25	n/a	18.156	13.346	n/a	n/a	186.33	76.53	n/a	n/a
3G	mid/87	168.10	n/a	21.612	15.007	3.117	n/a	221.76	94.35	35.95	n/a
4G	mid/21	169.62	n/a	21.807	15.135	3.145	n/a	223.76	95.19	**35.98**	n/a
5G	full/21	**197.32**	3.339	**25.376**	**18.251**	**3.659**	0.0840	**260.30**	**110.85**	32.70	2.277
6G	low/21	141.22	n/a	18.152	13.291	n/a	n/a	186.30	76.46	n/a	n/a
1D	full/87	1207.53	n/a	13.177	9.449	1.861	n/a	420.12	175.26	55.02	n/a
2D	low/87	826.60	n/a	9.658	7.019	n/a	n/a	287.59	117.93	n/a	n/a
3D	mid/87	1048.59	n/a	11.690	8.138	1.684	n/a	364.82	155.06	63.67	n/a
4D	mid/21	1072.38	n/a	12.080	8.315	1.739	n/a	373.10	158.40	**65.23**	n/a
5D	full/21	**1233.97**	n/a	13.622	9.778	1.944	n/a	**429.32**	**181.01**	56.96	n/a
6D	low/21	851.15	n/a	10.046	7.402	n/a	n/a	296.13	121.49	n/a	n/a

Table 8.1B-5
HBRP
Emission Rates and Stack Parameters for HBRP
Rev 08/07

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
One-Hour Averaging Period: NOx and CO, emergency Diesel backup operation (Case 5D)									
ICE 1	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 2	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 3	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 4	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 5	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 6	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 7	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 8	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 9	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
ICE 10	1.620	30.480	597.444	63.98	31.037	2.504	2.764E-02	0.871	--
Emergency Gen.	0.152	3.048	769.611	1.588	87.073	--	--	--	--
Fire Pump Engine	0.127	12.192	838.556	0.568	44.856	--	--	--	--
One-Hour Averaging Period: Normal Operation (Case 5G)									
ICE 1	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 2	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 3	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 4	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 5	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 6	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 7	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 8	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 9	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
ICE 10	1.620	30.480	656.889	56.99	27.651	0.395	5.077E-02	0.521	--
Emergency Gen.	0.152	3.048	769.611	1.59	87.07	0.339	7.647E-04	8.210E-02	--
Fire Pump Engine	0.127	12.192	838.556	0.57	44.856	0.286	3.231E-04	3.442E-02	--
Three-Hour Averaging Period (Case 5G)									
ICE 1	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 2	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 3	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 4	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 5	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 6	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 7	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 8	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 9	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 10	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
Emergency Gen.	0.152	3.048	769.611	1.59	87.073	--	2.549E-04	--	--
Fire Pump Engine	0.127	12.192	838.556	0.57	44.856	--	1.077E-04	--	--
Eight-Hour Averaging Period, emergency Diesel backup operation (includes one startup) (Case 5D)									
ICE 1	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 2	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 3	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 4	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 5	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 6	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 7	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 8	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 9	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
ICE 10	1.620	30.480	597.444	63.98	31.037	--	--	1.165	--
Emergency Gen.	0.152	3.048	769.611	1.59	87.073	--	--	1.026E-02	--
Fire Pump Engine	0.127	12.192	838.556	0.57	44.856	--	--	4.302E-03	--

Table 8.1B-5 (cont'd)

						Emission Rates, g/s			
	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	NOx	SO2	CO	PM10
24-Hour Averaging Period: SO2 (Case 5G)									
ICE 1	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 2	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 3	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 4	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 5	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 6	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 7	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 8	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 9	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
ICE 10	1.620	30.480	656.889	56.99	27.651	--	5.077E-02	--	--
Emergency Gen.	0.152	3.048	769.611	1.59	87.073	--	3.186E-05	--	--
Fire Pump Engine	0.127	12.192	838.556	0.57	44.856	--	1.346E-05	--	--
24-Hour Averaging Period: PM10, emergency Diesel backup operation (Case 4D)									
ICE 1	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 2	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 3	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 4	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 5	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 6	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 7	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 8	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 9	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
ICE 10	1.620	30.480	584.111	52.05	25.252	--	--	--	***0.4818***
Emergency Gen.	0.152	3.048	769.611	1.59	87.073	--	--	--	--
Fire Pump Engine	0.127	12.192	838.556	0.57	44.856	--	--	--	--
24-Hour Averaging Period: PM10, normal operation (Case 4G)									
ICE 1	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 2	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 3	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 4	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 5	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 6	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 7	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 8	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 9	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
ICE 10	1.620	30.480	686.333	46.96	22.784	--	--	--	***4.536E-01***
Emergency Gen.	0.152	3.048	769.611	1.59	87.073	--	--	--	2.769E-04
Fire Pump Engine	0.127	12.192	838.556	0.57	44.856	--	--	--	3.403E-04
Annual Averaging Period (Case 1G)									
ICE 1	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 2	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 3	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 4	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 5	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 6	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 7	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 8	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 9	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
ICE 10	1.620	30.480	663.556	55.97	27.152	5.010E-01	1.260E-02	--	***3.393E-01***
Emergency Gen.	0.152	3.048	769.611	1.59	87.073	2.581E-03	4.365E-06	--	3.794E-05
Fire Pump Engine	0.127	12.192	838.556	0.57	44.856	1.631E-03	1.844E-06	--	4.661E-05

Table 8.1B-6
HBRP
Calculation of Inversion Fumigation Impacts from the ICEs
Rev 8/07
ICE Emission Rates, g/s per engine

Case	NOx	SO2	CO	PM10
1G	0.391	0.050	0.516	0.454
2G	0.222	0.029	0.293	0.454
3G	0.306	0.039	0.404	0.454
4G	0.308	0.040	0.407	0.454
5G	0.395	0.051	0.521	0.454
6G	0.224	0.029	0.296	0.454
1D	2.510	0.027	0.873	***0.810***
2D	1.332	0.016	0.463	***0.810***
3D	1.921	0.021	0.668	***0.810***
4D	1.917	0.022	0.667	***0.810***
5D	2.504	0.028	0.871	***0.810***
6D	1.330	0.016	0.463	***0.810***

Inversion Breakup Modeling Results from SCREEN3

	Unit Impacts,	Maximum One-Hour Avg Impacts, ug/m3, 10 engines				
Case	ug/m3 per g/s	NOx	SO2	CO	PM10	Distance to Maximum (m)
1G	3.045	11.9093	1.5316	15.7104	13.8121	8,363
2G	4.134	9.1897	1.1812	12.1228	18.7518	6,674
3G	3.355	10.2661	1.3198	13.5428	15.2183	7,786
4G	3.36	10.3627	1.3323	13.6702	15.2410	7,777
5G	3.024	11.9378	1.5352	15.7480	13.7169	8,405
6G	4.065	9.1160	1.1717	12.0255	18.4388	6,758
1D	2.867	71.9485	0.7851	25.0319	23.2134	8,742
2D	3.97	52.8610	0.6176	18.3911	32.1441	6,878
3D	3.329	63.9599	0.7130	22.2526	26.9541	7,831
4D	3.442	65.9673	0.7431	22.9510	27.8690	7,640
5D	2.960	74.1179	0.8182	25.7867	23.9664	8,538
6D	4.201	55.8592	0.6593	19.4342	34.0145	6,596

Table B-6 (cont'd)

Flat Terrain Modeling Results from SCREEN3

Case	Unit Impacts, ug/m3 per g/s	Maximum One-Hour Avg Impacts, ug/m3, 10 engines NOx	SO2	CO	PM10	Distance to Maximum (m)
1G	2.211	8.6474	1.1121	11.4075	10.0291	1,100
2G	3.393	7.5425	0.9695	9.9498	15.3906	926
3G	2.547	7.7937	1.0020	10.2812	11.5532	1,012
4G	2.553	7.8738	1.0123	10.3869	11.5804	1,011
5G	2.192	8.6533	1.1128	11.4152	9.9429	1,100
6G	3.318	7.4408	0.9564	9.8157	15.0504	932
1D	2.147	53.8798	0.5880	18.7456	17.3837	946
2D	3.216	42.8214	0.5003	14.8982	26.0392	941
3D	2.519	48.3974	0.5395	16.8381	20.3957	1,016
4D	2.64	50.5967	0.5699	17.6033	21.3754	1,001
5D	2.163	54.1612	0.5979	18.8434	17.5133	944
6D	3.465	46.0728	0.5438	16.0294	28.0553	920

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

Case	1-hr unit	3-hr unit	8-hr unit	24-hr unit
1G	3.045	2.6280	2.3674	2.2631
2G	4.134	3.7635	3.5319	3.4393
3G	3.355	2.9510	2.6985	2.5975
4G	3.360	2.9565	2.7043	2.6034
5G	3.024	2.6080	2.3480	2.2440
6G	4.065	3.6915	3.4581	3.3647
1D	2.867	2.5070	2.2820	2.1920
2D	3.970	3.5930	3.3574	3.2631
3D	3.329	2.9240	2.6709	2.5696
4D	3.442	3.0410	2.7904	2.6901
5D	2.960	2.5615	2.3124	2.2128
6D	4.201	3.8330	3.6030	3.5110

Table B-6 (cont'd)

Calculation of Fumigation Impacts from 10 Wartsila Reciprocating Engines

Case/Avg Period	NOx	SO2	CO	PM10
One-Hour				
1G	11.9093	1.5316	15.7104	-
2G	9.1897	1.1812	12.1228	-
3G	10.2661	1.3198	13.5428	-
4G	10.3627	1.3323	13.6702	-
5G	11.9378	**1.5352**	15.7480	-
6G	9.1160	1.1717	12.0255	-
1D	71.9485	0.7851	25.0319	-
2D	52.8610	0.6176	18.3911	-
3D	63.9599	0.7130	22.2526	-
4D	65.9673	0.7431	22.9510	-
5D	**74.1179**	0.8182	**25.7867**	-
6D	55.8592	0.6593	19.4342	-
3 Hours				
1G	-	1.1896	-	-
2G	-	0.9678	-	-
3G	-	1.0448	-	-
4G	-	1.0551	-	-
5G	-	**1.1916**	-	-
6G	-	0.9576	-	-
1D	-	0.6179	-	-
2D	-	0.5031	-	-
3D	-	0.5637	-	-
4D	-	0.5909	-	-
5D	-	0.6372	-	-
6D	-	0.5414	-	-
8 Hours				
1G	-	-	8.5500	-
2G	-	-	7.2501	-
3G	-	-	7.6249	-
4G	-	-	7.7018	-
5G	-	-	8.5593	-
6G	-	-	7.1610	-
1D	-	-	13.9470	-
2D	-	-	10.8872	-
3D	-	-	12.4973	-
4D	-	-	13.0242	-
5D	-	-	**14.1017**	-
6D	-	-	11.6675	-
24 Hours				
1G	-	**0.4553**	-	4.1062
2G	-	n/a	-	n/a
3G	-	0.4087	-	4.7129
4G	-	0.4129	-	4.7237
5G	-	0.4557	-	4.0715
6G	-	n/a	-	n/a
1D	-	0.2401	-	7.0992
2D	-	n/a	-	n/a
3D	-	0.2202	-	8.3223
4D	-	0.2323	-	**8.7125**
5D	-	0.2447	-	7.1666
6D	-	n/a	-	n/a

NOTES TO TABLE 8.1B-6

INVERSION BREAKUP FUMIGATION ANALYSIS

Inversion breakup fumigation is generally a short-term phenomenon and was evaluated here as persisting for up to 90 minutes. SCREEN3 was used to model 1-hour unit impacts from the engines under 2.5 m/s winds and F stability (for fumigation impacts) and under all meteorological conditions (shown in the table as "Inversion Breakup Modeling Results from SCREEN3"). Since SCREEN3 is a single-source model, each SCREEN3 run evaluated the impacts of 1 engine with an emission rate of 1.0 g/s per engine and SCREEN3 results are in units of $\mu g/m^3$ per 1.0 g/s.

For longer-term averaging periods, impacts were calculated using the highest modeled impact from SCREEN3 for the corresponding averaging period. A sample calculation for 24-hour average PM_{10} for Case 1G is as follows:

- For 1 engines, Case 1G, 1-hour average unit impact under inversion breakup conditions = 3.045 µg/m3 per 1.0 g/s
- For 1 engine, Case 1, max. 1-hour average unit impact from SCREEN3 = 2.211 µg/m3 per 1.0 g/s
- For a single engine, the appropriate unit impact for the 24-hour averaging period is calculated as 1.5 hours of inversion breakup fumigation plus 22.5 hours of operation under typical conditions (from SCREEN3): [(1.5 * 3.045 µg/m3 per g/s) + (22.5 * 2.211 µg/m3 per g/s)] ÷ 24 hrs = 2.263 $\mu g/m^3$ per g/s
- For 10 engines with an emission rate of 0.454 g/s each, the total 24-hour average PM_{10} impact under inversion breakup fumigation conditions is: 2.263 $\mu g/m^3$ per g/s * 0.454 g/s per engine* 0.4 [persistence factor for converting 1-hour average screening impact into 24-hour average concentration] * 10 engines = 4.106 $\mu g/m^3$

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Table 8.1B-7
HBRP
Calculation of Shoreline Fumigation Impacts from the Wärtsilä Reciprocating Engines
Rev 08/07
ICE Emission Rates, g/s per engine

Case	NOx	SO2	CO	PM10
1G	0.391	0.050	0.516	0.454
2G	0.222	0.029	0.293	0.454
3G	0.306	0.039	0.404	0.454
4G	0.308	0.040	0.407	0.454
5G	0.395	0.051	0.521	0.454
6G	0.224	0.029	0.296	0.454
1D	2.510	0.027	0.873	0.810
2D	1.332	0.016	0.463	0.810
3D	1.921	0.021	0.668	0.810
4D	1.917	0.022	0.667	0.810
5D	2.504	0.028	0.871	0.810
6D	1.330	0.016	0.463	0.810

Shoreline Fumigation Breakup Modeling Results from SCREEN3

	Impacts, ug/m3 per g/s	Maximum One-Hour Avg Impacts, ug/m3, 10 engines				Distance to Maximum (m)
Case		NO2 (1)	SO2	CO	PM10	
1G	21.22	82.99	10.67	109.48	96.25	564
2G	29.07	64.62	8.31	85.25	131.86	391
3G	23.48	71.85	9.24	94.78	106.51	503
4G	23.52	72.54	9.33	95.69	106.69	502
5G	21.07	83.18	10.70	109.73	95.57	568
6G	28.59	64.11	8.24	84.58	129.68	399
1D	19.93	222.98	5.46	174.01	161.37	603
2D	27.93	210.15	4.35	129.39	226.14	410
3D	23.29	217.71	4.99	155.68	188.57	508
4D	24.12	219.19	5.21	160.83	195.29	488
5D	20.61	224.57	5.70	179.55	166.87	582
6D	29.53	212.22	4.63	136.61	239.10	383

Note 1: NO2 concentrations were ozone limited using highest ozone reading at Ukiah for the 5-year period.

Table 8.1B-7 (cont'd)

Flat Terrain Modeling Results from SCREEN3

Case	Impacts, ug/m3 per g/s	Maximum One-Hour Avg Impacts, ug/m3, 10 engines				Distance to Maximum (m)
		NOx	SO2	CO	PM10	
1G	2.211	8.6474	1.1121	11.4075	10.0291	1,100
2G	3.393	7.5425	0.9695	9.9498	15.3906	926
3G	2.547	7.7937	1.0020	10.2812	11.5532	1,012
4G	2.553	7.8738	1.0123	10.3869	11.5804	1,011
5G	2.192	8.6533	1.1128	11.4152	9.9429	1,100
6G	3.318	7.4408	0.9564	9.8157	15.0504	932
1D	2.147	53.8798	0.5880	18.7456	17.3837	946
2D	3.216	42.8214	0.5003	14.8982	26.0392	941
3D	2.519	48.3974	0.5395	16.8381	20.3957	1,016
4D	2.640	50.5967	0.5699	17.6033	21.3754	1,001
5D	2.163	54.1612	0.5979	18.8434	17.5133	944
6D	3.465	46.0728	0.5438	16.0294	28.0553	920

Adjust unit impacts for longer averaging periods to account for 90-minute duration of fumigation (ug/m3 per g/s)

Case	1-hr unit	3-hr unit	8-hr unit	24-hr unit
1G	21.2200	11.7155	5.7752	3.3991
2G	29.0700	16.2315	8.2074	4.9978
3G	23.4800	13.0135	6.4719	3.8553
4G	23.5200	13.0365	6.4843	3.8634
5G	21.0700	11.6310	5.7316	3.3719
6G	28.5900	15.9540	8.0565	4.8975
1D	19.9300	11.0385	5.4813	3.2584
2D	27.9300	15.5730	7.8499	4.7606
3D	23.2900	12.9045	6.4136	3.8172
4D	24.1200	13.3800	6.6675	3.9825
5D	20.6100	11.3865	5.6218	3.3159
6D	29.5300	16.4975	8.3522	5.0941

Table 8.1B-7 (cont'd)

Calculation of Shoreline Fumigation Impacts from 10 Engines

Case/Avg Period	NO2	SO2	CO	PM10
One-Hour				
1G	82.9933	10.6731	109.4827	-
2G	64.6212	8.3063	85.2467	-
3G	71.8476	9.2369	94.7795	-
4G	72.5390	9.3259	95.6916	-
5G	83.1775	**10.6967**	109.7257	-
6G	64.1144	8.2407	84.5782	-
1D	222.9751	5.4578	174.0098	-
2D	210.1491	4.3451	129.3863	-
3D	217.7069	4.9884	155.6810	-
4D	219.1870	5.2071	160.8302	-
5D	**224.5671**	5.6968	**179.5485**	-
6D	212.2250	4.6343	136.6084	-
3 Hours				
1G	-	5.3033	-	-
2G	-	4.1741	-	-
3G	-	4.6075	-	-
4G	-	4.6522	-	-
5G	-	**5.3143**	-	-
6G	-	4.1387	-	-
1D	-	2.7206	-	-
2D	-	2.1804	-	-
3D	-	2.4876	-	-
4D	-	2.5997	-	-
5D	-	2.8326	-	-
6D	-	2.3301	-	-
8 Hours				
1G	-	-	20.8576	-
2G	-	-	16.8476	-
3G	-	-	18.2873	-
4G	-	-	18.4671	-
5G	-	-	20.8939	-
6G	-	-	16.6836	-
1D	-	-	33.5003	-
2D	-	-	25.4553	-
3D	-	-	30.0098	-
4D	-	-	31.1208	-
5D	-	-	**34.2830**	-
6D	-	-	27.0466	-
24 Hours				
1G	-	**0.6839**	-	6.1673
2G	-	n/a	-	n/a
3G	-	0.6067	-	6.9951
4G	-	0.6128	-	7.0098
5G	-	0.6847	-	6.1179
6G	-	n/a	-	n/a
1D	-	0.3569	-	10.5531
2D	-	n/a	-	n/a
3D	-	0.3270	-	12.3627
4D	-	0.3439	-	**12.8981**
5D	-	0.3666	-	10.7393
6D	-	n/a	-	n/a

NOTES TO TABLE 8.1B-7

SHORELINE FUMIGATION ANALYSIS

Shoreline fumigation was modeled for the engines using the default SCREEN3 TIBL factor of 6 at a distance to shoreline of 196 meters. As for inversion breakup fumigation, shoreline fumigation conditions were assumed to persist for up to 90 minutes. For longer-term averaging periods, impacts were calculated using the highest modeled impact from SCREEN3 for the corresponding averaging period. Since SCREEN3 is a single-source model, each SCREEN3 run evaluated the impacts of 1 engine with an emission rate of 1.0 g/s per engine and SCREEN3 results are in units of $\mu g/m^3$ per 1.0 g/s.

A sample calculation for 8-hour average CO for Case 3G follows.

- For 1 engine, Case 3G, 1-hour average unit impact under shoreline fumigation conditions = 23.48 μg/m3 per g/s
- For 1 engine, Case 3G, max. 1-hour average unit impact from SCREEN3 = 2.547 μg/m3 per g/s
- For a single engine, 8-hour unit impact is calculated as 90 minutes of shoreline fumigation plus 22.5 hours of operation under typical conditions (from SCREEN3): [(1.5 * 23.48 μg/m3 per g/s) + (6.5 * 2.547 μg/m3 per g/s)] ÷ 8 hrs = 6.472 $\mu g/m^3$ per g/s
- For 10 engines with an emission rate of 0.404 g/s, the total 8-hour average CO impact under shoreline fumigation conditions is: 6.472 $\mu g/m^3$ per g/s * 0.404 g/s per engine* 0.7 [persistence factor for converting 1-hour average screening impact into 8-hour average concentration] * 10 engines = 18.29 $\mu g/m^3$

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Table 8.1B-8
HBRP
Emission Rates and Stack Parameters for Modeling Startup Impacts
Assume all reciprocating engines in startup
Rev 8/07

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Em Rates, g/s	
						NOx	CO
Natural Gas Startup (Case 2D)							
Each Reciprocating Engine	1.62	30.48	697.4	33.9	16.441	2.97	3.03
Diesel Startup (Case 6D) (50% load, 30 minutes)							
Each Reciprocating Engine	1.62	30.48	599.1	37.6	18.223	7.34	3.21
Diesel Startup (Case 5D) (full load, 30 minutes)							
Each Reciprocating Engine	1.62	30.48	597.4	64.0	31.037	2.50	n/a

Table 8.1B-9
HBRP
Commissioning Emissions for the Wärtsilä Reciprocating Engines

Operating Mode	Hours of Operation per Engine During Activity Prd	Activity Duration, days	Average Engine Load, %	Consumed Natural Gas, scft	Consumed Diesel, gal	Total Hourly Emissions (lbs/hr) NOx	CO	ROC	PM10
Protection relay tests	3	1	100	39,948	0	323.3	197.1	86.6	24.5
Test run and tuning	50	3	75	436,847	0	242.5	147.9	65.0	18.4
Crankshaft and generator coupling adjustments	4	1	100	46,597	0	323.3	197.2	86.6	24.5
SCR tuning, Natural Gas	8	1	75	69,895	0	11.2	14.8	18.2	18.4
SCR tuning, Diesel Fuel	8	1	75	0	31,443	71.7	25.0	28.5	40.5

Notes:
1. Commissioning schedule, engine load and emissions estimate provided by Wärtsilä. Schedule calls for natural gas operation during commissioning activities except for SCR tuning on Diesel fuel.
2. Each group of 5 engines will be commissioned simultaneously. Emissions shown reflect 5 engines in operation.
3. Activities shown do not include zero-emission (no fuel consumption) or fully controlled (reliability and emissions testing) commissioning activities. Cumulative time for initial commissioning is expected to be 15 to 30 days for each group of 5 engines, or up to 60 days total. Performance and emissions testing will occur for a period of 45 to 90 days following completion of initial conditioning.

Table 8.1B-10
HBRP
Emission Rates and Stack Parameters for Modeling Commissioning Impacts
Rev 08/07

Operating Mode	Hours of Operation per Engine During Activity Prd	Activity Duration, days	Hours of Operation per Day in Mode	Average Engine Load, %	Total Hourly Emissions (lbs/hr) (5 engines in operation) NOx	CO	PM10
Test run and tuning	50	3	18	75	242.5	147.9	18.4
Alignment	4	1	4	100	323.3	197.2	24.5
SCR tuning on Diesel	8	1	8	75	71.7	25.0	40.5

	Emission Rate for Avg Prd, g/s, EACH, 5 engines				Unit Impact Modeling Result, ug/m3 per g/s, 10 engines			Operating Case (from Table 8.1B-4)
Operating Mode	NOx 1 hr	CO 1 hr	CO 8 hr	PM10 24 hr	1 hr avg	8 hr avg	24 hr avg	
Test run and tuning	6.11	3.73	3.73	0.35	549.98	233.97	79.33	Case 4G
Alignment	8.15	4.97	2.48	0.103	501.91	214.35	72.59	Case 1G
SCR tuning on Diesel	1.81	0.63	0.63	0.34	559.54	237.56	80.56	Case 4D

Modeling Parameters for 1-hour Average NO2 Impacts: 5 engines, EACH									
	Stack Diam (m)	Stack Ht (m)	Exhaust Temp (deg K)	Exh Velocity (m/s)	NOx Em, g/s per engine	Stack Diam (ft)	Stack Ht (ft)	Exhaust Temp (deg F)	Flow Rate (acfm)
Test run and tuning	1.620	30.480	686.333	22.784	6.111	5.32	100.0	776.0	99,509
Alignment	1.620	30.480	663.556	27.152	8.148	5.32	100.0	735.0	118,586
SCR tuning on Diesel	1.620	30.480	584.111	25.252	1.807	5.32	100.0	592.0	110,290

	Max. Modeled Impact During Commissioning, ug/m3			
Operating Mode	NO2 1 hr ozone lmtd	CO 1 hr	CO 8 hr	PM10 24 hr
Test run and tuning	222.3	1024.6	435.9	13.8
Alignment	233.3	1246.8	266.2	3.7
SCR tuning on Diesel	177.1	176.1	74.8	13.7

Table 8.1B-11A
Ozone Limiting Calculation for CTSCREEN Results
HBRP Normal Operations

1-hour average NO2, Diesel mode										
	conc, ppm					conc, ug/m3				
Pollutant	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.192	0.192	0.192	0.192	0.192	361.0	361.0	361.0	361.0	361.0
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.089	0.111	0.097	0.089	0.107	167.7	209.1	182.7	167.7	201.5

Table 8.1B-11B
Ozone Limiting Calculation for CTSCREEN Results
HBRP Commissioning Activities

Test Run

Pollutant	conc, ppm					conc, ug/m3				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.262	0.262	0.262	0.262	0.262	493.0	493.0	493.0	493.0	493.0
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.096	0.118	0.104	0.096	0.114	180.9	222.3	195.9	180.9	214.7

Alignment

Pollutant	conc, ppm					conc, ug/m3				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.321	0.321	0.321	0.321	0.321	603.4	603.4	603.4	603.4	603.4
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.102	0.124	0.110	0.102	0.120	191.9	233.3	207.0	191.9	225.8

Table 8.1B-11C
Ozone Limiting Calculation for CTSCREEN Results
HBRP Startup

Natural Gas only										
	conc, ppm					conc, ug/m3				
Pollutant	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.302	0.302	0.302	0.302	0.302	567.4	567.4	567.4	567.4	567.4
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.100	0.122	0.108	0.100	0.118	188.3	229.7	203.4	188.3	222.2

Diesel-- normal conditions										
	conc, ppm					conc, ug/m3				
Pollutant	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.755	0.755	0.755	0.755	0.755	1420.0	1420.0	1420.0	1420.0	1420.0
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.146	0.168	0.154	0.146	0.164	273.6	315.0	288.6	273.6	307.4
Diesel-- full load										
	conc, ppm					conc, ug/m3				
Pollutant	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.189	0.189	0.189	0.189	0.189	356.1	356.1	356.1	356.1	356.1
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.089	0.111	0.097	0.089	0.107	167.2	208.6	182.3	167.2	201.1
Average						220.4	261.8	235.4	220.4	254.2

Diesel-- Emergency only										
	conc, ppm					conc, ug/m3				
Pollutant	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.878	0.878	0.878	0.878	0.878	1650.2	1650.2	1650.2	1650.2	1650.2
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.158	0.180	0.166	0.158	0.176	296.6	338.0	311.7	296.6	330.5

Table 8.1B-11D
Ozone Limiting Calculation for CTSCREEN Results
HBRP Shoreline Fumigation

Pollutant	conc, ppm					conc, ug/m3				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Max 1-hr NOx	0.209	0.209	0.209	0.209	0.209	392.6	392.6	392.6	392.6	392.6
Max 1-hr ozone	0.07	0.092	0.078	0.07	0.088					
Max 1-hr NO2	0.091	0.113	0.099	0.091	0.109	170.9	212.2	185.9	170.9	204.7

Table 8.1B-12
HBRP
PM2.5 24-Hour Average Modeling Results

	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
Date	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
1/1/2001	1.31E-01	7.12E-02	7.87778	4.36556	7.88	4.37	21.9	29.78	26.27
1/2/2001	1.78E-01	9.76E-02	0.05086	0.00489	0.18	0.10	21.9	22.08	22.00
1/3/2001	1.89E+00	1.03E+00	2.56561	0.75454	2.57	1.03	21.9	24.47	22.93
1/4/2001	1.77E+00	9.65E-01	2.46722	0.29956	2.47	0.96	21.9	24.37	22.86
1/5/2001	7.56E-01	4.19E-01	1.95153	1.02411	1.95	1.02	21.9	23.85	22.92
1/6/2001	2.46E+00	1.35E+00	2.44222	0.96111	2.46	1.35	21.9	24.36	23.25
1/7/2001	8.99E+00	4.99E+00	0.55455	0.12941	8.99	4.99	9.9	18.89	14.89
1/8/2001	8.38E-01	4.60E-01	1.72486	0.84887	1.72	0.85	9.9	11.62	10.75
1/9/2001	5.03E+00	2.80E+00	0.47833	0.23908	5.03	2.80	9.9	14.93	12.70
1/10/2001	3.83E+00	2.11E+00	0.08554	0.0464	3.83	2.11	9.9	13.73	12.01
1/11/2001	6.51E-01	3.56E-01	4.44928	2.43424	4.45	2.43	9.9	14.35	12.33
1/12/2001	1.07E+00	5.88E-01	10.27159	5.49788	10.27	5.50	9.9	20.17	15.40
1/13/2001	5.34E-01	2.97E-01	0.69528	0.17495	0.70	0.30	18.7	19.35	18.95
1/14/2001	1.46E+00	8.02E-01	1.53194	0.84183	1.53	0.84	18.7	20.18	19.49
1/15/2001	1.11E+00	6.05E-01	0.00000	0.00000	1.11	0.61	18.7	19.76	19.26
1/16/2001	6.79E-01	3.77E-01	2.39778	0.00381	2.40	0.38	18.7	21.05	19.03
1/17/2001	4.63E-01	2.56E-01	2.27389	0.74056	2.27	0.74	27.4	29.67	28.14
1/18/2001	5.93E-01	3.27E-01	1.46722	0.17523	1.47	0.33	27.4	28.87	27.73
1/19/2001	7.73E-01	4.30E-01	2.65567	1.45556	2.66	1.46	27.4	30.06	28.86
1/20/2001	4.54E+00	2.52E+00	0.03792	0.02138	4.54	2.52	27.4	31.94	29.92
1/21/2001	9.98E-01	5.55E-01	6.26022	3.33278	6.26	3.33	27.4	33.66	30.73
1/22/2001	1.91E+00	1.06E+00	1.4275	0.46589	1.91	1.06	27.4	29.31	28.46
1/23/2001	5.96E+00	3.29E+00	0.566	0.31028	5.96	3.29	27.4	33.36	30.69
1/24/2001	1.39E+00	7.65E-01	4.38667	2.41778	4.39	2.42	27.4	31.79	29.82
1/25/2001	9.98E+00	5.50E+00	0.00007	0	9.98	5.50	25.0	34.98	30.50
1/26/2001	3.82E+00	2.10E+00	0.03191	0	3.82	2.10	25.0	28.82	27.10
1/27/2001	2.64E+00	1.46E+00	0.66455	0.37618	2.64	1.46	25.0	27.64	26.46
1/28/2001	8.26E-01	4.57E-01	1.70489	0.40894	1.70	0.46	25.0	26.70	25.46
1/29/2001	9.78E-01	5.40E-01	4.93195	2.71974	4.93	2.72	25.0	29.93	27.72
1/30/2001	2.64E-02	2.40E-02	2.67111	1.44302	2.67	1.44	25.0	27.67	26.44
1/31/2001	1.38E-01	7.59E-02	1.50678	0.83118	1.51	0.83	29.0	30.51	29.83
2/1/2001	2.71E-01	1.48E-01	1.41167	0.29312	1.41	0.29	29.0	30.41	29.29
2/2/2001	1.06E+00	5.74E-01	4.76598	2.33189	4.77	2.33	29.0	33.77	31.33
2/3/2001	9.76E-01	5.37E-01	0	0	0.98	0.54	29.0	29.98	29.54
2/4/2001	2.46E+00	1.34E+00	5.93324	3.23275	5.93	3.23	29.0	34.93	32.23
2/5/2001	7.05E-01	3.90E-01	12.09638	7.01696	12.10	7.02	29.0	41.10	36.02
2/6/2001	2.16E+00	1.19E+00	15.69632	8.17595	15.70	8.18	4.3	20.00	12.48
2/7/2001	1.84E+00	1.01E+00	3.89385	2.11174	3.89	2.11	4.3	8.19	6.41
2/8/2001	1.16E+00	6.40E-01	0.55778	0	1.16	0.64	4.3	5.46	4.94
2/9/2001	1.82E+00	9.90E-01	0.00305	0.00179	1.82	0.99	4.3	6.12	5.29
2/10/2001	1.63E+00	9.11E-01	0.65763	0.1773	1.63	0.91	4.3	5.93	5.21
2/11/2001	3.52E+00	1.97E+00	0.0117	0.00672	3.52	1.97	4.3	7.82	6.27
2/12/2001	1.31E+00	7.19E-01	0.99278	0.53717	1.31	0.72	23.5	24.81	24.22
2/13/2001	1.46E+00	8.01E-01	3.42924	1.87139	3.43	1.87	23.5	26.93	25.37
2/14/2001	1.12E+00	6.11E-01	0.17856	0.00417	1.12	0.61	23.5	24.62	24.11
2/15/2001	5.10E+00	2.84E+00	0.75182	0.41286	5.10	2.84	23.5	28.60	26.34
2/16/2001	4.54E+00	2.47E+00	0.00001	0.00001	4.54	2.47	23.5	28.04	25.97
2/17/2001	3.43E+00	1.88E+00	0.35787	0.09339	3.43	1.88	23.5	26.93	25.38
2/18/2001	1.78E+00	9.98E-01	0.17467	0.07933	1.78	1.00	8.3	10.08	9.30
2/19/2001	7.47E+00	4.13E+00	0.00019	0.00011	7.47	4.13	8.3	15.77	12.43
2/20/2001	8.41E+00	4.62E+00	0.00039	0.00007	8.41	4.62	8.3	16.71	12.92
2/21/2001	4.69E+00	2.58E+00	0.21089	0.00032	4.69	2.58	8.3	12.99	10.88
2/22/2001	2.84E+00	1.56E+00	0.39711	0.09661	2.84	1.56	8.3	11.14	9.86
2/23/2001	1.72E+00	9.50E-01	2.89111	1.63278	2.89	1.63	8.3	11.19	9.93
2/24/2001	3.86E+00	2.16E+00	8.00948	4.38143	8.01	4.38	3.8	11.81	8.18
2/25/2001	1.10E+00	6.07E-01	4.58167	2.57589	4.58	2.58	3.8	8.38	6.38
2/26/2001	1.71E+00	9.39E-01	1.42	0.77167	1.71	0.94	3.8	5.51	4.74
2/27/2001	6.42E-01	3.52E-01	4.2286	1.30261	4.23	1.30	3.8	8.03	5.10
2/28/2001	6.86E-01	3.78E-01	1.99498	1.02724	1.99	1.03	3.8	5.79	4.83
3/1/2001	5.67E+00	3.15E+00	3.14182	1.73182	5.67	3.15	3.8	9.47	6.95
3/2/2001	1.99E+00	1.10E+00	10.40449	5.68808	10.40	5.69	4.7	15.05	10.34
3/3/2001	8.67E-01	4.83E-01	2.48889	0.80722	2.49	0.81	4.7	7.14	5.46
3/4/2001	4.11E+00	2.28E+00	3.42087	1.85304	4.11	2.28	4.7	8.76	6.93
3/5/2001	1.26E+00	6.84E-01	7.86667	4.34725	7.87	4.35	4.7	12.52	9.00
3/6/2001	1.23E+00	6.72E-01	2.57889	1.44889	2.58	1.45	4.7	7.23	6.10
3/7/2001	9.17E-01	5.04E-01	7.20234	3.85545	7.20	3.86	4.7	11.85	8.51
3/8/2001	3.04E+00	1.67E+00	19.19967	9.4368	19.20	9.44	5.5	24.70	14.94
3/9/2001	2.14E+00	1.19E+00	9.53062	5.35283	9.53	5.35	5.5	15.03	10.85
3/10/2001	3.57E+00	1.97E+00	10.15734	4.35549	10.16	4.36	5.5	15.66	9.86
3/11/2001	3.27E+00	1.82E+00	12.15563	5.73408	12.16	5.73	5.5	17.66	11.23
3/12/2001	1.11E+00	6.17E-01	0.44772	0.11588	1.11	0.62	5.5	6.61	6.12
3/13/2001	1.31E+00	7.20E-01	5.63618	3.15635	5.64	3.16	5.5	11.14	8.66
3/14/2001	1.37E+00	7.56E-01	1.10556	0.59223	1.37	0.76	8.9	10.27	9.66
3/15/2001	7.21E-01	3.94E-01	7.10817	3.78526	7.11	3.79	8.9	16.01	12.69
3/16/2001	9.38E-01	5.14E-01	3.25075	1.63029	3.25	1.63	8.9	12.15	10.53
3/17/2001	1.23E+00	6.75E-01	1.80033	0.15578	1.80	0.67	8.9	10.70	9.57
3/18/2001	2.01E+00	1.11E+00	1.80723	0.99446	2.01	1.11	8.9	10.91	10.01
3/19/2001	7.56E-01	4.17E-01	4.77092	2.23083	4.77	2.23	8.9	13.67	11.13
3/20/2001	1.21E+00	6.69E-01	6.62222	3.66389	6.62	3.66	11.6	18.22	15.26
3/21/2001	1.61E+00	8.94E-01	2.46508	0.76538	2.47	0.89	11.6	14.07	12.49
3/22/2001	7.20E-01	3.95E-01	8.66575	4.82513	8.67	4.83	11.6	20.27	16.43
3/23/2001	5.47E-01	3.01E-01	7.35017	3.49	7.35	3.49	11.6	18.95	15.09
3/24/2001	6.91E+00	3.80E+00	0.28709	0.13275	6.91	3.80	11.6	18.51	15.40
3/25/2001	9.45E-01	5.22E-01	8.26955	4.83189	8.27	4.83	11.6	19.87	16.43
3/26/2001	1.74E+00	9.58E-01	10.3653	5.68529	10.37	5.69	12.9	23.27	18.59
3/27/2001	5.56E-01	3.09E-01	3.02444	1.66444	3.02	1.66	12.9	15.92	14.56
3/28/2001	6.10E-01	3.39E-01	5.40755	3.03895	5.41	3.04	12.9	18.31	15.94
3/29/2001	1.90E+00	1.05E+00	16.99978	9.29317	17.00	9.29	12.9	29.90	22.19
3/30/2001	1.12E+00	6.21E-01	7.91861	4.36116	7.92	4.36	12.9	20.82	17.26
3/31/2001	1.09E+00	6.04E-01	29.76078	16.35254	29.76	16.35	12.9	42.66	29.25
4/1/2001	1.54E+00	8.47E-01	15.00822	8.38306	15.01	8.38	3.5	18.51	11.88
4/2/2001	1.82E+00	1.00E+00	0.94406	0.51572	1.82	1.00	3.5	5.32	4.50

Date	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
4/3/2001	1.97E+00	1.09E+00	0	0.00005	1.97	1.09	3.5	5.47	4.59
4/4/2001	2.94E+00	1.62E+00	2.63445	1.44773	2.94	1.62	3.5	6.44	5.12
4/5/2001	2.06E+00	1.13E+00	0.27833	0.15544	2.06	1.13	3.5	5.56	4.63
4/6/2001	1.06E+00	5.88E-01	7.23889	4.00056	7.24	4.00	3.5	10.74	7.50
4/7/2001	2.06E+00	1.14E+00	2.28789	1.26722	2.29	1.27	5.6	7.89	6.87
4/8/2001	3.05E+00	1.76E+00	2.60295	0.18382	3.05	1.76	5.6	8.65	7.36
4/9/2001	3.95E+00	2.19E+00	6.34659	3.49639	6.35	3.50	5.6	11.95	9.10
4/10/2001	5.41E-01	3.00E-01	0.60667	0.33211	0.61	0.33	5.6	6.21	5.93
4/11/2001	3.58E+00	1.98E+00	2.25933	0.93843	3.58	1.98	5.6	9.18	7.58
4/12/2001	7.22E-01	4.56E-01	1.93401	1.06065	1.93	1.06	5.6	7.53	6.66
4/13/2001	2.69E+00	1.49E+00	1.82111	0.98606	2.69	1.49	6.8	9.49	8.29
4/14/2001	2.50E+00	1.47E+00	2.74167	1.11776	2.74	1.47	6.8	9.54	8.27
4/15/2001	3.22E+00	1.79E+00	0.46554	0.15576	3.22	1.79	6.8	10.02	8.59
4/16/2001	6.22E+00	3.47E+00	0.23845	0.01998	6.22	3.47	6.8	13.02	10.27
4/17/2001	3.93E+00	2.19E+00	0.54739	0.07218	3.93	2.19	6.8	10.73	8.99
4/18/2001	9.26E-01	5.10E-01	6.0739	3.35172	6.07	3.35	6.8	12.87	10.15
4/19/2001	1.99E+00	1.10E+00	0.58013	0.17403	1.99	1.10	6.5	8.49	7.60
4/20/2001	1.47E+00	8.19E-01	0.8515	0.48956	1.47	0.82	6.5	7.97	7.32
4/21/2001	1.96E+00	1.09E+00	4.85709	2.66114	4.86	2.66	6.5	11.36	9.16
4/22/2001	1.19E+00	6.56E-01	7.84744	4.05605	7.85	4.06	6.5	14.35	10.56
4/23/2001	3.44E+00	1.91E+00	13.15944	7.30919	13.16	7.31	6.5	19.66	13.81
4/24/2001	2.18E+00	1.21E+00	22.53251	12.47625	22.53	12.48	6.5	29.03	18.98
4/25/2001	9.96E-01	5.47E-01	7.34129	4.11066	7.34	4.11	3.4	10.74	7.51
4/26/2001	1.06E+00	5.77E-01	7.98467	4.05598	7.98	4.06	3.4	11.38	7.46
4/27/2001	1.84E+00	1.03E+00	2.00237	0.49489	2.00	1.03	3.4	5.40	4.43
4/28/2001	2.86E+00	1.58E+00	4.00389	2.23056	4.00	2.23	3.4	7.40	5.63
4/29/2001	1.29E+00	7.08E-01	0.75495	0.22994	1.29	0.71	3.4	4.69	4.11
4/30/2001	9.13E-01	5.41E-01	3.38289	1.8769	3.38	1.88	3.4	6.78	5.28
5/1/2001	5.44E+00	3.02E+00	9.15108	4.8411	9.15	4.84	8.9	18.05	13.74
5/2/2001	4.68E+00	2.59E+00	5.67803	2.91437	5.68	2.91	8.9	14.58	11.81
5/3/2001	2.47E+00	1.36E+00	2.42444	1.32222	2.47	1.36	8.9	11.37	10.26
5/4/2001	2.50E+00	1.39E+00	5.37306	2.9675	5.37	2.97	8.9	14.27	11.87
5/5/2001	2.24E+00	1.24E+00	3.7643	1.8703	3.76	1.87	8.9	12.66	10.77
5/6/2001	2.12E+00	1.17E+00	0.00572	0.00329	2.12	1.17	8.9	11.02	10.07
5/7/2001	2.78E+00	1.54E+00	9.78	5.33222	9.78	5.33	8.5	18.28	13.83
5/8/2001	2.01E+00	1.09E+00	8.69643	4.76619	8.70	4.77	8.5	17.20	13.27
5/9/2001	8.29E-01	4.58E-01	19.35112	10.92896	19.35	10.93	8.5	27.85	19.43
5/10/2001	1.93E+00	1.06E+00	1.46706	0.83033	1.93	1.06	8.5	10.43	9.56
5/11/2001	2.73E+00	1.51E+00	5.71173	0.86436	5.71	1.51	8.5	14.21	10.01
5/12/2001	1.03E+00	5.58E-01	9.15268	5.03876	9.15	5.04	8.5	17.65	13.54
5/13/2001	4.07E+00	2.25E+00	3.4451	1.87326	4.07	2.25	6.4	10.47	8.65
5/14/2001	2.86E+00	1.58E+00	0.0004	0.00023	2.86	1.58	6.4	9.26	7.98
5/15/2001	2.91E+00	1.60E+00	3.10571	1.71579	3.11	1.72	6.4	9.51	8.12
5/16/2001	3.85E+00	2.12E+00	18.67054	10.33815	18.67	10.34	6.4	25.07	16.74
5/17/2001	2.57E+00	1.42E+00	3.59016	1.52067	3.59	1.52	6.4	9.99	7.92
5/18/2001	1.52E+00	8.38E-01	3.14328	0.40648	3.14	0.84	6.4	9.54	7.24
5/19/2001	2.12E+00	1.17E+00	2.33527	0.64981	2.34	1.17	11.6	13.94	12.77
5/20/2001	3.38E+00	1.86E+00	3.29167	1.41389	3.38	1.86	11.6	14.98	13.46
5/21/2001	2.09E+00	1.15E+00	2.67204	0.80099	2.67	1.15	11.6	14.27	12.75
5/22/2001	1.71E+00	9.35E-01	3.42737	0.88504	3.43	0.94	11.6	15.03	12.54
5/23/2001	1.41E+00	7.64E-01	11.1118	6.17383	11.11	6.17	11.6	22.71	17.77
5/24/2001	7.35E-01	4.02E-01	10.75667	6.04556	10.76	6.05	11.6	22.36	17.65
5/25/2001	1.30E+00	7.21E-01	1.83053	1.00071	1.83	1.00	9.8	11.63	10.80
5/26/2001	1.53E+00	8.40E-01	1.70187	0.94209	1.70	0.94	9.8	11.50	10.74
5/27/2001	2.36E+00	1.30E+00	1.71	0.97044	2.36	1.30	9.8	12.16	11.10
5/28/2001	1.20E+00	6.59E-01	7.24796	3.7846	7.25	3.78	9.8	17.05	13.58
5/29/2001	2.09E+00	1.15E+00	9.92521	5.39858	9.93	5.40	9.8	19.73	15.20
5/30/2001	1.25E+00	6.91E-01	6.34778	2.69833	6.35	2.70	9.8	16.15	12.50
5/31/2001	8.87E-01	4.82E-01	4.78393	2.32778	4.78	2.33	14.3	19.08	16.63
6/1/2001	1.46E+00	8.01E-01	17.70878	9.77069	17.71	9.77	14.3	32.01	24.07
6/2/2001	3.57E+00	1.97E+00	9.44762	5.19119	9.45	5.19	14.3	23.75	19.49
6/3/2001	3.21E+00	1.78E+00	6.28905	3.46589	6.29	3.47	14.3	20.59	17.77
6/4/2001	2.10E+00	1.15E+00	9.21852	4.90001	9.22	4.90	14.3	23.52	19.20
6/5/2001	2.05E+00	1.22E+00	1.73284	0.28313	2.05	1.22	14.3	16.35	15.52
6/6/2001	1.99E+00	1.09E+00	7.37583	4.06819	7.38	4.07	3.7	11.08	7.77
6/7/2001	1.62E+00	8.89E-01	2.12111	1.16256	2.12	1.16	3.7	5.82	4.86
6/8/2001	2.74E+00	1.51E+00	7.34721	4.12056	7.35	4.12	3.7	11.05	7.82
6/9/2001	2.02E+00	1.11E+00	5.69253	3.17062	5.69	3.17	3.7	9.39	6.87
6/10/2001	2.79E+00	1.54E+00	2.75683	0.86222	2.79	1.54	3.7	6.49	5.24
6/11/2001	1.48E+00	8.03E-01	13.19773	7.27142	13.20	7.27	3.7	16.90	10.97
6/12/2001	2.77E+00	1.53E+00	23.25981	12.85234	23.26	12.85	4.8	28.01	17.60
6/13/2001	2.26E+00	1.25E+00	5.18394	2.86778	5.18	2.87	4.8	9.93	7.62
6/14/2001	2.26E+00	1.24E+00	11.24983	5.91989	11.25	5.92	4.8	16.00	10.67
6/15/2001	2.00E+00	1.10E+00	7.34638	4.05954	7.35	4.06	4.8	12.10	8.81
6/16/2001	2.78E+00	1.53E+00	8.46667	4.72	8.47	4.72	4.8	13.22	9.47
6/17/2001	2.60E+00	1.42E+00	2.73556	1.19	2.74	1.42	4.8	7.49	6.17
6/18/2001	2.22E+00	1.21E+00	4.95167	2.79	4.95	2.79	5.8	10.75	8.59
6/19/2001	2.29E+00	1.25E+00	0.71778	0.26189	2.29	1.25	5.8	8.09	7.05
6/20/2001	2.19E+00	1.20E+00	0.80356	0.44556	2.19	1.20	5.8	7.99	7.00
6/21/2001	1.71E+00	9.48E-01	15.93889	8.84787	15.94	8.85	5.8	21.74	14.65
6/22/2001	2.20E+00	1.24E+00	7.87526	3.85002	7.88	3.85	5.8	13.68	9.65
6/23/2001	1.55E+00	8.52E-01	9.4332	5.14461	9.43	5.14	5.8	15.23	10.94
6/24/2001	2.58E+00	1.42E+00	5.52173	3.04671	5.52	3.05	4.3	9.82	7.35
6/25/2001	1.23E+00	6.78E-01	7.7693	4.28025	7.77	4.28	4.3	12.07	8.58
6/26/2001	1.21E+01	6.66E+00	0.00032	0.00018	12.07	6.66	4.3	16.37	10.96
6/27/2001	4.49E+00	2.51E+00	6.61379	2.19855	6.61	2.51	4.3	10.91	6.81
6/28/2001	1.10E+00	5.98E-01	14.29401	7.923	14.29	7.92	4.3	18.59	12.22
6/29/2001	1.97E+00	1.09E+00	10.13796	5.55177	10.14	5.55	4.3	14.44	9.85
6/30/2001	2.01E+00	1.12E+00	15.95239	8.81135	15.95	8.81	3.5	19.45	12.31
7/1/2001	2.43E+00	1.34E+00	7.22223	4.05794	7.22	4.06	3.5	10.72	7.56
7/2/2001	1.67E+00	9.24E-01	0.53161	0.29258	1.67	0.92	3.5	5.17	4.42
7/3/2001	1.72E+00	9.46E-01	6.38866	3.53818	6.39	3.54	3.5	9.89	7.04
7/4/2001	1.17E+00	6.46E-01	7.81706	4.31678	7.82	4.32	3.5	11.32	7.82
7/5/2001	1.17E+00	6.39E-01	0.43183	0.17789	1.17	0.64	3.5	4.67	4.14
7/6/2001	1.45E+00	7.98E-01	2.5848	0.6814	2.58	0.80	9.9	12.48	10.70
7/7/2001	1.34E+00	7.37E-01	4.87952	2.65755	4.88	2.66	9.9	14.78	12.56
7/8/2001	1.28E+00	6.98E-01	1.6035	0.88067	1.60	0.88	9.9	11.50	10.78

	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
Date	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
7/9/2001	2.70E+00	1.48E+00	4.78886	2.65693	4.79	2.66	9.9	14.69	12.56
7/10/2001	2.12E+00	1.16E+00	1.92885	0.61863	2.12	1.16	9.9	12.02	11.06
7/11/2001	1.40E+00	7.61E-01	6.81667	3.75444	6.82	3.75	9.9	16.72	13.65
7/12/2001	1.20E+00	6.67E-01	7.91623	4.24828	7.92	4.25	5.2	13.12	9.45
7/13/2001	1.12E+00	6.18E-01	6.45903	3.62922	6.46	3.63	5.2	11.66	8.83
7/14/2001	9.51E-01	5.19E-01	5.88351	3.22775	5.88	3.23	5.2	11.08	8.43
7/15/2001	2.08E+00	1.15E+00	6.62026	3.48585	6.62	3.49	5.2	11.82	8.69
7/16/2001	2.81E+00	1.55E+00	9.4967	5.20201	9.50	5.20	5.2	14.70	10.40
7/17/2001	2.35E+00	1.29E+00	6.19381	3.3722	6.19	3.37	5.2	11.39	8.57
7/18/2001	2.34E+00	1.30E+00	10.41778	5.85722	10.42	5.86	4.2	14.62	10.06
7/19/2001	1.08E+00	5.96E-01	6.60233	3.70421	6.60	3.70	4.2	10.80	7.90
7/20/2001	1.29E+00	7.09E-01	9.45	5.18635	9.45	5.19	4.2	13.65	9.39
7/21/2001	2.71E+00	1.51E+00	13.32787	7.30063	13.33	7.30	4.2	17.53	11.50
7/22/2001	1.10E+00	5.96E-01	3.00003	1.62099	3.00	1.62	4.2	7.20	5.82
7/23/2001	1.75E+00	9.63E-01	3.89978	2.16222	3.90	2.16	4.2	8.10	6.36
7/24/2001	2.03E+00	1.12E+00	1.78149	0.49604	2.03	1.12	10.0	12.03	11.12
7/25/2001	1.96E+00	1.08E+00	1.42945	0.78838	1.96	1.08	10.0	11.96	11.08
7/26/2001	3.03E+00	1.67E+00	1.56213	0.39172	3.03	1.67	10.0	13.03	11.67
7/27/2001	1.46E+00	8.07E-01	9.39401	5.17831	9.39	5.18	10.0	19.39	15.18
7/28/2001	2.93E+00	1.63E+00	1.11741	0.64444	2.93	1.63	10.0	12.93	11.63
7/29/2001	1.36E+00	7.48E-01	1.20408	0.40117	1.36	0.75	10.0	11.36	10.75
7/30/2001	1.01E+00	5.52E-01	10.27782	5.63962	10.28	5.64	2.7	12.98	8.34
7/31/2001	1.63E+00	8.88E-01	7.3513	4.11183	7.35	4.11	2.7	10.05	6.81
8/1/2001	2.15E+00	1.18E+00	13.74811	7.61033	13.75	7.61	2.7	16.45	10.31
8/2/2001	6.26E-01	3.46E-01	13.25739	7.15406	13.26	7.15	2.7	15.96	9.85
8/3/2001	2.63E+00	1.45E+00	5.84047	3.23556	5.84	3.24	2.7	8.54	5.94
8/4/2001	1.28E+00	7.03E-01	1.97757	1.10097	1.98	1.10	2.7	4.68	3.80
8/5/2001	3.35E+00	1.84E+00	0	0	3.35	1.84	3.8	7.15	5.64
8/6/2001	1.73E+00	9.59E-01	12.13833	6.62333	12.14	6.62	3.8	15.94	10.42
8/7/2001	9.32E-01	5.04E-01	6.88417	3.59516	6.88	3.60	3.8	10.68	7.40
8/8/2001	1.32E+00	7.19E-01	6.09843	3.4117	6.10	3.41	3.8	9.90	7.21
8/9/2001	1.29E+00	7.03E-01	0.98167	0.52796	1.29	0.70	3.8	5.09	4.50
8/10/2001	6.27E-01	3.45E-01	14.56577	8.04731	14.57	8.05	3.8	18.37	11.85
8/11/2001	5.46E-01	3.04E-01	17.90647	10.04458	17.91	10.04	5.7	23.61	15.74
8/12/2001	7.58E-01	4.12E-01	7.07682	4.16143	7.08	4.16	5.7	12.78	9.86
8/13/2001	1.35E+00	7.35E-01	12.30897	6.74711	12.31	6.75	5.7	18.01	12.45
8/14/2001	5.97E-01	3.27E-01	10.52359	5.76895	10.52	5.77	5.7	16.22	11.47
8/15/2001	7.25E-01	3.95E-01	9.66189	5.29619	9.66	5.30	5.7	15.36	11.00
8/16/2001	6.35E-01	3.44E-01	15.38583	8.59969	15.39	8.60	5.7	21.09	14.30
8/17/2001	1.67E+00	9.19E-01	10.7009	6.00836	10.70	6.01	4.2	14.90	10.21
8/18/2001	1.40E+00	7.74E-01	5.51778	3.04667	5.52	3.05	4.2	9.72	7.25
8/19/2001	8.58E-01	4.69E-01	6.7961	3.7102	6.80	3.71	4.2	11.00	7.91
8/20/2001	7.38E-01	4.07E-01	3.74942	2.11672	3.75	2.12	4.2	7.95	6.32
8/21/2001	3.14E+00	1.73E+00	2.42389	1.34723	3.14	1.73	4.2	7.34	5.93
8/22/2001	4.14E+00	2.30E+00	0.63118	0.15146	4.14	2.30	4.2	8.34	6.50
8/23/2001	1.47E+00	8.10E-01	5.61227	3.14167	5.61	3.14	7.2	12.81	10.34
8/24/2001	7.67E-01	4.27E-01	8.78023	4.89571	8.78	4.90	7.2	15.98	12.10
8/25/2001	1.11E+00	6.16E-01	9.2	5.03833	9.20	5.04	7.2	16.40	12.24
8/26/2001	1.41E+00	7.84E-01	11.9517	6.60952	11.95	6.61	7.2	19.15	13.81
8/27/2001	1.39E+00	7.70E-01	12.10791	6.57521	12.11	6.58	7.2	19.31	13.78
8/28/2001	6.83E-01	3.74E-01	8.89178	5.01667	8.89	5.02	7.2	16.09	12.22
8/29/2001	7.96E-01	4.44E-01	4.69325	2.53187	4.69	2.53	3.8	8.49	6.33
8/30/2001	8.81E-01	4.71E-01	3.24996	0.99361	3.25	0.99	3.8	7.05	4.79
8/31/2001	9.20E-01	5.00E-01	15.909	8.7595	15.91	8.76	3.8	19.71	12.56
9/1/2001	2.09E+00	1.15E+00	4.06874	2.19629	4.07	2.20	3.8	7.87	6.00
9/2/2001	2.16E+00	1.19E+00	4.15283	2.15222	4.15	2.15	3.8	7.95	5.95
9/3/2001	2.09E+00	1.15E+00	8.81667	4.83611	8.82	4.84	3.8	12.62	8.64
9/4/2001	1.99E+00	1.11E+00	12.43404	6.97887	12.43	6.98	4.5	16.93	11.48
9/5/2001	2.37E+00	1.30E+00	8.45831	4.66757	8.46	4.67	4.5	12.96	9.17
9/6/2001	1.36E+00	7.41E-01	0	0	1.36	0.74	4.5	5.86	5.24
9/7/2001	2.45E+00	1.35E+00	2.48299	0.92645	2.48	1.35	4.5	6.98	5.85
9/8/2001	6.16E-01	3.42E-01	10.32539	5.80314	10.33	5.80	4.5	14.83	10.30
9/9/2001	7.77E-01	4.28E-01	12.22658	6.84417	12.23	6.84	4.5	16.73	11.34
9/10/2001	6.82E-01	3.76E-01	6.86803	3.85056	6.87	3.85	5.5	12.37	9.35
9/11/2001	6.27E-01	3.48E-01	8.93042	4.11409	8.93	4.11	5.5	14.43	9.61
9/12/2001	8.56E-01	4.67E-01	0.60983	0.14489	0.86	0.47	5.5	6.36	5.97
9/13/2001	5.59E-01	3.03E-01	6.72238	3.70724	6.72	3.71	5.5	12.22	9.21
9/14/2001	9.55E-01	5.22E-01	4.79492	2.20989	4.79	2.21	5.5	10.29	7.71
9/15/2001	1.50E+00	8.32E-01	8.25	4.555	8.25	4.56	5.5	13.75	10.06
9/16/2001	6.17E-01	3.39E-01	3.46048	1.51374	3.46	1.51	4.1	7.56	5.61
9/17/2001	9.91E-01	5.49E-01	9.048	4.97322	9.05	4.97	4.1	13.15	9.07
9/18/2001	1.15E+00	6.36E-01	1.01389	0.289	1.15	0.64	4.1	5.25	4.74
9/19/2001	1.55E+00	8.51E-01	8.95555	4.91944	8.96	4.92	4.1	13.06	9.02
9/20/2001	9.76E-01	5.44E-01	3.12695	1.41421	3.13	1.41	4.1	7.23	5.51
9/21/2001	1.20E+00	6.59E-01	0.82254	0.42372	1.20	0.66	4.1	5.30	4.76
9/22/2001	1.95E+00	1.06E+00	2.55	1.20778	2.55	1.21	6.5	9.05	7.71
9/23/2001	1.44E+00	8.00E-01	2.61396	1.47949	2.61	1.48	6.5	9.11	7.98
9/24/2001	9.78E-01	5.35E-01	1.905	1.04333	1.91	1.04	6.5	8.41	7.54
9/25/2001	3.64E+00	2.01E+00	2.96122	1.14	3.64	2.01	6.5	10.14	8.51
9/26/2001	7.73E-01	4.28E-01	4.44932	2.37052	4.45	2.37	6.5	10.95	8.87
9/27/2001	1.27E+00	7.00E-01	0.94517	0.51233	1.27	0.70	6.5	7.77	7.20
9/28/2001	9.53E-01	5.20E-01	2.77333	0.77057	2.77	0.77	7.5	10.27	8.27
9/29/2001	2.22E+00	1.22E+00	0	0	2.22	1.22	7.5	9.72	8.72
9/30/2001	1.45E+00	8.05E-01	0.06178	0	1.45	0.81	7.5	8.95	8.31
10/1/2001	1.17E+00	6.44E-01	4.02511	2.21089	4.03	2.21	7.5	11.53	9.71
10/2/2001	1.99E+00	1.08E+00	1.5	0.85056	1.99	1.08	7.5	9.49	8.58
10/3/2001	1.30E+00	7.06E-01	0.89778	0.16844	1.30	0.71	7.5	8.80	8.21
10/4/2001	1.91E+00	1.06E+00	0.76695	0.26843	1.91	1.06	7.8	9.71	8.86
10/5/2001	1.36E+00	7.50E-01	6.38459	3.55978	6.38	3.56	7.8	14.18	11.36
10/6/2001	1.08E+00	5.91E-01	5.66765	3.21778	5.67	3.22	7.8	13.47	11.02
10/7/2001	1.12E+00	6.20E-01	1.61004	0.75898	1.61	0.76	7.8	9.41	8.56
10/8/2001	1.78E+00	9.84E-01	3.30333	1.81778	3.30	1.82	7.4	10.70	9.22
10/9/2001	1.57E+00	8.60E-01	2.88278	0.61798	2.88	0.86	7.4	10.28	8.26
10/10/2001	8.07E-01	4.49E-01	2.43944	1.35333	2.44	1.35	7.4	9.84	8.75
10/11/2001	2.08E+00	1.15E+00	8.8767	4.75803	8.88	4.76	5.3	14.18	10.06
10/12/2001	1.38E+00	7.54E-01	0.92111	0.49778	1.38	0.75	5.3	6.68	6.05
10/13/2001	1.12E+00	6.17E-01	0.18417	0.10166	1.12	0.62	5.3	6.42	5.92

Date	HBRP, AERMOD Flat Terrain Diesel Mode	HBRP, AERMOD Flat Terrain Nat. Gas Mode	HBRP, CTDMPLUS Diesel Mode	HBRP, CTDMPLUS Nat. Gas Mode	MAX (AERMOD/CTDMPLUS) Diesel Mode	MAX (AERMOD/CTDMPLUS) Nat. Gas Mode	Measured Background	Total Impact Diesel Mode	Total Impact Nat. Gas Mode
10/14/2001	1.24E+00	6.84E-01	0.69278	0.06461	1.24	0.68	5.3	6.54	5.98
10/15/2001	1.04E+00	5.69E-01	1.49482	0.18539	1.49	0.57	5.3	6.79	5.87
10/16/2001	5.29E-01	2.92E-01	3.65067	2.052	3.65	2.05	11.8	15.45	13.85
10/17/2001	1.07E+00	5.89E-01	3.27161	1.88136	3.27	1.88	11.8	15.07	13.68
10/18/2001	8.04E-01	4.38E-01	1.385	0.3825	1.39	0.44	11.8	13.19	12.24
10/19/2001	9.05E-01	5.00E-01	1.47444	0.81333	1.47	0.81	11.8	13.27	12.61
10/20/2001	8.41E-01	4.56E-01	3.79013	0.77249	3.79	0.77	11.8	15.59	12.57
10/21/2001	6.20E-01	3.43E-01	0.31872	0.17611	0.62	0.34	11.8	12.42	12.14
10/22/2001	6.38E-01	3.46E-01	3.54944	1.93222	3.55	1.93	8.5	12.05	10.43
10/23/2001	1.39E+00	7.59E-01	5.04961	2.75739	5.05	2.76	8.5	13.55	11.26
10/24/2001	1.94E+00	1.08E+00	1.31778	0.33177	1.94	1.08	8.5	10.44	9.58
10/25/2001	1.00E+00	5.55E-01	7.42833	4.00778	7.43	4.01	8.5	15.93	12.51
10/26/2001	1.08E+00	6.01E-01	9.9962	5.63487	10.00	5.63	8.5	18.50	14.13
10/27/2001	5.82E-01	3.22E-01	9.50035	5.21889	9.50	5.22	8.5	18.00	13.72
10/28/2001	8.14E-01	4.50E-01	10.1979	5.35889	10.20	5.36	9.6	19.80	14.96
10/29/2001	2.80E+00	1.55E+00	0.50628	0.27544	2.80	1.55	9.6	12.40	11.15
10/30/2001	5.79E+00	3.16E+00	1.14556	0.61444	5.79	3.16	9.6	15.39	12.76
10/31/2001	1.11E+00	5.96E-01	1.64244	0.45661	1.64	0.60	9.6	11.24	10.20
11/1/2001	8.94E-01	4.90E-01	5.16778	2.89389	5.17	2.89	9.6	14.77	12.49
11/2/2001	1.48E+00	8.17E-01	6.14436	3.34624	6.14	3.35	9.6	15.74	12.95
11/3/2001	2.03E+00	1.12E+00	0.92352	0.51153	2.03	1.12	9.3	11.33	10.42
11/4/2001	1.63E+00	8.97E-01	2.32278	0.21633	2.32	0.90	9.3	11.62	10.20
11/5/2001	1.22E+00	6.75E-01	9.38282	5.21512	9.38	5.22	9.3	18.68	14.52
11/6/2001	1.01E+00	5.54E-01	9.2668	5.08235	9.27	5.08	9.3	18.57	14.38
11/7/2001	5.78E-01	3.15E-01	0	0	0.58	0.31	9.3	9.88	9.61
11/8/2001	8.27E-01	4.57E-01	1.10556	0	1.11	0.46	9.3	10.41	9.76
11/9/2001	1.06E+00	5.83E-01	0.55228	0.00106	1.06	0.58	32.6	33.66	33.18
11/10/2001	1.34E+00	7.40E-01	3.55867	1.71056	3.56	1.71	32.6	36.16	34.31
11/11/2001	1.21E+01	6.68E+00	2.11455	0.635	12.05	6.68	32.6	44.65	39.28
11/12/2001	3.29E+00	1.84E+00	1.01524	0.33891	3.29	1.84	32.6	35.89	34.44
11/13/2001	9.48E+00	5.17E+00	0	0	9.48	5.17	32.6	42.08	37.77
11/14/2001	3.64E+00	1.99E+00	0.00109	0	3.64	1.99	32.6	36.24	34.59
11/15/2001	9.53E+00	5.20E+00	1.31955	0.75364	9.53	5.20	18.1	27.58	23.25
11/16/2001	8.30E-01	4.56E-01	12.32032	6.68852	12.32	6.69	18.1	30.37	24.74
11/17/2001	7.58E-01	4.21E-01	0	0	0.76	0.42	18.1	18.81	18.47
11/18/2001	7.23E+00	3.93E+00	2.17391	0.63127	7.23	3.93	18.1	25.28	21.98
11/19/2001	8.62E+00	4.79E+00	0.03258	0.01817	8.62	4.79	18.1	26.67	22.84
11/20/2001	2.19E+00	1.20E+00	0.70442	0.18333	2.19	1.20	18.1	20.24	19.25
11/21/2001	5.62E+00	3.07E+00	0.66425	0.08908	5.62	3.07	3.5	9.12	6.57
11/22/2001	5.41E-01	2.92E-01	0.74311	0.22368	0.74	0.29	3.5	4.24	3.79
11/23/2001	6.78E-01	3.74E-01	1.45944	0.80111	1.46	0.80	3.5	4.96	4.30
11/24/2001	1.54E+00	8.47E-01	11.88263	6.55191	11.88	6.55	3.5	15.38	10.05
11/25/2001	8.53E-01	4.60E-01	3.72429	2.03857	3.72	2.04	3.5	7.22	5.54
11/26/2001	5.69E-01	3.10E-01	1.26444	0.67833	1.26	0.68	3.5	4.76	4.18
11/27/2001	9.52E-01	5.19E-01	3.55389	0.28901	3.55	0.52	19.1	22.65	19.62
11/28/2001	1.32E+01	7.27E+00	0	0	13.16	7.27	19.1	32.26	26.37
11/29/2001	1.10E+00	6.07E-01	3.88817	2.06123	3.89	2.06	19.1	22.99	21.16
11/30/2001	5.93E+00	3.26E+00	0.00001	0.00001	5.93	3.26	19.1	25.03	22.36
12/1/2001	4.75E+00	2.60E+00	0.68257	0.13669	4.75	2.60	19.1	23.85	21.70
12/2/2001	1.20E+01	6.60E+00	0.20678	0.09721	12.01	6.60	19.1	31.11	25.70
12/3/2001	1.50E+00	8.26E-01	9.25957	4.9273	9.26	4.93	12.6	21.86	17.53
12/4/2001	1.52E+00	8.30E-01	1.52722	0.84	1.53	0.84	12.6	14.13	13.44
12/5/2001	1.78E+00	9.68E-01	0.41961	0.23328	1.78	0.97	12.6	14.38	13.57
12/6/2001	7.94E-01	4.39E-01	6.16667	3.32944	6.17	3.33	12.6	18.77	15.93
12/7/2001	9.22E-01	5.12E-01	6.80556	3.7	6.81	3.70	12.6	19.41	16.30
12/8/2001	1.14E+00	6.30E-01	1.06222	0.28906	1.14	0.63	12.6	13.74	13.23
12/9/2001	2.51E+00	1.39E+00	9.82942	5.20923	9.83	5.21	4.3	14.13	9.51
12/10/2001	6.04E-01	3.33E-01	5.54531	3.03257	5.55	3.03	4.3	9.85	7.33
12/11/2001	8.14E-01	4.47E-01	0.16544	0.09139	0.81	0.45	4.3	5.11	4.75
12/12/2001	6.06E-01	3.37E-01	6.93667	2.38951	6.94	2.39	4.3	11.24	6.69
12/13/2001	5.24E+00	2.89E+00	2.06668	1.12186	5.24	2.89	4.3	9.54	7.19
12/14/2001	8.26E-01	4.54E-01	7.18742	5.2866	7.19	5.29	4.3	11.49	9.59
12/15/2001	1.90E+00	1.03E+00	0	0	1.90	1.03	4.0	5.90	5.03
12/16/2001	6.24E+00	3.43E+00	1.81217	1.00391	6.24	3.43	4.0	10.24	7.43
12/17/2001	1.05E+00	5.74E-01	5.75	3.23889	5.75	3.24	4.0	9.75	7.24
12/18/2001	6.12E+00	3.38E+00	3.54429	2.01909	6.12	3.38	4.0	10.12	7.38
12/19/2001	5.20E+00	2.84E+00	2.34524	0.67977	5.20	2.84	4.0	9.20	6.84
12/20/2001	7.23E-01	3.99E-01	8.31156	4.61309	8.31	4.61	4.0	12.31	8.61
12/21/2001	5.86E+00	3.22E+00	0.00098	0.00056	5.86	3.22	7.3	13.16	10.52
12/22/2001	4.29E+00	2.36E+00	0.99182	0.46087	4.29	2.36	7.3	11.59	9.66
12/23/2001	7.02E-01	3.87E-01	0.07406	0.04089	0.70	0.39	7.3	8.00	7.69
12/24/2001	4.19E+00	2.28E+00	0.03302	0.01826	4.19	2.28	7.3	11.49	9.58
12/25/2001	1.89E+00	1.05E+00	2.58056	1.45	2.58	1.45	7.3	9.88	8.75
12/26/2001	3.83E+00	2.13E+00	9.04762	4.97143	9.05	4.97	7.3	16.35	12.27
12/27/2001	6.51E+00	3.62E+00	0.25485	0.04984	6.51	3.62	11.5	18.01	15.12
12/28/2001	6.98E-01	3.84E-01	2.42056	0.79278	2.42	0.79	11.5	13.92	12.29
12/29/2001	8.12E-01	4.47E-01	2.41434	0.48838	2.41	0.49	11.5	13.91	11.99
12/30/2001	3.56E+00	1.97E+00	1.48429	0.82952	3.56	1.97	11.5	15.06	13.47
12/31/2001	3.69E+00	2.04E+00	1.18111	0.34878	3.69	2.04	11.5	15.19	13.54
8th highest value								34.98	32.23

Date	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
1/1/2002	1.42E+01	7.79E+00	0	0.00001	14.18	7.79	11.5	25.68	19.29
1/2/2002	1.49E+00	8.16E-01	0.6443	0.23072	1.49	0.82	12.1	13.59	12.92
1/3/2002	6.04E-01	3.34E-01	1.95997	1.09683	1.96	1.10	12.1	14.06	13.20
1/4/2002	5.28E+00	2.87E+00	1.61444	0.88778	5.28	2.87	12.1	17.38	14.97
1/5/2002	7.26E+00	4.00E+00	0.0006	0.00015	7.26	4.00	12.1	19.36	16.10
1/6/2002	1.15E+01	6.31E+00	0.00161	0	11.53	6.31	12.1	23.63	18.41
1/7/2002	1.15E+01	6.28E+00	0.15878	0.08661	11.47	6.28	12.1	23.57	18.38
1/8/2002	8.36E-01	4.61E-01	9.01943	4.96509	9.02	4.97	9.7	18.72	14.67
1/9/2002	3.51E-01	1.95E-01	13.82612	7.71495	13.83	7.71	9.7	23.53	17.41
1/10/2002	6.46E-01	3.55E-01	2.95267	1.48722	2.95	1.49	9.7	12.65	11.19
1/11/2002	7.82E-01	4.36E-01	1.38928	0.71337	1.39	0.71	9.7	11.09	10.41
1/12/2002	1.41E+00	7.80E-01	5.13752	2.95799	5.14	2.96	9.7	14.84	12.66
1/13/2002	1.01E+00	5.63E-01	14.26319	7.82868	14.26	7.83	9.7	23.96	17.53
1/14/2002	9.32E-01	5.10E-01	0.45783	2.07102	0.93	2.07	4.3	5.23	6.37
1/15/2002	2.34E+00	1.29E+00	4.35833	2.37502	4.36	2.38	4.3	8.66	6.68
1/16/2002	3.85E-01	2.11E-01	1.53035	0.7587	1.53	0.76	4.3	5.83	5.06
1/17/2002	1.08E+00	5.93E-01	3.95261	2.20812	3.95	2.21	4.3	8.25	6.51
1/18/2002	1.13E+00	6.24E-01	1.09361	0.59067	1.13	0.62	4.3	5.43	4.92
1/19/2002	1.41E+00	7.72E-01	5.89704	3.22796	5.90	3.23	4.3	10.20	7.53
1/20/2002	2.09E+00	1.16E+00	0.00157	0.00087	2.09	1.16	6.7	8.79	7.86
1/21/2002	1.59E+00	8.76E-01	1.93274	1.06719	1.93	1.07	6.7	8.63	7.77
1/22/2002	8.14E-01	4.52E-01	0.6815	0.21017	0.81	0.45	6.7	7.51	7.15
1/23/2002	1.25E+00	6.93E-01	1.33062	0.74333	1.33	0.74	6.7	8.03	7.44
1/24/2002	8.52E-01	4.72E-01	0.68485	0.20033	0.85	0.47	6.7	7.55	7.17
1/25/2002	8.84E+00	4.86E+00	1.77412	1.02021	8.84	4.86	6.7	15.54	11.56
1/26/2002	8.51E-01	4.64E-01	1.46393	0.59894	1.46	0.60	5.1	6.56	5.70
1/27/2002	8.53E-01	4.72E-01	3.34556	1.88611	3.35	1.89	5.1	8.45	6.99
1/28/2002	1.18E+00	6.47E-01	0.57167	0.24589	1.18	0.65	5.1	6.28	5.75
1/29/2002	1.32E+00	7.26E-01	0.26239	0.14417	1.32	0.73	5.1	6.42	5.83
1/30/2002	6.28E-01	3.48E-01	2.69333	1.48111	2.69	1.48	5.1	7.79	6.58
1/31/2002	2.37E+00	1.31E+00	0.41606	0.11561	2.37	1.31	5.1	7.47	6.41
2/1/2002	1.46E+00	8.17E-01	0.00024	0.00014	1.46	0.82	11.3	12.76	12.12
2/2/2002	1.94E+00	1.07E+00	1.29795	0.38867	1.94	1.07	11.3	13.24	12.37
2/3/2002	3.93E-01	2.18E-01	1.71778	0.94889	1.72	0.95	11.3	13.02	12.25
2/4/2002	8.70E-01	4.79E-01	4.41372	2.41824	4.41	2.42	11.3	15.71	13.72
2/5/2002	8.03E-01	4.46E-01	2.0428	1.11779	2.04	1.12	11.3	13.34	12.42
2/6/2002	7.58E+00	4.19E+00	0.91682	0.50318	7.58	4.19	11.3	18.88	15.49
2/7/2002	4.11E+00	2.28E+00	1.78318	0.99347	4.11	2.28	4.0	8.11	6.28
2/8/2002	9.43E-01	5.18E-01	0.60944	0.00108	0.94	0.52	4.0	4.94	4.52
2/9/2002	8.54E-01	4.68E-01	0.92	0.50572	0.92	0.51	4.0	4.92	4.51
2/10/2002	1.82E+00	1.00E+00	0.13489	0.00007	1.82	1.00	4.0	5.82	5.00
2/11/2002	5.74E+00	3.17E+00	2.495	1.36611	5.74	3.17	4.0	9.74	7.17
2/12/2002	1.01E+00	5.59E-01	2.57485	1.41373	2.57	1.41	4.0	6.57	5.41
2/13/2002	7.86E-01	4.37E-01	8.51276	4.57926	8.51	4.58	14.0	22.51	18.58
2/14/2002	7.45E-01	4.08E-01	6.43333	3.51111	6.43	3.51	14.0	20.43	17.51
2/15/2002	3.62E+00	2.02E+00	1.37222	0.75	3.62	2.02	14.0	17.62	16.02
2/16/2002	2.11E+00	1.18E+00	11.04628	6.32728	11.05	6.33	14.0	25.05	20.33
2/17/2002	7.11E-01	3.86E-01	2.8701	1.50067	2.87	1.50	14.0	16.87	15.50
2/18/2002	1.04E+01	5.75E+00	1.46579	0.80538	10.39	5.75	14.0	24.39	19.75
2/19/2002	2.47E+00	1.36E+00	0.29829	0.0775	2.47	1.36	2.4	4.87	3.76
2/20/2002	7.30E-01	3.98E-01	0.82151	0.20608	0.82	0.40	2.4	3.22	2.80
2/21/2002	9.75E-01	5.38E-01	2.43833	1.36778	2.44	1.37	2.4	4.84	3.77
2/22/2002	5.69E+00	3.13E+00	0.54467	0.08461	5.69	3.13	2.4	8.09	5.53
2/23/2002	5.12E+00	2.79E+00	2.14093	1.14274	5.12	2.79	2.4	7.52	5.19
2/24/2002	5.17E-01	2.86E-01	2.9999	1.65095	3.00	1.65	2.4	5.40	4.05
2/25/2002	2.10E+00	1.16E+00	0.72233	0.07194	2.10	1.16	9.9	12.00	11.06
2/26/2002	7.04E-01	3.91E-01	1.19778	0.65444	1.20	0.65	9.9	11.10	10.55
2/27/2002	1.06E+00	5.85E-01	17.94318	9.94557	17.94	9.95	9.9	27.84	19.85
2/28/2002	6.26E-01	3.52E-01	13.31359	7.30169	13.31	7.30	9.9	23.21	17.20
3/1/2002	3.14E+00	1.74E+00	2.27	2.50626	3.14	2.51	9.9	13.04	12.41
3/2/2002	1.43E+00	7.87E-01	0	0	1.43	0.79	9.9	11.33	10.69
3/3/2002	2.28E+00	1.26E+00	0	0	2.28	1.26	13.5	15.78	14.76
3/4/2002	1.05E+00	5.79E-01	1.38178	0.69833	1.38	0.70	13.5	14.88	14.20
3/5/2002	3.03E+00	1.69E+00	0.3421	0.08506	3.03	1.69	13.5	16.53	15.19
3/6/2002	2.36E+00	1.31E+00	0.71208	0.39304	2.36	1.31	13.5	15.86	14.81
3/7/2002	1.54E+00	8.54E-01	3.38397	1.7165	3.38	1.72	13.5	16.88	15.22
3/8/2002	2.26E+00	1.25E+00	2.16	1.19722	2.26	1.25	13.5	15.76	14.75
3/9/2002	4.96E+00	2.76E+00	2.01762	1.11571	4.96	2.76	5.3	10.26	8.06
3/10/2002	3.17E+00	1.78E+00	0.0002	0.00001	3.17	1.78	5.3	8.47	7.08
3/11/2002	2.76E+00	1.54E+00	1.26378	0.70406	2.76	1.54	5.3	8.06	6.84
3/12/2002	1.88E+00	1.06E+00	4.41054	2.40242	4.41	2.40	5.3	9.71	7.70
3/13/2002	1.23E+00	6.86E-01	0.27144	0.15178	1.23	0.69	5.3	6.53	5.99
3/14/2002	2.21E+00	1.22E+00	0.24449	0.13899	2.21	1.22	5.3	7.51	6.52
3/15/2002	1.75E+00	9.68E-01	3.06794	1.66911	3.07	1.67	7.1	10.17	8.77
3/16/2002	8.69E-01	4.80E-01	0.44556	0.24789	0.87	0.48	7.1	7.97	7.58
3/17/2002	1.17E+00	6.48E-01	1.74056	0.95341	1.74	0.95	7.1	8.84	8.05
3/18/2002	2.01E+00	1.10E+00	1.56889	0.83667	2.01	1.10	7.1	9.11	8.20
3/19/2002	1.96E+00	1.09E+00	4.14111	0.73056	4.14	1.09	7.1	11.24	8.19
3/20/2002	1.79E+00	9.88E-01	0.16094	0.08872	1.79	0.99	7.1	8.89	8.09
3/21/2002	1.24E-01	8.17E-02	7.05192	3.90468	7.05	3.90	9.3	16.35	13.20
3/22/2002	3.29E+00	1.81E+00	0.52524	0.28548	3.29	1.81	9.3	12.59	11.11
3/23/2002	1.85E+00	1.14E+00	6.33333	3.4919	6.33	3.49	9.3	15.63	12.79
3/24/2002	1.44E+00	8.00E-01	6.07717	3.09222	6.08	3.09	9.3	15.38	12.39
3/25/2002	2.36E+00	1.30E+00	4.25222	2.35778	4.25	2.36	9.3	13.55	11.66
3/26/2002	2.12E+00	1.17E+00	2.82375	1.60798	2.82	1.61	9.3	12.12	10.91
3/27/2002	1.88E+00	1.04E+00	1.69307	1.35783	1.88	1.36	7.8	9.68	9.16
3/28/2002	1.89E+00	1.04E+00	9.1328	4.96585	9.13	4.97	7.8	16.93	12.77
3/29/2002	2.07E+00	1.14E+00	11.59132	6.27039	11.59	6.27	7.8	19.39	14.07
3/30/2002	1.53E+00	8.44E-01	13.7446	7.51897	13.74	7.52	7.8	21.54	15.32
3/31/2002	2.01E+00	1.11E+00	2.75851	1.4141	2.76	1.41	7.8	10.56	9.21
4/1/2002	1.38E+00	7.54E-01	0.36511	0.19733	1.38	0.75	7.8	9.18	8.55
4/2/2002	5.86E+00	3.26E+00	1.68612	0.70611	5.86	3.26	9.4	15.26	12.66

Date	HBRP, AERMOD Flat Terrain Diesel Mode	HBRP, AERMOD Flat Terrain Nat. Gas Mode	HBRP, CTDMPLUS Diesel Mode	HBRP, CTDMPLUS Nat. Gas Mode	MAX (AERMOD/CTDMPLUS) Diesel Mode	MAX (AERMOD/CTDMPLUS) Nat. Gas Mode	Measured Background	Total Impact Diesel Mode	Total Impact Nat. Gas Mode
4/3/2002	8.45E-01	4.69E-01	8.7229	4.87467	8.72	4.87	9.4	18.12	14.27
4/4/2002	9.10E-01	5.09E-01	15.71783	8.31956	15.72	8.32	9.4	25.12	17.72
4/5/2002	1.24E+00	6.85E-01	0.81911	0.25089	1.24	0.69	9.4	10.64	10.09
4/6/2002	1.71E+00	9.42E-01	3.34631	1.48522	3.35	1.49	9.4	12.75	10.89
4/7/2002	1.94E+00	1.08E+00	3.24895	1.78221	3.25	1.78	9.4	12.65	11.18
4/8/2002	2.22E+00	1.22E+00	1.97638	1.07329	2.22	1.22	6.0	8.22	7.22
4/9/2002	2.85E+00	1.57E+00	1.33842	0.69271	2.85	1.57	6.0	8.85	7.57
4/10/2002	1.62E+00	8.87E-01	1.55007	0.84883	1.62	0.89	6.0	7.62	6.89
4/11/2002	1.92E+00	1.06E+00	2.53206	1.37073	2.53	1.37	6.0	8.53	7.37
4/12/2002	8.81E-01	4.88E-01	8.35289	4.54249	8.35	4.54	6.0	14.35	10.54
4/13/2002	9.94E-01	5.45E-01	2.3231	1.26034	2.32	1.26	6.0	8.32	7.26
4/14/2002	7.14E-01	3.91E-01	5.7645	2.95957	5.76	2.96	3.0	8.76	5.96
4/15/2002	2.38E+00	1.32E+00	3.36767	1.814	3.37	1.81	3.0	6.37	4.81
4/16/2002	3.25E+00	1.81E+00	7.12222	3.90444	7.12	3.90	3.0	10.12	6.90
4/17/2002	1.83E+00	1.01E+00	6.46176	3.57818	6.46	3.58	3.0	9.46	6.58
4/18/2002	2.43E+00	1.34E+00	0.76057	0.41276	2.43	1.34	3.0	5.43	4.34
4/19/2002	2.66E+00	1.47E+00	10.8704	5.96643	10.87	5.97	3.0	13.87	8.97
4/20/2002	2.14E+00	1.18E+00	8.51667	4.69889	8.52	4.70	9.2	17.72	13.90
4/21/2002	2.09E+00	1.15E+00	7.59444	4.195	7.59	4.20	9.2	16.79	13.40
4/22/2002	1.70E+00	9.42E-01	4.76333	2.61444	4.76	2.61	9.2	13.96	11.81
4/23/2002	2.72E+00	1.49E+00	1.93389	1.05778	2.72	1.49	9.2	11.92	10.69
4/24/2002	1.56E+00	8.62E-01	0.76111	0.21206	1.56	0.86	9.2	10.76	10.06
4/25/2002	1.70E+00	9.45E-01	4.59148	2.5151	4.59	2.52	9.2	13.79	11.72
4/26/2002	1.44E+00	8.07E-01	22.83903	13.46962	22.84	13.47	5.0	27.84	18.47
4/27/2002	2.87E+00	1.59E+00	10.79657	5.94902	10.80	5.95	5.0	15.80	10.95
4/28/2002	3.42E+00	1.89E+00	0	0	3.42	1.89	5.0	8.42	6.89
4/29/2002	2.20E+00	1.21E+00	1.63555	0.90439	2.20	1.21	5.0	7.20	6.21
4/30/2002	9.61E-01	5.28E-01	19.56439	10.70695	19.56	10.71	5.0	24.56	15.71
5/1/2002	8.61E-01	4.71E-01	6.9241	3.86082	6.92	3.86	5.0	11.92	8.86
5/2/2002	8.96E-01	4.94E-01	15.78314	8.78931	15.78	8.79	4.9	20.68	13.69
5/3/2002	2.69E+00	1.49E+00	8.96228	4.9468	8.96	4.95	4.9	13.86	9.85
5/4/2002	2.37E+00	1.31E+00	10.97222	6.00944	10.97	6.01	4.9	15.87	10.91
5/5/2002	1.39E+00	7.75E-01	10.30938	5.6626	10.31	5.66	4.9	15.21	10.56
5/6/2002	1.74E+00	9.64E-01	9.48755	5.19848	9.49	5.20	4.9	14.39	10.10
5/7/2002	4.80E+00	2.67E+00	11.58537	6.50369	11.59	6.50	4.9	16.49	11.40
5/8/2002	1.10E+00	6.06E-01	8.78333	4.84261	8.78	4.84	6.3	15.08	11.14
5/9/2002	1.84E+00	1.03E+00	11.17363	6.16933	11.17	6.17	6.3	17.47	12.47
5/10/2002	3.42E+00	1.89E+00	5.67708	3.09806	5.68	3.10	6.3	11.98	9.40
5/11/2002	1.48E+00	8.11E-01	3.53944	1.97444	3.54	1.97	6.3	9.84	8.27
5/12/2002	1.71E+00	9.40E-01	10.3272	5.67678	10.33	5.68	6.3	16.63	11.98
5/13/2002	2.65E+00	1.46E+00	17.47252	9.70743	17.47	9.71	6.3	23.77	16.01
5/14/2002	2.73E+00	1.52E+00	4.87423	2.68349	4.87	2.68	5.0	9.87	7.68
5/15/2002	1.87E+00	1.03E+00	7.27498	3.78822	7.27	3.79	5.0	12.27	8.79
5/16/2002	1.64E+00	9.10E-01	5.95	3.33835	5.95	3.34	5.0	10.95	8.34
5/17/2002	1.66E+00	9.13E-01	10.50189	5.56459	10.50	5.56	5.0	15.50	10.56
5/18/2002	2.30E+00	1.27E+00	6.07687	3.42285	6.08	3.42	5.0	11.08	8.42
5/19/2002	7.86E+00	4.35E+00	0.22452	0.00563	7.86	4.35	5.0	12.86	9.35
5/20/2002	6.42E+00	3.59E+00	0.24972	0.13039	6.42	3.59	1.9	8.32	5.49
5/21/2002	2.44E+00	1.35E+00	3.00122	1.64553	3.00	1.65	1.9	4.90	3.55
5/22/2002	4.41E+00	2.43E+00	4.67208	2.57333	4.67	2.57	1.9	6.57	4.47
5/23/2002	1.92E+00	1.06E+00	1.25222	0.68333	1.92	1.06	1.9	3.82	2.96
5/24/2002	1.81E+00	9.78E-01	1.83111	1.04444	1.83	1.04	1.9	3.73	2.94
5/25/2002	2.00E+00	1.12E+00	6.93972	3.84735	6.94	3.85	1.9	8.84	5.75
5/26/2002	9.33E-01	5.08E-01	0.64889	0.3555	0.93	0.51	4.4	5.33	4.91
5/27/2002	1.77E+00	9.73E-01	1.63141	0.84169	1.77	0.97	4.4	6.17	5.37
5/28/2002	5.81E+00	3.22E+00	4.95556	2.71409	5.81	3.22	4.4	10.21	7.62
5/29/2002	6.56E-01	3.54E-01	7.23013	3.42624	7.23	3.43	4.4	11.63	7.83
5/30/2002	9.87E-01	5.42E-01	6.38509	3.50693	6.39	3.51	4.4	10.79	7.91
5/31/2002	2.27E+00	1.25E+00	9.38489	5.25723	9.38	5.26	4.4	13.78	9.66
6/1/2002	1.38E+00	7.58E-01	8.99011	5.00298	8.99	5.00	6.8	15.79	11.80
6/2/2002	2.04E+00	1.12E+00	9.60783	5.3545	9.61	5.35	6.8	16.41	12.15
6/3/2002	2.05E+00	1.13E+00	6.14813	3.39327	6.15	3.39	6.8	12.95	10.19
6/4/2002	1.81E+00	1.00E+00	18.45463	9.63411	18.45	9.63	6.8	25.25	16.43
6/5/2002	1.70E+00	9.47E-01	23.14833	12.49548	23.15	12.50	6.8	29.95	19.30
6/6/2002	1.96E+00	1.08E+00	8.49248	4.58984	8.49	4.59	6.8	15.29	11.39
6/7/2002	3.45E+00	1.91E+00	8.32017	4.54152	8.32	4.54	6.1	14.42	10.64
6/8/2002	2.82E+00	1.56E+00	5.76983	3.97209	5.77	3.97	6.1	11.87	10.07
6/9/2002	3.49E+00	1.93E+00	11.1382	6.13384	11.14	6.13	6.1	17.24	12.23
6/10/2002	1.87E+00	1.03E+00	10.06249	5.39361	10.06	5.39	6.1	16.16	11.49
6/11/2002	2.43E+00	1.34E+00	3.07328	1.72256	3.07	1.72	6.1	9.17	7.82
6/12/2002	1.35E+00	7.35E-01	2.46124	1.3939	2.46	1.39	6.1	8.56	7.49
6/13/2002	1.05E+00	5.84E-01	6.39183	3.44056	6.39	3.44	2.6	8.99	6.04
6/14/2002	1.54E+00	8.52E-01	8.20282	4.52765	8.20	4.53	2.6	10.80	7.13
6/15/2002	2.71E+00	1.49E+00	0.79989	0.00044	2.71	1.49	2.6	5.31	4.09
6/16/2002	2.12E+00	1.16E+00	0.65722	0	2.12	1.16	2.6	4.72	3.76
6/17/2002	2.31E+00	1.27E+00	0.99043	0.1811	2.31	1.27	2.6	4.91	3.87
6/18/2002	2.62E-01	1.42E-01	24.18768	13.27115	24.19	13.27	2.6	26.79	15.87
6/19/2002	1.22E+00	6.80E-01	8.86194	4.87022	8.86	4.87	5.0	13.86	9.87
6/20/2002	8.55E-01	4.70E-01	6.99155	3.93087	6.99	3.93	5.0	11.99	8.93
6/21/2002	1.02E+00	5.68E-01	18.03874	9.20706	18.04	9.21	5.0	23.04	14.21
6/22/2002	1.21E+00	6.68E-01	6.65951	3.73004	6.66	3.73	5.0	11.66	8.73
6/23/2002	1.98E+00	1.10E+00	8.8459	4.75551	8.85	4.76	5.0	13.85	9.76
6/24/2002	1.05E+00	5.83E-01	8.52741	4.32729	8.53	4.33	5.0	13.53	9.33
6/25/2002	1.49E+00	8.22E-01	2.37683	1.31954	2.38	1.32	3.5	5.88	4.82
6/26/2002	2.17E+00	1.20E+00	2.77309	1.56868	2.77	1.57	3.5	6.27	5.07
6/27/2002	9.94E-01	5.40E-01	10.59396	5.82204	10.59	5.82	3.5	14.09	9.32
6/28/2002	4.10E+00	2.26E+00	1.41222	0.79833	4.10	2.26	3.5	7.60	5.76
6/29/2002	1.57E+00	8.59E-01	3.60449	2.04666	3.60	2.05	3.5	7.10	5.55
6/30/2002	1.72E+00	9.43E-01	6.5957	3.66391	6.60	3.66	3.5	10.10	7.16
7/1/2002	1.86E+00	1.02E+00	6.82194	3.63333	6.82	3.63	7.0	13.82	10.63
7/2/2002	1.67E+00	9.13E-01	5.41389	3.00506	5.41	3.01	7.0	12.41	10.01
7/3/2002	2.69E+00	1.48E+00	6.84773	3.68795	6.85	3.69	7.0	13.85	10.69
7/4/2002	2.07E+00	1.15E+00	14.61012	8.06426	14.61	8.06	7.0	21.61	15.06
7/5/2002	1.58E+00	8.74E-01	6.63614	3.68701	6.64	3.69	7.0	13.64	10.69
7/6/2002	8.77E-01	4.86E-01	7.50131	4.19281	7.50	4.19	7.0	14.50	11.19
7/7/2002	1.59E+00	8.69E-01	0.255	0.0558	1.59	0.87	5.0	6.59	5.87
7/8/2002	2.18E+00	1.18E+00	8.79722	4.92833	8.80	4.93	5.0	13.80	9.93

	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
Date	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
7/9/2002	1.90E+00	1.03E+00	2.22389	1.21222	2.22	1.21	5.0	7.22	6.21
7/10/2002	1.43E+00	7.90E-01	4.13511	2.20156	4.14	2.20	5.0	9.14	7.20
7/11/2002	1.12E+00	6.21E-01	2.45056	1.35222	2.45	1.35	5.0	7.45	6.35
7/12/2002	2.86E+00	1.59E+00	1.42569	0.83694	2.86	1.59	5.0	7.86	6.59
7/13/2002	5.63E-01	3.09E-01	10.97886	5.94861	10.98	5.95	8.9	19.88	14.85
7/14/2002	2.55E+00	1.40E+00	1.68667	0.92833	2.55	1.40	8.9	11.45	10.30
7/15/2002	2.03E+00	1.12E+00	3.03788	1.59627	3.04	1.60	8.9	11.94	10.50
7/16/2002	1.48E+00	8.29E-01	15.4008	8.55125	15.40	8.55	8.9	24.30	17.45
7/17/2002	1.37E+00	7.55E-01	8.10057	4.55971	8.10	4.56	8.9	17.00	13.46
7/18/2002	1.46E+00	8.15E-01	12.18507	6.59234	12.19	6.59	8.9	21.09	15.49
7/19/2002	9.18E-01	5.07E-01	9.50003	5.20517	9.50	5.21	3.5	13.00	8.71
7/20/2002	1.47E+00	8.07E-01	11.84608	6.45155	11.85	6.45	3.5	15.35	9.95
7/21/2002	1.07E+00	5.89E-01	2.61258	1.33279	2.61	1.33	3.5	6.11	4.83
7/22/2002	1.08E+00	5.81E-01	6.06611	3.40611	6.07	3.41	3.5	9.57	6.91
7/23/2002	8.69E-01	4.78E-01	3.77237	2.05322	3.77	2.05	3.5	7.27	5.55
7/24/2002	2.23E+00	1.22E+00	2.28776	1.24357	2.29	1.24	3.5	5.79	4.74
7/25/2002	6.99E-01	3.79E-01	9.48574	5.18729	9.49	5.19	4.4	13.89	9.59
7/26/2002	1.75E+00	9.62E-01	10.84196	5.8279	10.84	5.83	4.4	15.24	10.23
7/27/2002	2.27E+00	1.25E+00	4.62422	2.63241	4.62	2.63	4.4	9.02	7.03
7/28/2002	3.21E+00	1.76E+00	3.48773	1.93955	3.49	1.94	4.4	7.89	6.34
7/29/2002	7.10E-01	3.87E-01	4.94535	2.7346	4.95	2.73	4.4	9.35	7.13
7/30/2002	1.69E+00	9.32E-01	13.05606	6.98232	13.06	6.98	4.4	17.46	11.38
7/31/2002	3.97E+00	2.20E+00	2.43419	1.40105	3.97	2.20	5.1	9.07	7.30
8/1/2002	8.22E-01	4.44E-01	2.31782	1.30836	2.32	1.31	5.1	7.42	6.41
8/2/2002	2.06E+00	1.13E+00	1.80233	0.99633	2.06	1.13	5.1	7.16	6.23
8/3/2002	8.67E-01	4.75E-01	7.61434	4.15386	7.61	4.15	5.1	12.71	9.25
8/4/2002	2.47E+00	1.37E+00	2.24233	1.26757	2.47	1.37	5.1	7.57	6.47
8/5/2002	2.72E+00	1.50E+00	8.51613	4.76034	8.52	4.76	5.1	13.62	9.86
8/6/2002	2.64E+00	1.46E+00	3.37606	1.83834	3.38	1.84	4.1	7.48	5.94
8/7/2002	1.56E+00	8.59E-01	2.42314	1.32727	2.42	1.33	4.1	6.52	5.43
8/8/2002	1.96E+00	1.07E+00	1.25389	0.68778	1.96	1.07	4.1	6.06	5.17
8/9/2002	1.25E+00	6.72E-01	1.96556	0.5652	1.97	0.67	4.1	6.07	4.77
8/10/2002	1.23E+00	6.68E-01	9.59778	5.26033	9.60	5.26	4.1	13.70	9.36
8/11/2002	3.98E+00	2.17E+00	2.38356	1.30722	3.98	2.17	4.1	8.08	6.27
8/12/2002	3.21E+00	1.77E+00	0.72134	0.3598	3.21	1.77	8.5	11.71	10.27
8/13/2002	1.54E+00	8.38E-01	12.26761	6.76897	12.27	6.77	8.5	20.77	15.27
8/14/2002	9.92E-01	5.53E-01	8.78727	4.84351	8.79	4.84	8.5	17.29	13.34
8/15/2002	2.19E+00	1.20E+00	3.88569	2.09437	3.89	2.09	8.5	12.39	10.59
8/16/2002	2.57E+00	1.42E+00	4.97665	2.66948	4.98	2.67	8.5	13.48	11.17
8/17/2002	7.74E-01	4.28E-01	1.73726	0.98574	1.74	0.99	8.5	10.24	9.49
8/18/2002	1.07E+00	5.95E-01	4.88005	2.70337	4.88	2.70	18.7	23.58	21.40
8/19/2002	1.01E+00	5.61E-01	4.09222	2.25111	4.09	2.25	18.7	22.79	20.95
8/20/2002	1.81E+00	9.93E-01	6.11558	3.33974	6.12	3.34	18.7	24.82	22.04
8/21/2002	1.77E+00	9.68E-01	8.13706	4.21841	8.14	4.22	18.7	26.84	22.92
8/22/2002	7.87E-01	4.36E-01	0.67527	0.37381	0.79	0.44	18.7	19.49	19.14
8/23/2002	1.63E-02	1.33E-02	3.50472	1.921	3.50	1.92	18.7	22.20	20.62
8/24/2002	1.19E+00	6.51E-01	6.92433	3.87706	6.92	3.88	2.5	9.42	6.38
8/25/2002	8.14E-01	4.50E-01	13.95887	7.63217	13.96	7.63	2.5	16.46	10.13
8/26/2002	1.57E+00	8.73E-01	4.29756	2.3475	4.30	2.35	2.5	6.80	4.85
8/27/2002	1.54E+00	8.52E-01	1.27416	0.69667	1.54	0.85	2.5	4.04	3.35
8/28/2002	9.55E-01	5.17E-01	0.78389	0.24628	0.96	0.52	2.5	3.46	3.02
8/29/2002	5.11E-01	2.79E-01	2.92569	1.51502	2.93	1.52	2.5	5.43	4.02
8/30/2002	8.10E-01	4.46E-01	2.93597	1.52	2.94	1.52	8.7	11.64	10.22
8/31/2002	2.29E+00	1.25E+00	1.39074	0.76121	2.29	1.25	8.7	10.99	9.95
9/1/2002	1.86E+00	1.02E+00	6.66667	3.69833	6.67	3.70	8.7	15.37	12.40
9/2/2002	1.60E+00	8.64E-01	2.47056	1.35111	2.47	1.35	8.7	11.17	10.05
9/3/2002	1.35E+00	7.47E-01	5.15117	2.59111	5.15	2.59	8.7	13.85	11.29
9/4/2002	1.27E+00	6.98E-01	1.71111	0.96389	1.71	0.96	8.7	10.41	9.66
9/5/2002	2.36E+00	1.28E+00	2.32194	1.26629	2.36	1.28	5.8	8.16	7.08
9/6/2002	3.13E-02	1.75E-02	6.92583	3.80635	6.93	3.81	5.8	12.73	9.61
9/7/2002	1.69E+00	9.32E-01	8.2	4.52845	8.20	4.53	5.8	14.00	10.33
9/8/2002	1.54E+00	8.42E-01	0.75889	0.00001	1.54	0.84	5.8	7.34	6.64
9/9/2002	1.18E+00	6.55E-01	6.05278	3.04167	6.05	3.04	5.8	11.85	8.84
9/10/2002	9.65E-01	5.15E-01	4.68191	2.56238	4.68	2.56	5.8	10.48	8.36
9/11/2002	2.96E+00	1.64E+00	9.10646	5.00495	9.11	5.00	5.6	14.71	10.60
9/12/2002	6.06E-01	3.33E-01	7.5155	4.03278	7.52	4.03	5.6	13.12	9.63
9/13/2002	8.98E-01	4.87E-01	1.95407	0.99283	1.95	0.99	5.6	7.55	6.59
9/14/2002	1.38E+00	7.55E-01	3.42	1.93389	3.42	1.93	5.6	9.02	7.53
9/15/2002	1.30E+00	7.21E-01	2.41167	1.32613	2.41	1.33	5.6	8.01	6.93
9/16/2002	1.83E+00	9.85E-01	2.62778	0	2.63	0.99	5.6	8.23	6.59
9/17/2002	7.44E-01	4.00E-01	0.25778	0.05811	0.74	0.40	7.5	8.24	7.90
9/18/2002	2.26E+00	1.24E+00	9.08804	5.02406	9.09	5.02	7.5	16.59	12.52
9/19/2002	1.85E+00	1.02E+00	2.56944	1.41	2.57	1.41	7.5	10.07	8.91
9/20/2002	2.81E+00	1.55E+00	5.66111	3.05611	5.66	3.06	7.5	13.16	10.56
9/21/2002	2.02E+00	1.10E+00	5.1432	2.81875	5.14	2.82	7.5	12.64	10.32
9/22/2002	1.48E+00	8.17E-01	6.13306	2.94833	6.13	2.95	7.5	13.63	10.45
9/23/2002	4.31E+00	2.39E+00	1.45	0.79444	4.31	2.39	9.1	13.41	11.49
9/24/2002	1.39E+00	7.74E-01	5.43669	2.98389	5.44	2.98	9.1	14.54	12.08
9/25/2002	1.62E+00	8.95E-01	2.75706	1.56889	2.76	1.57	9.1	11.86	10.67
9/26/2002	6.34E-01	3.44E-01	4.77	2.575	4.77	2.58	9.1	13.87	11.68
9/27/2002	1.20E+00	6.59E-01	7.6	4.19556	7.60	4.20	9.1	16.70	13.30
9/28/2002	5.92E-01	3.23E-01	2.09491	1.0303	2.09	1.03	9.1	11.19	10.13
9/29/2002	1.11E+00	6.10E-01	12.3635	6.74169	12.36	6.74	5.1	17.46	11.84
9/30/2002	2.16E+00	1.20E+00	1.82444	0.97923	2.16	1.20	5.1	7.26	6.30
10/1/2002	1.56E+00	8.61E-01	5.38556	2.94425	5.39	2.94	5.1	10.49	8.04
10/2/2002	2.20E+00	1.22E+00	9.67778	5.34611	9.68	5.35	5.1	14.78	10.45
10/3/2002	1.40E+00	7.76E-01	3.06778	1.75056	3.07	1.75	5.1	8.17	6.85
10/4/2002	1.31E+00	7.29E-01	19.43718	10.86722	19.44	10.87	5.1	24.54	15.97
10/5/2002	1.49E+00	8.16E-01	8.34422	4.5485	8.34	4.55	7.1	15.44	11.65
10/6/2002	2.38E+00	1.29E+00	0.188	0.09578	2.38	1.29	7.1	9.48	8.39
10/7/2002	8.44E-01	4.67E-01	2.42056	1.325	2.42	1.33	7.1	9.52	8.43
10/8/2002	1.44E+00	7.91E-01	0.49217	0.27067	1.44	0.79	7.1	8.54	7.89
10/9/2002	1.40E+00	7.57E-01	0	0	1.40	0.76	7.1	8.50	7.86
10/10/2002	8.46E-01	4.69E-01	9.45002	5.17333	9.45	5.17	7.1	16.55	12.27
10/11/2002	1.08E+00	6.00E-01	1.43722	0.79278	1.44	0.79	10.6	12.04	11.39
10/12/2002	7.44E-01	4.01E-01	0	0	0.74	0.40	10.6	11.34	11.00
10/13/2002	8.86E-01	4.89E-01	1.47889	0.81222	1.48	0.81	10.6	12.08	11.41

	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
Date	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
10/14/2002	1.36E+00	7.46E-01	4.64992	2.53278	4.65	2.53	10.6	15.25	13.13
10/15/2002	4.48E-01	2.42E-01	3.62333	1.74987	3.62	1.75	10.6	14.22	12.35
10/16/2002	6.75E-01	3.66E-01	2.16244	1.09046	2.16	1.09	10.6	12.76	11.69
10/17/2002	6.91E-01	3.78E-01	0.35861	0.19667	0.69	0.38	8.7	9.39	9.08
10/18/2002	1.12E+00	6.14E-01	2.26222	1.22778	2.26	1.23	8.7	10.96	9.93
10/19/2002	4.78E-01	2.57E-01	9.25013	5.08923	9.25	5.09	8.7	17.95	13.79
10/20/2002	5.57E-01	3.08E-01	9.1604	5.03956	9.16	5.04	8.7	17.86	13.74
10/21/2002	2.13E+00	1.19E+00	3.78623	1.69044	3.79	1.69	8.7	12.49	10.39
10/22/2002	2.74E-01	1.50E-01	1.2717	0.69694	1.27	0.70	8.7	9.97	9.40
10/23/2002	8.86E-01	4.88E-01	0.94856	0.53383	0.95	0.53	6.6	7.55	7.13
10/24/2002	6.31E-01	3.47E-01	0.38208	0.11122	0.63	0.35	6.6	7.23	6.95
10/25/2002	1.09E+00	5.91E-01	1.75944	0.96944	1.76	0.97	6.6	8.36	7.57
10/26/2002	1.89E-02	1.41E-02	0.15728	0.09006	0.16	0.09	6.6	6.76	6.69
10/27/2002	7.07E-01	3.96E-01	0.04178	0.02383	0.71	0.40	6.6	7.31	7.00
10/28/2002	1.84E+00	1.02E+00	0.46206	0.25244	1.84	1.02	6.6	8.44	7.62
10/29/2002	1.19E+00	6.51E-01	9.12222	5.01056	9.12	5.01	8.6	17.72	13.61
10/30/2002	1.32E+00	7.33E-01	1.05667	0.58111	1.32	0.73	8.6	9.92	9.33
10/31/2002	1.47E+00	8.14E-01	0.00992	0.0055	1.47	0.81	8.6	10.07	9.41
11/1/2002	8.59E-01	4.65E-01	2.92011	1.61389	2.92	1.61	8.6	11.52	10.21
11/2/2002	3.43E+00	1.90E+00	0.88167	0	3.43	1.90	8.6	12.03	10.50
11/3/2002	7.06E-01	3.79E-01	2.78389	1.56056	2.78	1.56	8.6	11.38	10.16
11/4/2002	1.00E+00	5.54E-01	2.29528	1.24453	2.30	1.24	12.0	14.30	13.24
11/5/2002	3.01E+00	1.65E+00	0.66296	0.069	3.01	1.65	12.0	15.01	13.65
11/6/2002	9.34E+00	5.17E+00	0.16594	0.09111	9.34	5.17	12.0	21.34	17.17
11/7/2002	9.32E+00	5.16E+00	0.2048	0.02196	9.32	5.16	12.0	21.32	17.16
11/8/2002	1.59E+00	8.57E-01	0.21538	0.01079	1.59	0.86	12.0	13.59	12.86
11/9/2002	2.17E+00	1.20E+00	0.42387	0.0305	2.17	1.20	12.0	14.17	13.20
11/10/2002	1.92E+00	1.06E+00	2.48413	1.33222	2.48	1.33	8.1	10.58	9.43
11/11/2002	1.66E+00	9.09E-01	1.84301	1.02056	1.84	1.02	8.1	9.94	9.12
11/12/2002	3.12E+00	1.70E+00	7.31278	4.05578	7.31	4.06	8.1	15.41	12.16
11/13/2002	1.01E+00	5.61E-01	2.90194	1.61589	2.90	1.62	8.1	11.00	9.72
11/14/2002	1.61E+00	8.90E-01	0.45306	0.24661	1.61	0.89	8.1	9.71	8.99
11/15/2002	1.44E+00	7.86E-01	1.46044	0.80327	1.46	0.80	8.1	9.56	8.90
11/16/2002	2.88E+00	1.59E+00	1.0519	0.57715	2.88	1.59	17.7	20.58	19.29
11/17/2002	7.28E-01	4.03E-01	5.59444	3.05889	5.59	3.06	17.7	23.29	20.76
11/18/2002	9.75E-01	5.43E-01	2.51	1.36778	2.51	1.37	17.7	20.21	19.07
11/19/2002	8.86E-01	4.83E-01	1.26	0.68889	1.26	0.69	17.7	18.96	18.39
11/20/2002	1.05E+00	5.79E-01	0.69944	0.39256	1.05	0.58	17.7	18.75	18.28
11/21/2002	1.39E+00	7.60E-01	1.32278	0.72056	1.39	0.76	17.7	19.09	18.46
11/22/2002	1.59E+00	8.80E-01	2.43111	1.32889	2.43	1.33	13.1	15.53	14.43
11/23/2002	1.07E+00	5.95E-01	0.58222	0.31322	1.07	0.59	13.1	14.17	13.69
11/24/2002	5.40E-01	3.00E-01	12.51259	5.71907	12.51	5.72	13.1	25.61	18.82
11/25/2002	9.51E-01	5.23E-01	2.51722	1.38556	2.52	1.39	13.1	15.62	14.49
11/26/2002	4.02E-01	2.19E-01	6.92778	3.78167	6.93	3.78	13.1	20.03	16.88
11/27/2002	9.00E-01	5.00E-01	2.64944	1.45611	2.65	1.46	13.1	15.75	14.56
11/28/2002	1.16E+00	6.35E-01	0.00073	0.00041	1.16	0.64	22.6	23.76	23.24
11/29/2002	1.27E+00	7.03E-01	0	0	1.27	0.70	22.6	23.87	23.30
11/30/2002	1.56E+00	8.65E-01	0	0	1.56	0.86	22.6	24.16	23.46
12/1/2002	9.24E-01	5.13E-01	0	0	0.92	0.51	22.6	23.52	23.11
12/2/2002	1.13E+00	6.25E-01	1.03556	0.59	1.13	0.62	22.6	23.73	23.22
12/3/2002	1.20E+00	6.57E-01	1.14111	0.62556	1.20	0.66	22.6	23.80	23.26
12/4/2002	2.66E+00	1.47E+00	5.56111	3.09889	5.56	3.10	6.8	12.36	9.90
12/5/2002	1.06E+00	5.83E-01	1.2472	0.66889	1.25	0.67	6.8	8.05	7.47
12/6/2002	7.88E-01	4.35E-01	2.39	1.30944	2.39	1.31	6.8	9.19	8.11
12/7/2002	6.50E-01	3.60E-01	2.54778	1.39444	2.55	1.39	6.8	9.35	8.19
12/8/2002	2.02E+00	1.10E+00	6.03333	3.36167	6.03	3.36	6.8	12.83	10.16
12/9/2002	4.44E+00	2.45E+00	0.85348	0.46592	4.44	2.45	6.8	11.24	9.25
12/10/2002	1.65E+00	9.16E-01	0.00147	0	1.65	0.92	15.3	16.90	16.17
12/11/2002	4.14E+00	2.24E+00	0.00066	0	4.14	2.24	15.3	19.39	17.49
12/12/2002	1.49E+01	8.19E+00	0.00024	0	14.89	8.19	15.3	30.14	23.44
12/13/2002	7.01E+00	3.85E+00	1.03909	0.565	7.01	3.85	15.3	22.26	19.10
12/14/2002	1.42E+01	7.84E+00	0.00007	0.00001	14.24	7.84	15.3	29.49	23.09
12/15/2002	1.40E+01	7.77E+00	0.00001	0.00001	14.04	7.77	15.3	29.29	23.02
12/16/2002	4.27E+00	2.40E+00	1.1128	0.59948	4.27	2.40	15.3	19.52	17.65
12/17/2002	1.00E+00	5.62E-01	3.30091	1.78045	3.30	1.78	15.3	18.55	17.03
12/18/2002	9.03E+00	5.02E+00	0	0.00001	9.03	5.02	15.3	24.28	20.27
12/19/2002	1.48E+01	8.20E+00	0.00194	0	14.78	8.20	15.3	30.03	23.45
12/20/2002	4.85E+00	2.67E+00	0.54701	0.09553	4.85	2.67	15.3	20.10	17.92
12/21/2002	5.67E-01	3.06E-01	0.46556	0.00017	0.57	0.31	15.3	15.82	15.56
12/22/2002	7.11E-01	3.91E-01	0.23667	0	0.71	0.39	23.7	24.41	24.09
12/23/2002	9.52E-01	5.25E-01	0	0	0.95	0.52	23.7	24.65	24.22
12/24/2002	2.02E+00	1.11E+00	0.51239	0.18891	2.02	1.11	23.7	25.72	24.81
12/25/2002	1.34E+01	7.38E+00	0.0073	0.00411	13.38	7.38	23.7	37.08	31.08
12/26/2002	1.12E+01	6.14E+00	0.0172	0.00002	11.17	6.14	23.7	34.87	29.84
12/27/2002	4.29E+00	2.34E+00	5.88899	3.5341	5.89	3.53	23.7	29.59	27.23
12/28/2002	1.75E+00	9.53E-01	0.11239	0.00067	1.75	0.95	3.2	4.95	4.15
12/29/2002	4.48E+00	2.46E+00	0.20329	0.04597	4.48	2.46	3.2	7.68	5.66
12/30/2002	1.69E+01	9.36E+00	0.00001	0.00001	16.92	9.36	3.2	20.12	12.56
12/31/2002	1.93E+00	1.05E+00	1.67113	0.93773	1.93	1.05	3.2	5.13	4.25
8th highest value								29.29	23.45

Date	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
1/1/2003	4.78E+00	2.61E+00	0.56	0.30705	4.78	2.61	3.2	7.98	5.81
1/2/2003	1.30E+01	7.17E+00	0.00016	0.00001	13.05	7.17	3.2	16.25	10.37
1/3/2003	1.24E+00	6.77E-01	2.71556	1.50611	2.72	1.51	7.2	9.92	8.71
1/4/2003	6.08E+00	3.35E+00	2.49906	1.22889	6.08	3.35	7.2	13.28	10.55
1/5/2003	2.82E+00	1.57E+00	0.26372	0.14389	2.82	1.57	7.2	10.02	8.77
1/6/2003	2.88E-01	1.56E-01	0	0	0.29	0.16	7.2	7.49	7.36
1/7/2003	1.33E+00	7.21E-01	0	0	1.33	0.72	7.2	8.53	7.92
1/8/2003	7.09E-01	3.89E-01	1.39944	0.76778	1.40	0.77	7.2	8.60	7.97
1/9/2003	3.20E+00	1.78E+00	1.22222	0.66778	3.20	1.78	11.2	14.40	12.98
1/10/2003	2.50E+00	1.34E+00	0.96739	0.52739	2.50	1.34	11.2	13.70	12.54
1/11/2003	8.04E+00	4.38E+00	0.00004	0	8.04	4.38	11.2	19.24	15.58
1/12/2003	1.01E+01	5.55E+00	0.00031	0	10.14	5.55	11.2	21.34	16.75
1/13/2003	6.68E-03	5.74E-03	1.81667	0.99778	1.82	1.00	11.2	13.02	12.20
1/14/2003	4.83E-01	2.69E-01	3.12871	1.711	3.13	1.71	11.2	14.33	12.91
1/15/2003	9.32E-01	5.18E-01	2.477	1.40918	2.48	1.41	3.6	6.08	5.01
1/16/2003	1.31E+00	7.27E-01	1.63778	0.00259	1.64	0.73	3.6	5.24	4.33
1/17/2003	2.75E+00	1.52E+00	0	0	2.75	1.52	3.6	6.35	5.12
1/18/2003	3.93E+00	2.17E+00	1.54389	0.84778	3.93	2.17	3.6	7.53	5.77
1/19/2003	1.27E+00	7.03E-01	1.82486	1.01782	1.82	1.02	3.6	5.42	4.62
1/20/2003	1.03E+00	5.73E-01	1.39889	0.79056	1.40	0.79	3.6	5.00	4.39
1/21/2003	6.12E+00	3.37E+00	0.00653	0.00035	6.12	3.37	1.6	7.72	4.97
1/22/2003	8.37E+00	4.61E+00	0.26721	0.09861	8.37	4.61	1.6	9.97	6.21
1/23/2003	9.51E-01	5.16E-01	0.29539	0.16211	0.95	0.52	1.6	2.55	2.12
1/24/2003	2.76E+00	1.52E+00	0	0	2.76	1.52	1.6	4.36	3.12
1/25/2003	5.63E-01	3.12E-01	2.54134	1.3818	2.54	1.38	1.6	4.14	2.98
1/26/2003	1.01E+00	5.59E-01	3.48452	1.90144	3.48	1.90	1.6	5.08	3.50
1/27/2003	6.94E-01	3.83E-01	8.49322	4.88188	8.49	4.88	3.8	12.29	8.68
1/28/2003	1.19E+00	6.48E-01	2.95944	1.61667	2.96	1.62	3.8	6.76	5.42
1/29/2003	4.19E-01	2.24E-01	2.64311	1.44889	2.64	1.45	3.8	6.44	5.25
1/30/2003	8.82E-01	4.75E-01	4.95624	2.6502	4.96	2.65	3.8	8.76	6.45
1/31/2003	4.32E-01	2.34E-01	0.91138	0.38817	0.91	0.39	3.8	4.71	4.19
2/1/2003	1.03E+00	5.63E-01	9.45303	5.40538	9.45	5.41	3.8	13.25	9.21
2/2/2003	1.17E+00	6.44E-01	4.61877	2.4088	4.62	2.41	20.0	24.57	22.36
2/3/2003	1.35E+00	7.42E-01	6.80122	3.70457	6.80	3.70	20.0	26.75	23.65
2/4/2003	1.28E+00	7.04E-01	2.65222	1.45778	2.65	1.46	20.0	22.60	21.41
2/5/2003	9.86E-01	5.47E-01	1.4501	0.79672	1.45	0.80	20.0	21.40	20.75
2/6/2003	6.86E-01	3.78E-01	0.01089	0.00604	0.69	0.38	20.0	20.64	20.33
2/7/2003	8.00E-01	4.33E-01	1.19056	0.65556	1.19	0.66	20.0	21.14	20.61
2/8/2003	8.04E-01	4.44E-01	0	0	0.80	0.44	36.1	36.90	36.54
2/9/2003	1.40E+00	7.76E-01	0.45028	0	1.40	0.78	36.1	37.50	36.88
2/10/2003	1.07E+00	5.94E-01	0	0.00021	1.07	0.59	36.1	37.17	36.69
2/11/2003	2.52E+00	1.39E+00	2.32833	1.31333	2.52	1.39	36.1	38.62	37.49
2/12/2003	4.11E-01	2.28E-01	1.47444	0.81	1.47	0.81	36.1	37.57	36.91
2/13/2003	3.85E-02	2.47E-02	10.40072	5.70478	10.40	5.70	36.1	46.50	41.80
2/14/2003	1.77E+00	9.78E-01	0.90206	0.45206	1.77	0.98	7.1	8.87	8.08
2/15/2003	6.57E+00	3.59E+00	0.10445	0.05691	6.57	3.59	7.1	13.67	10.69
2/16/2003	5.00E+00	2.75E+00	0.26046	0.06287	5.00	2.75	7.1	12.10	9.85
2/17/2003	8.83E-01	4.80E-01	0.26978	0.06194	0.88	0.48	7.1	7.98	7.58
2/18/2003	2.28E+00	1.25E+00	0.13172	0.06655	2.28	1.25	7.1	9.38	8.35
2/19/2003	7.72E-01	4.18E-01	3.01826	1.6617	3.02	1.66	7.1	10.12	8.76
2/20/2003	1.10E+00	6.07E-01	1.37556	0.40439	1.38	0.61	10.4	11.78	11.01
2/21/2003	8.22E-01	4.57E-01	2.80075	1.57691	2.80	1.58	10.4	13.20	11.98
2/22/2003	1.03E-01	5.69E-02	5.24814	2.86912	5.25	2.87	10.4	15.65	13.27
2/23/2003	1.03E+00	5.69E-01	0	0	1.03	0.57	10.4	11.43	10.97
2/24/2003	1.10E+00	6.07E-01	7.46398	4.11583	7.46	4.12	10.4	17.86	14.52
2/25/2003	9.93E-01	5.45E-01	3.40172	1.92989	3.40	1.93	10.4	13.80	12.33
2/26/2003	6.42E-01	3.49E-01	0.48539	0.1896	0.64	0.35	7.3	7.94	7.65
2/27/2003	1.78E+00	9.83E-01	0.68167	0.37589	1.78	0.98	7.3	9.08	8.28
2/28/2003	2.01E+00	1.10E+00	4.57002	2.53183	4.57	2.53	7.3	11.87	9.83
3/1/2003	1.64E+00	9.00E-01	0.67959	0.38175	1.64	0.90	7.3	8.94	8.20
3/2/2003	1.00E+00	5.47E-01	8.03809	4.47586	8.04	4.48	7.3	15.34	11.78
3/3/2003	1.83E+00	1.01E+00	0.96231	0.51951	1.83	1.01	7.3	9.13	8.31
3/4/2003	1.86E+00	1.03E+00	1.09709	0.59764	1.86	1.03	7.3	9.16	8.33
3/5/2003	1.81E+00	1.00E+00	5.65611	3.10661	5.66	3.11	7.3	12.96	10.41
3/6/2003	6.41E-01	3.52E-01	4.27659	2.39781	4.28	2.40	7.3	11.58	9.70
3/7/2003	1.08E+00	6.84E-01	1.58203	0.47656	1.58	0.68	7.3	8.88	7.98
3/8/2003	2.76E+00	1.53E+00	1.78161	0.92333	2.76	1.53	7.3	10.06	8.83
3/9/2003	7.28E+00	3.98E+00	0.53739	0.29013	7.28	3.98	7.3	14.58	11.28
3/10/2003	7.78E-01	4.29E-01	1.36325	0.63937	1.36	0.64	4.2	5.56	4.84
3/11/2003	1.85E+00	1.02E+00	5.35374	2.89404	5.35	2.89	4.2	9.55	7.09
3/12/2003	1.10E+01	6.13E+00	2.1368	1.23106	11.04	6.13	1.5	12.54	7.63
3/13/2003	7.25E+00	4.04E+00	0.24104	0.00237	7.25	4.04	1.5	8.75	5.54
3/14/2003	1.09E+01	6.05E+00	0.00177	0.00001	10.89	6.05	1.5	12.39	7.55
3/15/2003	2.87E+00	1.61E+00	0.32414	0.15773	2.87	1.61	1.5	4.37	3.11
3/16/2003	2.49E+00	1.38E+00	2.86786	0.28294	2.87	1.38	5.2	8.07	6.58
3/17/2003	2.44E+00	1.35E+00	2.61389	1.43	2.61	1.43	5.2	7.81	6.63
3/18/2003	1.27E+00	6.99E-01	0.44822	0.02676	1.27	0.70	5.2	6.47	5.90
3/19/2003	7.10E+00	3.95E+00	0.3015	0.1668	7.10	3.95	5.2	12.30	9.15
3/20/2003	1.51E+00	8.30E-01	0.62378	0.23544	1.51	0.83	5.2	6.71	6.03
3/21/2003	2.95E+00	1.63E+00	0.41829	0.10089	2.95	1.63	5.2	8.15	6.83
3/22/2003	2.46E+00	1.36E+00	0.36094	0.19978	2.46	1.36	13.3	15.76	14.66
3/23/2003	4.30E+00	2.38E+00	5.55464	3.34713	5.55	3.35	13.3	18.85	16.65
3/24/2003	1.63E+00	8.97E-01	1.44127	0.79332	1.63	0.90	13.3	14.93	14.20
3/25/2003	3.62E+00	2.01E+00	0.28856	0.15728	3.62	2.01	13.3	16.92	15.31
3/26/2003	9.93E-01	5.45E-01	7.47505	4.07389	7.48	4.07	13.3	20.78	17.37
3/27/2003	2.47E+00	1.36E+00	1.17225	0.63279	2.47	1.36	13.3	15.77	14.66
3/28/2003	1.23E+00	6.75E-01	0.62222	0.00348	1.23	0.67	7.4	8.63	8.07
3/29/2003	8.99E-01	4.87E-01	0	0	0.90	0.49	7.4	8.30	7.89
3/30/2003	1.33E+00	7.27E-01	2.06334	1.13445	2.06	1.13	7.4	9.46	8.53
3/31/2003	1.29E+00	7.15E-01	8.48728	4.74025	8.49	4.74	7.4	15.89	12.14
4/1/2003	2.28E+00	1.27E+00	3.71667	2.09333	3.72	2.09	7.4	11.12	9.49
4/2/2003	1.63E+00	8.86E-01	5.23	2.905	5.23	2.91	7.4	12.63	10.31

	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
Date	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
4/3/2003	4.29E+00	2.40E+00	0.25257	0.09877	4.29	2.40	2.5	6.79	4.90
4/4/2003	1.59E+00	8.90E-01	4.28479	2.39907	4.28	2.40	2.5	6.78	4.90
4/5/2003	1.00E+00	5.44E-01	0.26433	0.05833	1.00	0.54	2.5	3.50	3.04
4/6/2003	1.50E+00	8.25E-01	1.03731	0.30511	1.50	0.83	2.5	4.00	3.33
4/7/2003	1.02E+00	5.50E-01	2.58367	1.245	2.58	1.25	2.5	5.08	3.75
4/8/2003	5.36E+00	3.00E+00	5.415	2.945	5.42	3.00	2.5	7.92	5.50
4/9/2003	1.38E+00	7.56E-01	16.41411	8.77111	16.41	8.77	5.8	22.21	14.57
4/10/2003	1.76E+00	9.61E-01	1.33706	0.29225	1.76	0.96	5.8	7.56	6.76
4/11/2003	1.75E+00	9.60E-01	2.725	1.51056	2.73	1.51	5.8	8.53	7.31
4/12/2003	5.77E+00	3.18E+00	0.04787	0.02665	5.77	3.18	5.8	11.57	8.98
4/13/2003	2.38E+00	1.34E+00	0.36067	0.13828	2.38	1.34	5.8	8.18	7.14
4/14/2003	2.56E+00	1.41E+00	0.18911	0.10523	2.56	1.41	5.8	8.36	7.21
4/15/2003	2.46E+00	1.36E+00	0.26677	0.0571	2.46	1.36	3.4	5.86	4.76
4/16/2003	3.57E+00	1.98E+00	0.6258	0.07542	3.57	1.98	3.4	6.97	5.38
4/17/2003	1.41E+00	7.86E-01	6.59643	3.68444	6.60	3.68	3.4	10.00	7.08
4/18/2003	2.46E+00	1.36E+00	2.17495	1.16096	2.46	1.36	3.4	5.86	4.76
4/19/2003	2.40E+00	1.32E+00	0.28848	0.00033	2.40	1.32	3.4	5.80	4.72
4/20/2003	2.20E+00	1.21E+00	1.3233	0.7118	2.20	1.21	3.4	5.60	4.61
4/21/2003	1.70E+00	9.42E-01	8.62947	4.78001	8.63	4.78	3.1	11.73	7.88
4/22/2003	1.25E+00	6.89E-01	10.18097	5.63088	10.18	5.63	3.1	13.28	8.73
4/23/2003	8.01E+00	4.47E+00	0.67183	0.36541	8.01	4.47	3.1	11.11	7.57
4/24/2003	3.13E+00	1.73E+00	0.38247	0.12069	3.13	1.73	3.1	6.23	4.83
4/25/2003	7.50E+00	4.14E+00	0.31059	0.09426	7.50	4.14	3.1	10.60	7.24
4/26/2003	2.69E+00	1.51E+00	0.07017	0.00663	2.69	1.51	3.1	5.79	4.61
4/27/2003	6.81E+00	3.75E+00	0.01094	0.0061	6.81	3.75	2.7	9.51	6.45
4/28/2003	6.01E+00	3.31E+00	0	0	6.01	3.31	2.7	8.71	6.01
4/29/2003	5.28E+00	2.90E+00	0.45761	0.15258	5.28	2.90	2.7	7.98	5.60
4/30/2003	3.75E+00	2.07E+00	0.302	0.12294	3.75	2.07	3.5	7.25	5.57
5/1/2003	1.64E+00	9.02E-01	0.66167	0.16172	1.64	0.90	3.5	5.14	4.40
5/2/2003	1.15E+00	6.30E-01	2.91556	0	2.92	0.63	3.5	6.42	4.13
5/3/2003	1.14E+00	6.26E-01	1.97847	1.09732	1.98	1.10	6.7	8.68	7.80
5/4/2003	1.53E+00	8.42E-01	4.85389	2.63611	4.85	2.64	6.7	11.55	9.34
5/5/2003	2.57E+00	1.42E+00	4.55556	2.52278	4.56	2.52	6.7	11.26	9.22
5/6/2003	1.05E+00	5.75E-01	1.37167	0.76333	1.37	0.76	6.7	8.07	7.46
5/7/2003	2.12E+00	1.18E+00	14.37665	7.8714	14.38	7.87	6.7	21.08	14.57
5/8/2003	3.00E+00	1.66E+00	5.47033	2.98404	5.47	2.98	6.7	12.17	9.68
5/9/2003	8.16E-01	4.51E-01	1.04667	0	1.05	0.45	3.8	4.85	4.25
5/10/2003	1.15E-01	7.98E-02	3.82372	2.17805	3.82	2.18	3.8	7.62	5.98
5/11/2003	2.76E+00	1.53E+00	16.47691	9.08916	16.48	9.09	3.8	20.28	12.89
5/12/2003	3.08E+00	1.70E+00	9.41504	5.1769	9.42	5.18	3.8	13.22	8.98
5/13/2003	1.50E+00	8.25E-01	0.23633	0.09617	1.50	0.82	3.8	5.30	4.62
5/14/2003	2.21E+00	1.22E+00	15.87353	8.72638	15.87	8.73	3.8	19.67	12.53
5/15/2003	2.94E+00	1.63E+00	6.08967	2.92222	6.09	2.92	4.4	10.44	7.27
5/16/2003	1.80E-01	9.84E-02	4.05445	2.1997	4.05	2.20	4.4	8.40	6.55
5/17/2003	2.93E+00	1.63E+00	11.38123	6.54887	11.38	6.55	4.4	15.73	10.90
5/18/2003	3.22E+00	1.78E+00	5.1864	2.81895	5.19	2.82	4.4	9.54	7.17
5/19/2003	2.23E+00	1.23E+00	1.8455	1.03289	2.23	1.23	4.4	6.58	5.58
5/20/2003	1.24E-01	6.58E-02	5.44439	2.82014	5.44	2.82	4.4	9.79	7.17
5/21/2003	1.14E-01	6.20E-02	9.26838	5.08196	9.27	5.08	4.9	14.17	9.98
5/22/2003	1.72E+00	9.45E-01	8.38611	4.63611	8.39	4.64	4.9	13.29	9.54
5/23/2003	4.44E-02	3.29E-02	10.29267	5.50333	10.29	5.50	4.9	15.19	10.40
5/24/2003	2.38E+00	1.31E+00	3.33083	1.85752	3.33	1.86	4.9	8.23	6.76
5/25/2003	6.91E-01	3.77E-01	2.41278	1.33283	2.41	1.33	4.9	7.31	6.23
5/26/2003	3.27E+00	1.80E+00	3.86389	2.10278	3.86	2.10	4.9	8.76	7.00
5/27/2003	2.60E+00	1.43E+00	5.185	2.75278	5.19	2.75	5.8	10.99	8.55
5/28/2003	1.60E+00	8.86E-01	1.80111	1.02889	1.80	1.03	5.8	7.60	6.83
5/29/2003	8.86E-01	4.92E-01	1.11726	0.61502	1.12	0.62	5.8	6.92	6.42
5/30/2003	9.28E-01	5.07E-01	6.336	3.5358	6.34	3.54	5.8	12.14	9.34
5/31/2003	1.33E+00	7.45E-01	13.40609	7.36688	13.41	7.37	5.8	19.21	13.17
6/1/2003	2.11E+00	1.16E+00	9.31563	4.83506	9.32	4.84	5.8	15.12	10.64
6/2/2003	1.48E+00	8.16E-01	6.71672	3.71823	6.72	3.72	15.5	22.22	19.22
6/3/2003	2.30E+00	1.26E+00	0.35561	0.13611	2.30	1.26	15.5	17.80	16.76
6/4/2003	9.85E-01	5.42E-01	4.43214	2.48669	4.43	2.49	15.5	19.93	17.99
6/5/2003	3.27E-02	2.23E-02	10.79717	5.87417	10.80	5.87	15.5	26.30	21.37
6/6/2003	1.14E+00	6.24E-01	12.26636	6.76251	12.27	6.76	15.5	27.77	22.26
6/7/2003	9.91E-01	5.43E-01	19.7535	10.85746	19.75	10.86	15.5	35.25	26.36
6/8/2003	9.41E-01	5.13E-01	6.14015	3.39453	6.14	3.39	10.3	16.39	13.64
6/9/2003	2.39E+00	1.32E+00	11.28613	6.00384	11.29	6.00	10.3	21.54	16.25
6/10/2003	1.66E+00	9.15E-01	9.63489	5.26503	9.63	5.27	10.3	19.88	15.52
6/11/2003	7.67E-01	4.20E-01	12.94508	6.48392	12.95	6.48	10.3	23.20	16.73
6/12/2003	1.10E+00	6.05E-01	16.08113	8.62815	16.08	8.63	10.3	26.33	18.88
6/13/2003	2.16E+00	1.18E+00	11.57567	5.89304	11.58	5.89	10.3	21.83	16.14
6/14/2003	2.85E+00	1.57E+00	23.42222	12.84722	23.42	12.85	10.3	33.67	23.10
6/15/2003	2.01E+00	1.11E+00	9.50453	5.22005	9.50	5.22	10.3	19.75	15.47
6/16/2003	1.39E+00	7.56E-01	12.64554	6.37689	12.65	6.38	10.3	22.90	16.63
6/17/2003	1.03E+00	5.69E-01	12.27248	6.76727	12.27	6.77	10.3	22.52	17.02
6/18/2003	8.56E-01	4.77E-01	4.26876	2.41181	4.27	2.41	10.3	14.52	12.66
6/19/2003	1.60E+00	8.92E-01	18.83422	10.3267	18.83	10.33	10.3	29.08	20.58
6/20/2003	3.11E+00	1.71E+00	33.21056	18.30722	33.21	18.31	10.3	43.46	28.56
6/21/2003	2.47E+00	1.37E+00	18.96611	10.399	18.97	10.40	10.3	29.22	20.65
6/22/2003	2.37E+00	1.31E+00	5.29258	2.89558	5.29	2.90	10.3	15.54	13.15
6/23/2003	2.57E+00	1.42E+00	9.09499	4.99261	9.09	4.99	10.3	19.34	15.24
6/24/2003	3.56E+00	1.98E+00	3.1652	1.72393	3.56	1.98	10.3	13.81	12.23
6/25/2003	1.55E+00	8.40E-01	0.86539	0.3375	1.55	0.84	10.3	11.80	11.09
6/26/2003	1.60E+00	8.71E-01	4.29425	2.33167	4.29	2.33	10.3	14.54	12.58
6/27/2003	2.94E+00	1.60E+00	2.51498	1.37333	2.94	1.60	10.3	13.19	11.85
6/28/2003	1.66E+00	9.01E-01	0	0	1.66	0.90	10.3	11.91	11.15
6/29/2003	3.64E+00	2.02E+00	5.49671	3.02	5.50	3.02	10.3	15.75	13.27
6/30/2003	1.95E+00	1.07E+00	10.02149	5.59892	10.02	5.60	10.3	20.27	15.85
7/1/2003	1.56E+00	8.56E-01	6.07331	3.07667	6.07	3.08	10.3	16.32	13.33
7/2/2003	2.83E+00	1.55E+00	1.4339	0.78446	2.83	1.55	10.3	13.08	11.80
7/3/2003	1.74E+00	9.56E-01	1.56317	0.70356	1.74	0.96	10.3	11.99	11.21
7/4/2003	8.44E-01	4.70E-01	4.3082	2.45553	4.31	2.46	10.3	14.56	12.71
7/5/2003	7.83E-01	4.29E-01	3.53088	1.85318	3.53	1.85	10.3	13.78	12.10
7/6/2003	1.45E+00	7.88E-01	4.44552	1.94623	4.45	1.95	10.3	14.70	12.20
7/7/2003	1.78E+00	9.63E-01	12.93333	7.26167	12.93	7.26	10.3	23.18	17.51
7/8/2003	2.68E+00	1.47E+00	6.15842	3.33038	6.16	3.33	5.0	11.16	8.33

Date	HBRP, AERMOD Flat Terrain Diesel Mode	Nat. Gas Mode	HBRP, CTDMPLUS Diesel Mode	Nat. Gas Mode	MAX (AERMOD/CTDMPLUS) Diesel Mode	Nat. Gas Mode	Measured Background	Total Impact Diesel Mode	Nat. Gas Mode
7/9/2003	1.81E+00	9.91E-01	1.87389	1.02278	1.87	1.02	5.0	6.87	6.02
7/10/2003	3.09E+00	1.69E+00	0.90278	0.24206	3.09	1.69	5.0	8.09	6.69
7/11/2003	1.16E+00	6.33E-01	0.82278	0.44994	1.16	0.63	5.0	6.16	5.63
7/12/2003	1.66E+00	8.97E-01	7.4365	4.08372	7.44	4.08	5.0	12.44	9.08
7/13/2003	2.04E+00	1.12E+00	19.49328	10.607	19.49	10.61	5.0	24.49	15.61
7/14/2003	4.53E+00	2.51E+00	9.93681	5.46177	9.94	5.46	4.4	14.34	9.86
7/15/2003	8.77E-01	4.82E-01	12.82948	7.03684	12.83	7.04	4.4	17.23	11.44
7/16/2003	2.30E+00	1.27E+00	15.94504	8.77777	15.95	8.78	4.4	20.35	13.18
7/17/2003	1.37E+00	7.48E-01	1.61333	0.87778	1.61	0.88	4.4	6.01	5.28
7/18/2003	5.32E-01	2.92E-01	13.39294	7.34733	13.39	7.35	4.4	17.79	11.75
7/19/2003	1.26E+00	6.87E-01	17.62011	9.67791	17.62	9.68	4.4	22.02	14.08
7/20/2003	1.31E+00	7.19E-01	10.296	5.57188	10.30	5.57	4.4	14.70	9.97
7/21/2003	1.30E+00	7.09E-01	1.75303	0.9702	1.75	0.97	4.4	6.15	5.37
7/22/2003	1.40E+00	7.68E-01	1.57678	0.87	1.58	0.87	4.4	5.98	5.27
7/23/2003	1.57E+00	8.61E-01	1.48678	0.74881	1.57	0.86	4.4	5.97	5.26
7/24/2003	1.47E+00	8.04E-01	1.21012	0.6651	1.47	0.80	4.4	5.87	5.20
7/25/2003	1.52E+00	8.38E-01	4.63496	2.59991	4.63	2.60	4.4	9.03	7.00
7/26/2003	7.49E-01	4.10E-01	3.09696	1.70106	3.10	1.70	7.7	10.80	9.40
7/27/2003	1.27E+00	7.09E-01	13.37778	7.23889	13.38	7.24	7.7	21.08	14.94
7/28/2003	5.84E-03	3.86E-03	1.46167	0.80889	1.46	0.81	7.7	9.16	8.51
7/29/2003	3.94E-02	2.11E-02	2.62778	1.43722	2.63	1.44	7.7	10.33	9.14
7/30/2003	1.17E+00	6.45E-01	2.62934	1.48798	2.63	1.49	7.7	10.33	9.19
7/31/2003	3.83E+00	2.11E+00	0.98469	0.39261	3.83	2.11	7.7	11.53	9.81
8/1/2003	1.54E+00	8.46E-01	3.5169	1.87883	3.52	1.88	10.3	13.82	12.18
8/2/2003	7.60E-01	4.18E-01	1.44389	0.73	1.44	0.73	10.3	11.74	11.03
8/3/2003	9.07E-01	4.91E-01	4.59778	1.92794	4.60	1.93	10.3	14.90	12.23
8/4/2003	1.69E+00	9.33E-01	1.49461	0.72912	1.69	0.93	10.3	11.99	11.23
8/5/2003	1.29E+00	7.10E-01	2.30872	1.22339	2.31	1.22	10.3	12.61	11.52
8/6/2003	1.22E+00	6.66E-01	3.08	1.51694	3.08	1.52	10.3	13.38	11.82
8/7/2003	2.03E+00	1.11E+00	0	0	2.03	1.11	7.1	9.13	8.21
8/8/2003	2.22E+00	1.22E+00	2.04525	1.12333	2.22	1.22	7.1	9.32	8.32
8/9/2003	3.54E+00	1.93E+00	2.61111	1.41944	3.54	1.93	7.1	10.64	9.03
8/10/2003	3.07E+00	1.69E+00	5.39556	1.58611	5.40	1.69	7.1	12.50	8.79
8/11/2003	2.40E+00	1.31E+00	0.79	0.41172	2.40	1.31	7.1	9.50	8.41
8/12/2003	1.88E+00	1.03E+00	9.16648	5.00131	9.17	5.00	7.1	16.27	12.10
8/13/2003	1.14E+00	6.27E-01	7.14359	3.9752	7.14	3.98	6.1	13.24	10.08
8/14/2003	2.46E+00	1.35E+00	2.1521	0.81004	2.46	1.35	6.1	8.56	7.45
8/15/2003	3.05E+00	1.67E+00	10.14761	5.52389	10.15	5.52	6.1	16.25	11.62
8/16/2003	1.35E+00	7.32E-01	8.28747	4.67335	8.29	4.67	6.1	14.39	10.77
8/17/2003	5.77E-01	3.13E-01	3.04017	1.60068	3.04	1.60	6.1	9.14	7.70
8/18/2003	1.37E+00	7.54E-01	7.07343	3.76825	7.07	3.77	6.1	13.17	9.87
8/19/2003	8.69E-01	4.80E-01	6.56244	3.63314	6.56	3.63	8.2	14.76	11.83
8/20/2003	6.45E+00	3.58E+00	2.77241	1.46178	6.45	3.58	8.2	14.65	11.78
8/21/2003	9.81E-01	5.32E-01	9.35556	5.13944	9.36	5.14	8.2	17.56	13.34
8/22/2003	7.67E-01	4.18E-01	9.26128	4.95558	9.26	4.96	8.2	17.46	13.16
8/23/2003	1.85E+00	1.01E+00	2.13336	1.21756	2.13	1.22	8.2	10.33	9.42
8/24/2003	1.49E+00	8.24E-01	0.00564	0.00325	1.49	0.82	8.2	9.69	9.02
8/25/2003	2.06E+00	1.13E+00	3.27316	1.75907	3.27	1.76	5.9	9.17	7.66
8/26/2003	1.77E+00	9.67E-01	13.86901	7.42118	13.87	7.42	5.9	19.77	13.32
8/27/2003	1.78E+00	9.74E-01	7.80226	4.26034	7.80	4.26	5.9	13.70	10.16
8/28/2003	1.04E+00	5.73E-01	15	8.26278	15.00	8.26	5.9	20.90	14.16
8/29/2003	1.24E+00	6.90E-01	7.02667	3.71111	7.03	3.71	5.9	12.93	9.61
8/30/2003	1.18E+00	6.49E-01	2.1248	1.11975	2.12	1.12	6.3	8.42	7.42
8/31/2003	2.48E+00	1.36E+00	3.59544	1.51022	3.60	1.51	6.3	9.90	7.81
9/1/2003	1.57E+00	8.63E-01	2.04498	1.11476	2.04	1.11	6.3	8.34	7.41
9/2/2003	2.16E+00	1.18E+00	4.29449	2.4228	4.29	2.42	6.3	10.59	8.72
9/3/2003	1.25E+00	6.89E-01	3.85514	2.17458	3.86	2.17	6.3	10.16	8.47
9/4/2003	6.71E-01	3.65E-01	4.00342	2.20283	4.00	2.20	6.3	10.30	8.50
9/5/2003	9.37E-01	5.07E-01	5.7	3.155	5.70	3.16	6.3	12.00	9.46
9/6/2003	7.91E-01	4.35E-01	0.62564	0.26081	0.79	0.43	7.1	7.89	7.53
9/7/2003	4.77E-01	2.62E-01	1.73944	0.95556	1.74	0.96	7.1	8.84	8.06
9/8/2003	8.75E-01	4.86E-01	4.31722	2.45222	4.32	2.45	7.1	11.42	9.55
9/9/2003	6.72E-01	3.76E-01	0.66858	0.17628	0.67	0.38	7.1	7.77	7.48
9/10/2003	2.48E+00	1.36E+00	7.20938	3.99072	7.21	3.99	7.1	14.31	11.09
9/11/2003	2.41E+00	1.31E+00	2.99612	1.74015	3.00	1.74	7.1	10.10	8.84
9/12/2003	1.64E+00	9.01E-01	2.47778	1.35444	2.48	1.35	8.0	10.48	9.35
9/13/2003	7.17E-01	3.86E-01	0.66489	0.25828	0.72	0.39	8.0	8.72	8.39
9/14/2003	9.34E-01	5.05E-01	2.36428	1.25278	2.36	1.25	8.0	10.36	9.25
9/15/2003	1.03E+00	5.67E-01	0.4789	0.19417	1.03	0.57	8.0	9.03	8.57
9/16/2003	1.23E+00	6.75E-01	2.61397	1.14231	2.61	1.14	8.0	10.61	9.14
9/17/2003	3.60E+00	1.99E+00	2.6941	1.65567	3.60	1.99	8.0	11.60	9.99
9/18/2003	1.34E+00	7.27E-01	5.032	2.74556	5.03	2.75	7.1	12.13	9.85
9/19/2003	1.65E+00	9.15E-01	4.83444	2.70944	4.83	2.71	7.1	11.93	9.81
9/20/2003	3.51E-01	1.93E-01	0.77567	0.40011	0.78	0.40	7.1	7.88	7.50
9/21/2003	1.33E+00	7.34E-01	2.93167	1.58667	2.93	1.59	7.1	10.03	8.69
9/22/2003	1.74E+00	9.51E-01	2.45778	1.34667	2.46	1.35	7.1	9.56	8.45
9/23/2003	2.30E+00	1.26E+00	4.23336	2.30944	4.23	2.31	7.1	11.33	9.41
9/24/2003	7.26E-01	4.03E-01	12.3682	6.78073	12.37	6.78	8.2	20.57	14.98
9/25/2003	1.58E-01	8.64E-02	1.93373	0.96278	1.93	0.96	8.2	10.13	9.16
9/26/2003	4.54E-02	2.55E-02	10.19389	5.68278	10.19	5.68	8.2	18.39	13.88
9/27/2003	4.44E-01	2.46E-01	7.45787	4.10623	7.46	4.11	8.2	15.66	12.31
9/28/2003	1.35E+00	7.40E-01	2.25667	1.29333	2.26	1.29	8.2	10.46	9.49
9/29/2003	1.33E+00	7.26E-01	1.24111	0.67389	1.33	0.73	8.2	9.53	8.93
9/30/2003	9.58E-01	5.31E-01	2.57821	1.39967	2.58	1.40	3.6	6.18	5.00
10/1/2003	5.10E-01	2.83E-01	1.07022	0.512	1.07	0.51	3.6	4.67	4.11
10/2/2003	1.40E+00	7.82E-01	0.17878	0.0001	1.40	0.78	3.6	5.00	4.38
10/3/2003	9.02E-01	4.98E-01	3.86333	2.10167	3.86	2.10	3.6	7.46	5.70
10/4/2003	6.91E-01	3.75E-01	6.39	3.47833	6.39	3.48	3.6	9.99	7.08
10/5/2003	1.31E+00	7.23E-01	2.5185	1.34599	2.52	1.35	3.6	6.12	4.95
10/6/2003	1.56E+00	8.59E-01	1.18261	0.58889	1.56	0.86	8.3	9.86	9.16
10/7/2003	1.39E+00	7.65E-01	8.07018	4.42916	8.07	4.43	8.3	16.37	12.73
10/8/2003	6.05E-01	3.35E-01	9.07492	4.98784	9.07	4.99	8.3	17.37	13.29
10/9/2003	1.32E+00	7.19E-01	5.45556	3.05833	5.46	3.06	8.3	13.76	11.36
10/10/2003	2.27E+00	1.24E+00	1.29184	0.70587	2.27	1.24	8.3	10.57	9.54
10/11/2003	8.13E-01	4.50E-01	2.87956	1.57521	2.88	1.58	8.3	11.18	9.88
10/12/2003	1.49E+00	8.17E-01	4.40892	1.75995	4.41	1.76	10.1	14.51	11.86
10/13/2003	6.27E-01	3.37E-01	2.33611	1.28889	2.34	1.29	10.1	12.44	11.39

	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
Date	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
10/14/2003	1.54E+00	8.55E-01	3.4005	1.86875	3.40	1.87	10.1	13.50	11.97
10/15/2003	1.46E+00	7.94E-01	1.8085	1.04684	1.81	1.05	10.1	11.91	11.15
10/16/2003	1.28E+00	7.04E-01	2.59558	1.36444	2.60	1.36	10.1	12.70	11.46
10/17/2003	2.39E+00	1.29E+00	0.67124	0.33683	2.39	1.29	10.1	12.49	11.39
10/18/2003	8.08E-01	4.48E-01	4.41615	2.31289	4.42	2.31	12.6	17.02	14.91
10/19/2003	4.84E-01	2.63E-01	3.59514	2.01859	3.60	2.02	12.6	16.20	14.62
10/20/2003	1.77E+00	9.68E-01	5.09667	2.83056	5.10	2.83	12.6	17.70	15.43
10/21/2003	3.61E-02	1.98E-02	1.20111	0.65278	1.20	0.65	12.6	13.80	13.25
10/22/2003	1.30E+00	7.15E-01	5.96612	3.27244	5.97	3.27	12.6	18.57	15.87
10/23/2003	2.06E+00	1.13E+00	5.78572	3.15094	5.79	3.15	12.6	18.39	15.75
10/24/2003	1.13E+00	6.22E-01	1.275	0.69333	1.28	0.69	11.7	12.98	12.39
10/25/2003	1.18E+00	6.42E-01	0.52461	0.13122	1.18	0.64	11.7	12.88	12.34
10/26/2003	9.52E-01	5.22E-01	0	0	0.95	0.52	11.7	12.65	12.22
10/27/2003	3.30E+00	1.83E+00	3.41372	1.85394	3.41	1.85	11.7	15.11	13.55
10/28/2003	1.57E+00	8.61E-01	2.5567	2.36682	2.56	2.37	11.7	14.26	14.07
10/29/2003	1.06E+00	5.81E-01	9.44139	5.19576	9.44	5.20	11.7	21.14	16.90
10/30/2003	2.51E+00	1.38E+00	0.2535	0.0487	2.51	1.38	10.8	13.31	12.18
10/31/2003	1.52E+00	8.36E-01	0.21256	0.10711	1.52	0.84	10.8	12.32	11.64
11/1/2003	6.93E-01	3.82E-01	9.35117	5.14706	9.35	5.15	10.8	20.15	15.95
11/2/2003	1.64E+00	9.07E-01	0.79368	0.43542	1.64	0.91	10.8	12.44	11.71
11/3/2003	1.23E+00	6.79E-01	1.52478	0.00498	1.52	0.68	10.8	12.32	11.48
11/4/2003	4.61E-01	2.54E-01	0	0	0.46	0.25	10.8	11.26	11.05
11/5/2003	5.85E-01	3.19E-01	2.94846	1.60546	2.95	1.61	8.0	10.95	9.61
11/6/2003	5.59E+00	3.07E+00	2.9925	1.6825	5.59	3.07	8.0	13.59	11.07
11/7/2003	3.79E+00	2.07E+00	1.83721	0.98178	3.79	2.07	8.0	11.79	10.07
11/8/2003	4.41E+00	2.43E+00	0.00004	0.00003	4.41	2.43	8.0	12.41	10.43
11/9/2003	4.44E+00	2.46E+00	0.28018	0.0001	4.44	2.46	8.0	12.44	10.46
11/10/2003	1.14E+00	6.30E-01	0.725	0.39972	1.14	0.63	8.0	9.14	8.63
11/11/2003	1.10E+00	6.16E-01	3.54839	1.94039	3.55	1.94	14.3	17.85	16.24
11/12/2003	9.87E-01	5.39E-01	0.39122	0.21572	0.99	0.54	14.3	15.29	14.84
11/13/2003	1.43E+00	7.99E-01	5.42333	3.05389	5.42	3.05	14.3	19.72	17.35
11/14/2003	6.67E+00	3.67E+00	0.43478	0.09554	6.67	3.67	14.3	20.97	17.97
11/15/2003	1.86E+00	1.04E+00	0.17154	0.09529	1.86	1.04	14.3	16.16	15.34
11/16/2003	2.22E+00	1.23E+00	2.40778	1.31722	2.41	1.32	14.3	16.71	15.62
11/17/2003	7.83E-01	4.33E-01	3.645	1.99	3.65	1.99	21.8	25.45	23.79
11/18/2003	6.86E-01	3.78E-01	0.16147	0.02587	0.69	0.38	21.8	22.49	22.18
11/19/2003	9.84E-01	5.41E-01	4.20531	2.3191	4.21	2.32	21.8	26.01	24.12
11/20/2003	9.78E-01	5.44E-01	2.12111	1.15833	2.12	1.16	21.8	23.92	22.96
11/21/2003	8.45E-01	4.66E-01	2.54778	1.39389	2.55	1.39	21.8	24.35	23.19
11/22/2003	1.09E+00	5.97E-01	1.25167	0.67222	1.25	0.67	21.8	23.05	22.47
11/23/2003	7.38E-01	4.07E-01	0.53228	0.2895	0.74	0.41	18.7	19.44	19.11
11/24/2003	1.94E+00	1.08E+00	1.38	0.76056	1.94	1.08	18.7	20.64	19.78
11/25/2003	5.66E-01	3.10E-01	1.31451	0.75878	1.31	0.76	18.7	20.01	19.46
11/26/2003	4.02E-01	2.20E-01	0.51344	0.28333	0.51	0.28	18.7	19.21	18.98
11/27/2003	4.66E-01	2.56E-01	0.70333	0.35878	0.70	0.36	18.7	19.40	19.06
11/28/2003	1.44E+01	7.90E+00	0	0	14.36	7.90	18.7	33.06	26.60
11/29/2003	7.04E+00	3.85E+00	1.38619	0.77095	7.04	3.85	3.4	10.44	7.25
11/30/2003	6.21E-03	1.28E-02	1.47889	0.80778	1.48	0.81	3.4	4.88	4.21
12/1/2003	6.97E-01	3.82E-01	0.61222	0.2515	0.70	0.38	3.4	4.10	3.78
12/2/2003	1.54E+00	8.51E-01	1.25135	0.51957	1.54	0.85	3.4	4.94	4.25
12/3/2003	5.07E-01	2.81E-01	1.43667	0.78167	1.44	0.78	3.4	4.84	4.18
12/4/2003	1.13E+01	6.25E+00	1.92451	1.05602	11.32	6.25	3.4	14.72	9.65
12/5/2003	3.70E+00	2.02E+00	0.73273	0.40014	3.70	2.02	3.0	6.70	5.02
12/6/2003	1.03E+00	5.68E-01	1.39608	0.77532	1.40	0.78	3.0	4.40	3.78
12/7/2003	9.56E-01	6.84E-01	5.96605	3.24533	5.97	3.25	3.0	8.97	6.25
12/8/2003	6.93E-01	3.85E-01	1.582	0.87044	1.58	0.87	3.0	4.58	3.87
12/9/2003	8.82E+00	4.90E+00	5.64348	3.17087	8.82	4.90	3.0	11.82	7.90
12/10/2003	8.95E-01	4.92E-01	0.77087	0.41078	0.89	0.49	3.0	3.89	3.49
12/11/2003	9.72E-01	5.32E-01	0.18906	0.0176	0.97	0.53	7.6	8.57	8.13
12/12/2003	4.31E+00	2.34E+00	0.11073	0.00236	4.31	2.34	7.6	11.91	9.94
12/13/2003	1.03E+01	5.63E+00	1.57826	0.85565	10.27	5.63	7.6	17.87	13.23
12/14/2003	6.20E-01	3.42E-01	0.71389	0.11292	0.71	0.34	7.6	8.31	7.94
12/15/2003	6.33E-01	3.52E-01	0	0	0.63	0.35	7.6	8.23	7.95
12/16/2003	2.78E+00	1.54E+00	2.16546	1.18864	2.78	1.54	7.6	10.38	9.14
12/17/2003	3.64E-01	2.02E-01	0	0	0.36	0.20	34.7	35.06	34.90
12/18/2003	1.06E+00	5.89E-01	1.155	0.63444	1.16	0.63	34.7	35.86	35.33
12/19/2003	2.48E+00	1.37E+00	2.998	1.6625	3.00	1.66	34.7	37.70	36.36
12/20/2003	4.00E-01	2.23E-01	2.42	1.32	2.42	1.32	34.7	37.12	36.02
12/21/2003	6.71E-01	3.69E-01	0.39989	0.21994	0.67	0.37	34.7	35.37	35.07
12/22/2003	6.75E-01	3.70E-01	0.00394	0.0022	0.67	0.37	34.7	35.37	35.07
12/23/2003	1.47E+01	8.10E+00	0	0	14.68	8.10	1.4	16.08	9.50
12/24/2003	2.44E+00	1.34E+00	0.43419	0.06815	2.44	1.34	1.4	3.84	2.74
12/25/2003	7.99E-01	4.43E-01	2.61333	1.43667	2.61	1.44	1.4	4.01	2.84
12/26/2003	1.16E+00	6.38E-01	0.85667	0.0029	1.16	0.64	1.4	2.56	2.04
12/27/2003	6.37E-01	3.56E-01	2.51332	1.38968	2.51	1.39	1.4	3.91	2.79
12/28/2003	8.75E+00	4.86E+00	0	0	8.75	4.86	1.4	10.15	6.26
12/29/2003	9.11E-01	5.02E-01	2.98042	1.62939	2.98	1.63	11.7	14.68	13.33
12/30/2003	6.88E-01	3.85E-01	4.62222	2.545	4.62	2.55	11.7	16.32	14.25
12/31/2003	2.90E+00	1.60E+00	0.59227	0.32509	2.90	1.60	11.7	14.60	13.30
8th highest value								37.12	36.02

Date	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
1/1/2004	4.01E+00	2.21E+00	1.93558	1.02381	4.01	2.21	13.5	17.51	15.71
1/2/2004	2.16E+00	1.18E+00	0.20067	0.06061	2.16	1.18	13.5	15.66	14.68
1/3/2004	1.12E+00	6.16E-01	0.17035	0.08028	1.12	0.62	13.5	14.62	14.12
1/4/2004	1.22E+00	6.70E-01	0	0	1.22	0.67	13.4	14.62	14.07
1/5/2004	1.58E+00	8.74E-01	2.44	1.33833	2.44	1.34	13.4	15.84	14.74
1/6/2004	6.62E+00	3.64E+00	0.40507	0.10263	6.62	3.64	13.4	20.02	17.04
1/7/2004	1.42E+01	7.83E+00	0.00001	0.00001	14.21	7.83	13.4	27.61	21.23
1/8/2004	7.55E+00	4.12E+00	0.52208	0.28121	7.55	4.12	13.4	20.95	17.52
1/9/2004	7.07E+00	3.86E+00	0.0003	0	7.07	3.86	13.4	20.47	17.26
1/10/2004	4.09E-01	2.26E-01	2.58056	1.41222	2.58	1.41	13.3	15.88	14.71
1/11/2004	9.48E-01	5.22E-01	7.20894	3.92	7.21	3.92	13.3	20.51	17.22
1/12/2004	2.36E+00	1.29E+00	1.71545	0.96955	2.36	1.29	13.3	15.66	14.59
1/13/2004	2.41E+00	1.32E+00	0.24416	0.13563	2.41	1.32	13.3	15.71	14.62
1/14/2004	2.37E+00	1.29E+00	1.64475	0.90013	2.37	1.29	13.3	15.67	14.59
1/15/2004	5.66E-01	3.08E-01	4.82733	2.41343	4.83	2.41	13.3	18.13	15.71
1/16/2004	8.93E-01	4.92E-01	2.51334	1.37667	2.51	1.38	10.1	12.61	11.48
1/17/2004	4.03E-01	2.19E-01	1.38365	0.735	1.38	0.74	10.1	11.48	10.84
1/18/2004	3.60E-01	1.99E-01	14.12201	7.92234	14.12	7.92	10.1	24.22	18.02
1/19/2004	4.30E-01	2.37E-01	6.19498	3.39077	6.19	3.39	10.1	16.29	13.49
1/20/2004	1.06E+00	5.79E-01	5.86853	3.21039	5.87	3.21	10.1	15.97	13.31
1/21/2004	6.85E-01	3.74E-01	2.54333	1.39444	2.54	1.39	10.1	12.64	11.49
1/22/2004	3.20E-04	8.91E-03	0	0	0.00	0.01	12.0	12.00	12.01
1/23/2004	1.05E+00	5.71E-01	1.07889	0.58056	1.08	0.58	12.0	13.08	12.58
1/24/2004	1.27E+00	7.03E-01	2.40105	1.31842	2.40	1.32	12.0	14.40	13.32
1/25/2004	1.20E+00	6.65E-01	0.61	0.07872	1.20	0.66	12.0	13.20	12.66
1/26/2004	9.29E+00	5.13E+00	0	0	9.29	5.13	12.0	21.29	17.13
1/27/2004	8.73E-01	4.87E-01	7.71561	4.26348	7.72	4.26	12.0	19.72	16.26
1/28/2004	5.10E-01	2.78E-01	2.55234	1.22667	2.55	1.23	6.1	8.65	7.33
1/29/2004	3.36E+00	1.84E+00	2.55431	1.39444	3.36	1.84	6.1	9.46	7.94
1/30/2004	1.04E+00	5.67E-01	3.71778	2.03889	3.72	2.04	6.1	9.82	8.14
1/31/2004	7.30E-01	4.03E-01	0.39267	0.10078	0.73	0.40	6.1	6.83	6.50
2/1/2004	6.40E+00	3.51E+00	0.01926	0.01075	6.40	3.51	6.1	12.50	9.61
2/2/2004	6.42E+00	3.53E+00	0.00017	0.00001	6.42	3.53	6.1	12.52	9.63
2/3/2004	4.32E+00	2.37E+00	4.12542	2.13996	4.32	2.37	3.2	7.52	5.57
2/4/2004	1.13E+00	6.20E-01	2.45778	1.34056	2.46	1.34	3.2	5.66	4.54
2/5/2004	1.47E+00	8.15E-01	0.25694	0.141	1.47	0.81	3.2	4.67	4.01
2/6/2004	1.22E+00	6.65E-01	0.84167	0.45911	1.22	0.66	3.2	4.42	3.86
2/7/2004	1.39E+00	7.59E-01	1.58535	0.84084	1.59	0.84	3.2	4.79	4.04
2/8/2004	7.64E-01	4.16E-01	1.90803	0.00276	1.91	0.42	3.2	5.11	3.62
2/9/2004	9.25E-01	5.13E-01	0.49294	0.27461	0.92	0.51	0.4	1.32	0.91
2/10/2004	1.05E+00	5.71E-01	1.72817	0.89889	1.73	0.90	0.4	2.13	1.30
2/11/2004	1.73E+00	9.57E-01	0.67667	0.27433	1.73	0.96	0.4	2.13	1.36
2/12/2004	9.56E-01	5.27E-01	0.90167	0.48772	0.96	0.53	0.4	1.36	0.93
2/13/2004	5.98E+00	3.27E+00	0.00004	0.00002	5.98	3.27	0.4	6.38	3.67
2/14/2004	7.52E+00	4.15E+00	0.00155	0.00088	7.52	4.15	0.4	7.92	4.55
2/15/2004	8.56E+00	4.73E+00	0.00005	0.00001	8.56	4.73	1.1	9.66	5.83
2/16/2004	1.19E+01	6.59E+00	0.47056	0.11556	11.90	6.59	1.1	13.00	7.69
2/17/2004	6.56E+00	3.61E+00	0.01817	0.01006	6.56	3.61	1.1	7.66	4.71
2/18/2004	2.08E+00	1.15E+00	4.60138	2.2789	4.60	2.28	1.1	5.70	3.38
2/19/2004	7.35E-01	4.05E-01	5.18952	2.67044	5.19	2.67	1.1	6.29	3.77
2/20/2004	1.30E+00	7.16E-01	0	0	1.30	0.72	1.1	2.40	1.82
2/21/2004	6.17E-01	3.42E-01	1.5736	0.72111	1.57	0.72	3.7	5.27	4.42
2/22/2004	2.60E+00	1.45E+00	0.82611	0.18852	2.60	1.45	3.7	6.30	5.15
2/23/2004	3.24E+00	1.77E+00	4.39636	2.37045	4.40	2.37	3.7	8.10	6.07
2/24/2004	6.70E+00	3.71E+00	0.13294	0.01252	6.70	3.71	3.7	10.40	7.41
2/25/2004	1.60E+01	8.84E+00	0.00132	0.00077	15.96	8.84	3.7	19.66	12.54
2/26/2004	7.42E+00	4.06E+00	0.23883	0.06775	7.42	4.06	3.7	11.12	7.76
2/27/2004	5.81E-01	3.18E-01	0.59477	0.19257	0.59	0.32	6.3	6.89	6.62
2/28/2004	1.59E+00	8.77E-01	3.33444	1.83	3.33	1.83	6.3	9.63	8.13
2/29/2004	4.81E+00	2.66E+00	0.1363	0.05473	4.81	2.66	6.3	11.11	8.96
3/1/2004	1.33E+00	7.32E-01	5.64784	3.11511	5.65	3.12	6.3	11.95	9.42
3/2/2004	3.37E+00	1.87E+00	5.40131	4.10057	5.40	4.10	6.3	11.70	10.40
3/3/2004	1.40E+00	7.67E-01	21.01837	11.54361	21.02	11.54	6.3	27.32	17.84
3/4/2004	9.85E-01	5.50E-01	5.48129	3.07375	5.48	3.07	3.6	9.08	6.67
3/5/2004	1.52E+00	8.45E-01	0.49597	0.20235	1.52	0.84	3.6	5.12	4.44
3/6/2004	1.38E+00	7.54E-01	6.60556	3.57556	6.61	3.58	3.6	10.21	7.18
3/7/2004	9.95E-01	5.52E-01	9.3	5.19389	9.30	5.19	3.6	12.90	8.79
3/8/2004	1.82E+00	1.01E+00	2.44111	1.335	2.44	1.34	3.6	6.04	4.94
3/9/2004	2.45E+00	1.36E+00	5.03143	2.76463	5.03	2.76	3.6	8.63	6.36
3/10/2004	1.63E+00	9.00E-01	3.67106	2.07304	3.67	2.07	9.2	12.87	11.27
3/11/2004	1.04E+00	5.75E-01	3.72027	2.0606	3.72	2.06	9.2	12.92	11.26
3/12/2004	1.38E+00	7.59E-01	9.50257	5.23422	9.50	5.23	9.2	18.70	14.43
3/13/2004	1.26E+00	7.01E-01	11.72939	6.48958	11.73	6.49	9.2	20.93	15.69
3/14/2004	1.23E+00	6.88E-01	12.25189	6.76767	12.25	6.77	9.2	21.45	15.97
3/15/2004	1.72E+00	9.54E-01	7.87978	4.39504	7.88	4.40	9.2	17.08	13.60
3/16/2004	1.47E+00	8.14E-01	3.41628	1.91183	3.42	1.91	6.8	10.22	8.71
3/17/2004	2.14E+00	1.19E+00	0.00328	0.00188	2.14	1.19	6.8	8.94	7.99
3/18/2004	1.68E+00	9.30E-01	2.17161	1.19465	2.17	1.19	6.8	8.97	7.99
3/19/2004	1.51E+00	8.30E-01	7.15404	3.8969	7.15	3.90	6.8	13.95	10.70
3/20/2004	1.92E+00	1.06E+00	4.01333	0.22639	4.01	1.06	6.8	10.81	7.86
3/21/2004	1.46E+00	7.98E-01	4.24222	2.31389	4.24	2.31	6.8	11.04	9.11
3/22/2004	8.31E-01	4.55E-01	3.32516	1.56204	3.33	1.56	5.5	8.83	7.06
3/23/2004	1.67E+00	9.29E-01	9.64544	5.34833	9.65	5.35	5.5	15.15	10.85
3/24/2004	1.71E+00	9.43E-01	1.17816	0.27096	1.71	0.94	5.5	7.21	6.44
3/25/2004	7.09E+00	3.89E+00	0.31442	0.17596	7.09	3.89	3.7	10.79	7.59
3/26/2004	4.57E+00	2.53E+00	0.21071	0.1155	4.57	2.53	3.7	8.27	6.23
3/27/2004	1.56E+00	8.56E-01	0.94	0.51589	1.56	0.86	3.7	5.26	4.56
3/28/2004	1.08E+00	5.89E-01	0.66667	0.36367	1.08	0.59	8.3	9.38	8.89
3/29/2004	2.18E+00	1.22E+00	2.81604	1.40308	2.82	1.40	8.3	11.12	9.70
3/30/2004	2.14E+00	1.18E+00	11.64705	6.47768	11.65	6.48	8.3	19.95	14.78
3/31/2004	2.36E+00	1.31E+00	0.00082	0.00047	2.36	1.31	8.3	10.66	9.61
4/1/2004	2.79E+00	1.54E+00	1.38244	0.75328	2.79	1.54	8.3	11.09	9.84

Date	HBRP, AERMOD Flat Terrain Diesel Mode	HBRP, AERMOD Flat Terrain Nat. Gas Mode	HBRP, CTDMPLUS Diesel Mode	HBRP, CTDMPLUS Nat. Gas Mode	MAX (AERMOD/CTDMPLUS) Diesel Mode	MAX (AERMOD/CTDMPLUS) Nat. Gas Mode	Measured Background	Total Impact Diesel Mode	Total Impact Nat. Gas Mode
4/2/2004	2.71E+00	1.49E+00	0.36595	0.16139	2.71	1.49	8.3	11.01	9.79
4/3/2004	1.33E+00	7.32E-01	14.60731	8.1629	14.61	8.16	10.1	24.71	18.26
4/4/2004	1.67E+00	9.22E-01	8.96826	4.9379	8.97	4.94	10.1	19.07	15.04
4/5/2004	5.31E-01	2.92E-01	10.29684	5.54837	10.30	5.55	10.1	20.40	15.65
4/6/2004	9.16E-01	4.99E-01	1.54259	0.60234	1.54	0.60	10.1	11.64	10.70
4/7/2004	2.17E+00	1.18E+00	12.89951	7.06767	12.90	7.07	10.1	23.00	17.17
4/8/2004	6.34E-01	3.52E-01	2.73725	1.53352	2.74	1.53	10.1	12.84	11.63
4/9/2004	7.76E-01	4.27E-01	3.20944	1.74444	3.21	1.74	12.2	15.41	13.94
4/10/2004	1.71E+00	9.46E-01	0.528	0.2875	1.71	0.95	12.2	13.91	13.15
4/11/2004	2.01E+00	1.11E+00	3.57662	1.70789	3.58	1.71	12.2	15.78	13.91
4/12/2004	8.97E-01	4.96E-01	3.52	2.00056	3.52	2.00	12.2	15.72	14.20
4/13/2004	3.63E+00	2.02E+00	0.99742	0.48	3.63	2.02	12.2	15.83	14.22
4/14/2004	3.22E+00	1.79E+00	0.72064	0.14917	3.22	1.79	12.2	15.42	13.99
4/15/2004	3.46E+00	1.88E+00	0.94942	0.17534	3.46	1.88	3.7	7.16	5.58
4/16/2004	4.13E+00	2.28E+00	3.95222	1.92722	4.13	2.28	3.7	7.83	5.98
4/17/2004	2.69E+00	1.48E+00	0.52245	0.21389	2.69	1.48	3.7	6.39	5.18
4/18/2004	6.41E+00	3.56E+00	0.0011	0.00064	6.41	3.56	3.7	10.11	7.26
4/19/2004	8.90E+00	4.93E+00	0.22218	0.02108	8.90	4.93	3.7	12.60	8.63
4/20/2004	4.74E+00	2.63E+00	0.76591	0.42123	4.74	2.63	3.7	8.44	6.33
4/21/2004	1.77E+00	9.79E-01	2.09434	1.07594	2.09	1.08	5.7	7.79	6.78
4/22/2004	1.64E+00	8.99E-01	1.67789	0.95948	1.68	0.96	5.7	7.38	6.66
4/23/2004	2.16E+00	1.20E+00	7.05556	3.96279	7.06	3.96	5.7	12.76	9.66
4/24/2004	2.41E+00	1.33E+00	0.58778	0.32433	2.41	1.33	5.7	8.11	7.03
4/25/2004	2.03E+00	1.12E+00	6.78233	3.60833	6.78	3.61	5.7	12.48	9.31
4/26/2004	2.36E+00	1.30E+00	0	0	2.36	1.30	5.7	8.06	7.00
4/27/2004	1.64E+00	9.09E-01	5.66001	3.1444	5.66	3.14	10.8	16.46	13.94
4/28/2004	3.75E+00	2.08E+00	5.61748	3.07223	5.62	3.07	10.8	16.42	13.87
4/29/2004	2.98E+00	1.64E+00	0	0	2.98	1.64	10.8	13.78	12.44
4/30/2004	2.86E+00	1.57E+00	3.45519	1.95211	3.46	1.95	10.8	14.26	12.75
5/1/2004	1.29E+00	7.02E-01	6.3	3.48833	6.30	3.49	10.8	17.10	14.29
5/2/2004	1.69E+00	9.42E-01	2.33333	1.28167	2.33	1.28	10.8	13.13	12.08
5/3/2004	1.05E+00	5.80E-01	34.11761	18.74847	34.12	18.75	7.8	41.92	26.55
5/4/2004	2.20E+00	1.22E+00	0.39056	0.09278	2.20	1.22	7.8	10.00	9.02
5/5/2004	2.25E+00	1.24E+00	2.43213	1.32685	2.43	1.33	7.8	10.23	9.13
5/6/2004	3.85E+00	2.14E+00	1.42692	0.69944	3.85	2.14	7.8	11.65	9.94
5/7/2004	6.23E+00	3.43E+00	0.65077	0.18634	6.23	3.43	7.8	14.03	11.23
5/8/2004	4.26E+00	2.34E+00	0.84857	0.46202	4.26	2.34	7.8	12.06	10.14
5/9/2004	2.24E+00	1.24E+00	9.57482	4.99525	9.57	5.00	4.7	14.27	9.70
5/10/2004	2.44E+00	1.36E+00	9.6238	4.66687	9.62	4.67	4.7	14.32	9.37
5/11/2004	2.35E+00	1.29E+00	11.62023	6.34618	11.62	6.35	4.7	16.32	11.05
5/12/2004	2.48E+00	1.37E+00	2.68938	1.46767	2.69	1.47	4.7	7.39	6.17
5/13/2004	2.91E+00	1.60E+00	6.71939	3.51225	6.72	3.51	4.7	11.42	8.21
5/14/2004	3.22E+00	1.78E+00	28.64425	15.84778	28.64	15.85	4.7	33.34	20.55
5/15/2004	1.70E+00	9.37E-01	9.80386	5.38943	9.80	5.39	3.6	13.40	8.99
5/16/2004	1.84E+00	1.02E+00	7.92421	4.37089	7.92	4.37	3.6	11.52	7.97
5/17/2004	6.93E-01	3.76E-01	12.37889	6.76	12.38	6.76	3.6	15.98	10.36
5/18/2004	1.11E+00	6.06E-01	11.58938	6.48249	11.59	6.48	3.6	15.19	10.08
5/19/2004	3.11E+00	1.71E+00	2.50556	1.37191	3.11	1.71	3.6	6.71	5.31
5/20/2004	6.72E-01	3.67E-01	15.99253	8.92091	15.99	8.92	3.6	19.59	12.52
5/21/2004	2.05E+00	1.13E+00	22.2405	12.24236	22.24	12.24	4.3	26.54	16.54
5/22/2004	2.43E+00	1.34E+00	11.2044	6.27525	11.20	6.28	4.3	15.50	10.58
5/23/2004	2.77E+00	1.53E+00	6.62994	3.52249	6.63	3.52	4.3	10.93	7.82
5/24/2004	2.27E+00	1.25E+00	1.87513	0.97222	2.27	1.25	4.3	6.57	5.55
5/25/2004	1.72E+00	9.45E-01	3.57794	1.98117	3.58	1.98	4.3	7.88	6.28
5/26/2004	2.32E+00	1.28E+00	1.05411	0.53867	2.32	1.28	4.3	6.62	5.58
5/27/2004	2.36E+00	1.31E+00	5.09286	2.82783	5.09	2.83	2.6	7.69	5.43
5/28/2004	2.57E+00	1.42E+00	3.41203	1.90056	3.41	1.90	2.6	6.01	4.50
5/29/2004	2.43E+00	1.35E+00	8.43611	4.75222	8.44	4.75	2.6	11.04	7.35
5/30/2004	3.23E+00	1.77E+00	7.55556	4.17833	7.56	4.18	2.6	10.16	6.78
5/31/2004	3.38E+00	1.85E+00	14.51763	7.93057	14.52	7.93	2.6	17.12	10.53
6/1/2004	2.53E+00	1.38E+00	3.66611	2.04889	3.67	2.05	2.6	6.27	4.65
6/2/2004	1.84E+00	1.01E+00	8.91222	4.84667	8.91	4.85	5.0	13.91	9.85
6/3/2004	4.84E-01	2.63E-01	13.60894	7.32556	13.61	7.33	5.0	18.61	12.33
6/4/2004	1.25E+00	6.93E-01	8.12402	4.50654	8.12	4.51	5.0	13.12	9.51
6/5/2004	2.60E+00	1.43E+00	2.07024	1.14347	2.60	1.43	5.0	7.60	6.43
6/6/2004	1.18E+00	6.46E-01	3.6887	2.10056	3.69	2.10	5.0	8.69	7.10
6/7/2004	2.66E+00	1.47E+00	5.55599	3.13188	5.56	3.13	5.0	10.56	8.13
6/8/2004	2.34E+00	1.30E+00	24.58308	13.59114	24.58	13.59	4.8	29.38	18.39
6/9/2004	1.18E+00	6.56E-01	11.75201	6.51905	11.75	6.52	4.8	16.55	11.32
6/10/2004	2.60E+00	1.44E+00	18.56358	10.12063	18.56	10.12	4.8	23.36	14.92
6/11/2004	3.23E+00	1.78E+00	13.7189	7.50703	13.72	7.51	4.8	18.52	12.31
6/12/2004	2.76E+00	1.52E+00	4.00062	2.27137	4.00	2.27	4.8	8.80	7.07
6/13/2004	1.63E+00	8.92E-01	3.87117	2.13003	3.87	2.13	4.8	8.67	6.93
6/14/2004	2.66E+00	1.48E+00	14.84446	8.12386	14.84	8.12	7.2	22.04	15.32
6/15/2004	2.84E+00	1.56E+00	5.92056	3.24756	5.92	3.25	7.2	13.12	10.45
6/16/2004	2.02E+00	1.11E+00	2.38722	1.26667	2.39	1.27	7.2	9.59	8.47
6/17/2004	1.72E+00	9.45E-01	2.38889	1.30333	2.39	1.30	7.2	9.59	8.50
6/18/2004	1.53E+00	8.31E-01	7.35582	4.04516	7.36	4.05	7.2	14.56	11.25
6/19/2004	5.07E-01	2.84E-01	7.15519	4.0378	7.16	4.04	7.2	14.36	11.24
6/20/2004	9.83E-01	5.44E-01	17.23202	9.63592	17.23	9.64	4.0	21.23	13.64
6/21/2004	8.75E-01	4.84E-01	19.12894	10.59735	19.13	10.60	4.0	23.13	14.60
6/22/2004	7.54E-01	4.27E-01	14.65899	8.18391	14.66	8.18	4.0	18.66	12.18
6/23/2004	1.07E+00	5.85E-01	9.2752	5.17292	9.28	5.17	4.0	13.28	9.17
6/24/2004	1.18E+00	6.52E-01	5.99389	3.33856	5.99	3.34	4.0	9.99	7.34
6/25/2004	2.48E+00	1.36E+00	0	0	2.48	1.36	4.0	6.48	5.36
6/26/2004	2.36E+00	1.29E+00	8.8232	4.82458	8.82	4.82	3.1	11.92	7.92
6/27/2004	2.60E+00	1.44E+00	12.81289	7.42943	12.81	7.43	3.1	15.91	10.53
6/28/2004	1.25E+00	6.86E-01	2.18122	1.19287	2.18	1.19	3.1	5.28	4.29
6/29/2004	3.18E+00	1.77E+00	1.81992	1.04161	3.18	1.77	3.1	6.28	4.87
6/30/2004	1.39E+00	7.48E-01	0.79115	0.4175	1.39	0.75	3.1	4.49	3.85
7/1/2004	0.00E+00	0.00E+00	1.41483	0.29672	1.41	0.30	3.1	4.51	3.40
7/2/2004	1.19E-01	8.43E-02	9.64167	5.43522	9.64	5.44	5.3	14.94	10.74
7/3/2004	1.28E+00	7.03E-01	17.53159	9.49996	17.53	9.50	5.3	22.83	14.80
7/4/2004	1.85E+00	1.02E+00	5.51068	3.02895	5.51	3.03	5.3	10.81	8.33
7/5/2004	1.37E+00	7.52E-01	4.83117	2.6517	4.83	2.65	5.3	10.13	7.95
7/6/2004	1.68E+00	9.35E-01	8.94951	5.03418	8.95	5.03	5.3	14.25	10.33
7/7/2004	1.93E+00	1.07E+00	6.46028	3.5202	6.46	3.52	5.3	11.76	8.82

	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
Date	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
7/8/2004	2.01E+00	1.10E+00	8.40436	4.70152	8.40	4.70	9.2	17.60	13.90
7/9/2004	4.10E+00	2.26E+00	3.60121	2.06117	4.10	2.26	9.2	13.30	11.46
7/10/2004	3.37E+00	1.86E+00	9.2063	5.12916	9.21	5.13	9.2	18.41	14.33
7/11/2004	1.61E+00	8.77E-01	4.11606	2.20065	4.12	2.20	9.2	13.32	11.40
7/12/2004	1.23E+00	6.76E-01	6.91128	3.73222	6.91	3.73	9.2	16.11	12.93
7/13/2004	1.91E-01	1.05E-01	0.98333	0.5315	0.98	0.53	9.2	10.18	9.73
7/14/2004	1.78E+00	9.77E-01	0.05028	0.00362	1.78	0.98	5.3	7.08	6.28
7/15/2004	2.47E+00	1.36E+00	1.39	0.79389	2.47	1.36	5.3	7.77	6.66
7/16/2004	1.13E+00	6.27E-01	11.0521	5.89496	11.05	5.89	5.3	16.35	11.19
7/17/2004	1.76E+00	9.59E-01	2.55908	1.35778	2.56	1.36	5.3	7.86	6.66
7/18/2004	3.14E+00	1.72E+00	4.98289	2.667	4.98	2.67	5.3	10.28	7.97
7/19/2004	4.07E+00	2.23E+00	9.19337	5.16216	9.19	5.16	5.3	14.49	10.46
7/20/2004	3.92E+00	2.15E+00	12.26918	6.581	12.27	6.58	3.6	15.87	10.18
7/21/2004	2.36E+00	1.29E+00	2.34834	1.27611	2.36	1.29	3.6	5.96	4.89
7/22/2004	1.10E+00	5.99E-01	7.41765	3.85906	7.42	3.86	3.6	11.02	7.46
7/23/2004	1.19E+00	6.50E-01	2.86	1.61556	2.86	1.62	3.6	6.46	5.22
7/24/2004	1.00E+00	5.51E-01	3.38455	1.67186	3.38	1.67	3.6	6.98	5.27
7/25/2004	1.68E+00	9.27E-01	7.52301	4.21722	7.52	4.22	3.6	11.12	7.82
7/26/2004	1.42E+00	7.91E-01	3.05505	1.68325	3.06	1.68	8.8	11.86	10.48
7/27/2004	9.63E-01	5.34E-01	5.08908	2.87078	5.09	2.87	8.8	13.89	11.67
7/28/2004	2.37E+00	1.31E+00	5.93096	3.24048	5.93	3.24	8.8	14.73	12.04
7/29/2004	1.16E+00	6.34E-01	1.46533	0.764	1.47	0.76	8.8	10.27	9.56
7/30/2004	7.61E-01	4.12E-01	4.52161	2.47903	4.52	2.48	8.8	13.32	11.28
7/31/2004	7.97E-01	4.37E-01	2.89657	1.5454	2.90	1.55	8.8	11.70	10.35
8/1/2004	1.66E+00	9.16E-01	10.36833	5.68556	10.37	5.69	5.5	15.87	11.19
8/2/2004	1.07E+00	5.77E-01	6.25235	3.63353	6.25	3.63	5.5	11.75	9.13
8/3/2004	2.27E+00	1.25E+00	5.34523	2.9872	5.35	2.99	5.5	10.85	8.49
8/4/2004	1.35E+00	7.34E-01	3.29065	1.82918	3.29	1.83	5.5	8.79	7.33
8/5/2004	3.25E+00	1.78E+00	2.02944	1.10833	3.25	1.78	5.5	8.75	7.28
8/6/2004	2.24E+00	1.24E+00	8.71778	4.94833	8.72	4.95	5.5	14.22	10.45
8/7/2004	1.53E+00	8.40E-01	7.66212	4.23645	7.66	4.24	4.5	12.16	8.74
8/8/2004	2.33E+00	1.29E+00	2.21238	1.09389	2.33	1.29	4.5	6.83	5.79
8/9/2004	1.08E+00	5.89E-01	15.695	8.66747	15.70	8.67	4.5	20.20	13.17
8/10/2004	7.40E-01	4.10E-01	5.55685	3.05572	5.56	3.06	4.5	10.06	7.56
8/11/2004	1.35E+00	7.49E-01	4.23843	2.30197	4.24	2.30	4.5	8.74	6.80
8/12/2004	1.13E+00	6.20E-01	1.57078	0.67151	1.57	0.67	4.5	6.07	5.17
8/13/2004	3.21E+00	1.78E+00	0.65728	0.31851	3.21	1.78	7.7	10.91	9.48
8/14/2004	8.39E-01	4.54E-01	8.51278	4.935	8.51	4.94	7.7	16.21	12.64
8/15/2004	1.49E+00	8.17E-01	3.79293	2.04833	3.79	2.05	7.7	11.49	9.75
8/16/2004	2.81E+00	1.54E+00	1.26316	0.68356	2.81	1.54	7.7	10.51	9.24
8/17/2004	8.59E-01	4.75E-01	8.18925	4.57902	8.19	4.58	7.7	15.89	12.28
8/18/2004	1.11E+00	6.10E-01	15.91612	8.91389	15.92	8.91	7.7	23.62	16.61
8/19/2004	1.62E+00	8.94E-01	4.47368	2.29335	4.47	2.29	7.2	11.67	9.49
8/20/2004	4.14E+00	2.29E+00	2.47074	1.31172	4.14	2.29	7.2	11.34	9.49
8/21/2004	1.73E+00	9.56E-01	3.92699	1.95594	3.93	1.96	7.2	11.13	9.16
8/22/2004	2.41E+00	1.33E+00	4.7	2.56172	4.70	2.56	7.2	11.90	9.76
8/23/2004	6.86E-01	3.65E-01	3.45175	1.86894	3.45	1.87	7.2	10.65	9.07
8/24/2004	1.89E+00	1.03E+00	3.92083	2.15035	3.92	2.15	7.2	11.12	9.35
8/25/2004	1.74E+00	9.51E-01	2.77783	1.40328	2.78	1.40	5.4	8.18	6.80
8/26/2004	2.59E+00	1.42E+00	4.92511	2.66659	4.93	2.67	5.4	10.33	8.07
8/27/2004	2.62E+00	1.44E+00	2.30111	1.28778	2.62	1.44	5.4	8.02	6.84
8/28/2004	2.68E+00	1.48E+00	2.21389	1.21444	2.68	1.48	5.4	8.08	6.88
8/29/2004	4.69E+00	2.60E+00	7.09497	3.86111	7.09	3.86	5.4	12.49	9.26
8/30/2004	1.01E+00	5.48E-01	4.56575	2.58037	4.57	2.58	5.4	9.97	7.98
8/31/2004	1.19E+00	6.55E-01	12.53699	6.65934	12.54	6.66	3.6	16.14	10.26
9/1/2004	1.67E+00	9.19E-01	15.46067	8.32796	15.46	8.33	3.6	19.06	11.93
9/2/2004	4.87E+00	2.68E+00	6.2495	3.45749	6.25	3.46	3.6	9.85	7.06
9/3/2004	2.08E+00	1.15E+00	1.61417	1.96227	2.08	1.96	3.6	5.68	5.56
9/4/2004	1.64E+00	8.93E-01	2.224	1.15056	2.22	1.15	3.6	5.82	4.75
9/5/2004	1.60E+00	8.68E-01	3.15823	1.71907	3.16	1.72	3.6	6.76	5.32
9/6/2004	1.45E+00	7.96E-01	2.39722	1.31002	2.40	1.31	11.3	13.70	12.61
9/7/2004	1.52E+00	8.27E-01	4.32906	2.36004	4.33	2.36	11.3	15.63	13.66
9/8/2004	2.04E+00	1.12E+00	2.30461	1.19556	2.30	1.20	11.3	13.60	12.50
9/9/2004	5.83E-01	3.23E-01	3.68385	2.06582	3.68	2.07	11.3	14.98	13.37
9/10/2004	1.51E+00	8.22E-01	6.43736	3.47684	6.44	3.48	11.3	17.74	14.78
9/11/2004	1.15E+00	6.23E-01	8.30606	4.39056	8.31	4.39	11.3	19.61	15.69
9/12/2004	1.46E+00	7.97E-01	7.81211	4.38752	7.81	4.39	5.3	13.11	9.69
9/13/2004	2.68E+00	1.47E+00	4.64856	2.54487	4.65	2.54	5.3	9.95	7.84
9/14/2004	3.03E+00	1.67E+00	16.35468	9.06352	16.35	9.06	5.3	21.65	14.36
9/15/2004	1.51E+00	8.15E-01	7.30209	4.09896	7.30	4.10	5.3	12.60	9.40
9/16/2004	1.01E+00	5.51E-01	6.13109	3.32585	6.13	3.33	5.3	11.43	8.63
9/17/2004	7.86E-01	4.27E-01	1.43186	0.7795	1.43	0.78	5.3	6.73	6.08
9/18/2004	2.24E+00	1.23E+00	0.32489	0.15689	2.24	1.23	5.3	7.54	6.53
9/19/2004	1.22E+00	6.76E-01	2.45222	1.34278	2.45	1.34	5.3	7.75	6.64
9/20/2004	2.12E+00	1.17E+00	2.48	0.95167	2.48	1.17	5.3	7.78	6.47
9/21/2004	1.51E+00	8.28E-01	2.32699	1.27716	2.33	1.28	5.3	7.63	6.58
9/22/2004	2.60E+00	1.44E+00	2.90611	1.59111	2.91	1.59	5.3	8.21	6.89
9/23/2004	1.89E+00	1.04E+00	0	0	1.89	1.04	5.3	7.19	6.34
9/24/2004	1.46E+00	8.10E-01	0.71333	0.38628	1.46	0.81	5.3	6.76	6.11
9/25/2004	2.39E+00	1.32E+00	7.42333	4.15534	7.42	4.16	5.3	12.72	9.46
9/26/2004	1.42E+00	7.75E-01	6.44722	3.52111	6.45	3.52	5.3	11.75	8.82
9/27/2004	1.46E+00	8.08E-01	10.94174	6.01177	10.94	6.01	5.3	16.24	11.31
9/28/2004	1.33E+00	7.38E-01	2.75378	0.90128	2.75	0.90	5.3	8.05	6.20
9/29/2004	1.15E+00	6.34E-01	5.67755	3.22567	5.68	3.23	5.3	10.98	8.53
9/30/2004	1.11E+00	6.12E-01	2.44833	1.33778	2.45	1.34	5.2	7.65	6.54
10/1/2004	1.55E+00	8.51E-01	0.42022	0.11528	1.55	0.85	5.2	6.75	6.05
10/2/2004	1.26E+00	6.95E-01	0.70444	0	1.26	0.70	5.2	6.46	5.90
10/3/2004	7.86E-01	4.25E-01	3.47453	1.87833	3.47	1.88	5.2	8.67	7.08
10/4/2004	1.17E+00	6.40E-01	1.79427	0.70733	1.79	0.71	5.2	6.99	5.91
10/5/2004	2.80E+00	1.56E+00	9.77155	5.38307	9.77	5.38	5.2	14.97	10.58
10/6/2004	1.39E+00	7.65E-01	2.56893	1.40725	2.57	1.41	5.1	7.67	6.51
10/7/2004	8.84E-01	4.89E-01	2.28473	1.25546	2.28	1.26	5.1	7.38	6.36
10/8/2004	3.35E+00	1.87E+00	1.17778	0.64444	3.35	1.87	5.1	8.45	6.97
10/9/2004	2.03E+00	1.11E+00	5.41935	2.96692	5.42	2.97	5.1	10.52	8.07
10/10/2004	1.83E+00	1.00E+00	2.49	1.36222	2.49	1.36	5.1	7.59	6.46
10/11/2004	1.48E+00	8.13E-01	6.31111	3.50333	6.31	3.50	5.1	11.41	8.60
10/12/2004	1.52E+00	8.33E-01	1.63778	0.89389	1.64	0.89	3.6	5.24	4.49

Date	HBRP, AERMOD Flat Terrain		HBRP, CTDMPLUS		MAX (AERMOD/CTDMPLUS)		Measured	Total Impact	
	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Diesel Mode	Nat. Gas Mode	Background	Diesel Mode	Nat. Gas Mode
10/13/2004	1.21E+00	6.67E-01	4.28392	2.35612	4.28	2.36	3.6	7.88	5.96
10/14/2004	2.02E+00	1.10E+00	3.85833	2.09422	3.86	2.09	3.6	7.46	5.69
10/15/2004	9.55E-01	5.23E-01	0.86306	0.23711	0.96	0.52	3.6	4.56	4.12
10/16/2004	6.54E-01	3.57E-01	6.52222	3.66833	6.52	3.67	3.6	10.12	7.27
10/17/2004	2.55E+00	1.39E+00	0.58227	0.31327	2.55	1.39	3.6	6.15	4.99
10/18/2004	1.12E+01	6.18E+00	0	0.00001	11.19	6.18	2.0	13.19	8.18
10/19/2004	4.44E+00	2.43E+00	0.27	0.04993	4.44	2.43	2.0	6.44	4.43
10/20/2004	8.79E-01	4.81E-01	5.21128	2.85056	5.21	2.85	2.0	7.21	4.85
10/21/2004	1.27E+00	6.96E-01	2.78111	1.53833	2.78	1.54	2.0	4.78	3.54
10/22/2004	7.32E-01	3.95E-01	0.03573	0.02039	0.73	0.39	2.0	2.73	2.39
10/23/2004	9.66E-01	5.31E-01	5.30332	2.83533	5.30	2.84	2.0	7.30	4.84
10/24/2004	1.11E+00	6.12E-01	4.73228	2.4983	4.73	2.50	9.0	13.73	11.50
10/25/2004	4.40E+00	2.42E+00	1.439	0.789	4.40	2.42	9.0	13.40	11.42
10/26/2004	8.76E-01	4.91E-01	1.62269	0.88187	1.62	0.88	9.0	10.62	9.88
10/27/2004	9.75E-01	5.38E-01	1.91833	1.08389	1.92	1.08	9.0	10.92	10.08
10/28/2004	7.19E-01	3.96E-01	2.7223	1.41167	2.72	1.41	9.0	11.72	10.41
10/29/2004	6.84E-01	3.73E-01	1.34889	0.73667	1.35	0.74	9.0	10.35	9.74
10/30/2004	8.58E-01	4.73E-01	5.44502	3.00562	5.45	3.01	16.1	21.55	19.11
10/31/2004	1.49E+00	8.21E-01	1.07944	0.59333	1.49	0.82	16.1	17.59	16.92
11/1/2004	1.36E+00	7.53E-01	4.17611	2.29833	4.18	2.30	16.1	20.28	18.40
11/2/2004	1.00E+00	5.43E-01	2.22633	1.20577	2.23	1.21	16.1	18.33	17.31
11/3/2004	3.44E+00	1.91E+00	7.06655	3.95237	7.07	3.95	16.1	23.17	20.05
11/4/2004	1.48E+00	8.12E-01	6.11111	3.34889	6.11	3.35	16.1	22.21	19.45
11/5/2004	4.53E-01	2.47E-01	0	0	0.45	0.25	23.1	23.55	23.35
11/6/2004	1.02E+00	5.57E-01	13.76406	7.59245	13.76	7.59	23.1	36.86	30.69
11/7/2004	6.12E-01	3.39E-01	0.77556	0.41989	0.78	0.42	23.1	23.88	23.52
11/8/2004	5.98E-01	3.24E-01	1.61374	0.78331	1.61	0.78	23.1	24.71	23.88
11/9/2004	4.89E+00	2.72E+00	1.74444	0.99806	4.89	2.72	23.1	27.99	25.82
11/10/2004	1.03E+00	5.68E-01	0.76056	0.03532	1.03	0.57	23.1	24.13	23.67
11/11/2004	9.30E-01	5.14E-01	0.50539	0.27478	0.93	0.51	10.4	11.33	10.91
11/12/2004	7.51E-01	4.14E-01	0.49811	0.27572	0.75	0.41	10.4	11.15	10.81
11/13/2004	5.62E-01	3.08E-01	11.65831	6.41429	11.66	6.41	10.4	22.06	16.81
11/14/2004	1.96E-01	1.09E-01	1.74433	0.98372	1.74	0.98	10.4	12.14	11.38
11/15/2004	1.53E+00	8.75E-01	0.66394	0.36386	1.53	0.87	10.4	11.93	11.27
11/16/2004	1.20E+00	6.62E-01	10.38975	5.72423	10.39	5.72	10.4	20.79	16.12
11/17/2004	1.70E+00	9.40E-01	4.25722	1.46778	4.26	1.47	19.3	23.56	20.77
11/18/2004	1.68E+00	9.28E-01	13.85141	7.34894	13.85	7.35	19.3	33.15	26.65
11/19/2004	2.87E+00	1.59E+00	8.13983	4.29918	8.14	4.30	19.3	27.44	23.60
11/20/2004	2.57E+00	1.42E+00	1.4537	1.24145	2.57	1.42	19.3	21.87	20.72
11/21/2004	1.04E+00	5.73E-01	0.77255	0.41406	1.04	0.57	19.3	20.34	19.87
11/22/2004	8.45E-01	4.63E-01	5.58889	3.04167	5.59	3.04	19.3	24.89	22.34
11/23/2004	1.49E+00	8.22E-01	5.16644	2.87294	5.17	2.87	10.3	15.47	13.17
11/24/2004	1.22E+00	6.76E-01	7.95556	4.46056	7.96	4.46	10.3	18.26	14.76
11/25/2004	3.77E-01	2.08E-01	9.44576	5.19181	9.45	5.19	10.3	19.75	15.49
11/26/2004	6.11E-01	3.37E-01	10.57494	5.83724	10.57	5.84	10.3	20.87	16.14
11/27/2004	1.41E+00	7.76E-01	4.51062	2.45901	4.51	2.46	10.3	14.81	12.76
11/28/2004	1.48E+00	8.14E-01	1.59444	0.90667	1.59	0.91	10.3	11.89	11.21
11/29/2004	6.66E-01	3.68E-01	2.50441	1.37349	2.50	1.37	20.7	23.20	22.07
11/30/2004	1.76E+00	9.73E-01	3.46171	1.90722	3.46	1.91	20.7	24.16	22.61
12/1/2004	1.10E+00	6.07E-01	2.44611	1.34833	2.45	1.35	20.7	23.15	22.05
12/2/2004	8.13E-01	4.49E-01	7.15175	4.25575	7.15	4.26	20.7	27.85	24.96
12/3/2004	1.17E+00	6.45E-01	2.52722	1.39389	2.53	1.39	20.7	23.23	22.09
12/4/2004	2.91E+00	1.63E+00	0.18228	0.09931	2.91	1.63	20.7	23.61	22.33
12/5/2004	9.78E-01	5.42E-01	0	0	0.98	0.54	20.9	21.88	21.44
12/6/2004	1.04E+01	5.75E+00	0.15152	0.08061	10.39	5.75	20.9	31.29	26.65
12/7/2004	7.78E+00	4.30E+00	0.08613	0.048	7.78	4.30	20.9	28.68	25.20
12/8/2004	4.80E+00	2.63E+00	0.51624	0.21594	4.80	2.63	20.9	25.70	23.53
12/9/2004	1.08E+00	5.93E-01	1.0725	0.61359	1.08	0.61	20.9	21.98	21.51
12/10/2004	2.78E-01	1.54E-01	0.55528	0.30828	0.56	0.31	20.9	21.46	21.21
12/11/2004	1.70E+00	9.40E-01	2.165	1.20833	2.17	1.21	17.9	20.07	19.11
12/12/2004	1.22E+00	6.74E-01	2.30682	1.25038	2.31	1.25	17.9	20.21	19.15
12/13/2004	4.54E+00	2.46E+00	1.42475	0.80187	4.54	2.46	17.9	22.44	20.36
12/14/2004	3.72E-01	2.03E-01	4.27944	2.40611	4.28	2.41	17.9	22.18	20.31
12/15/2004	4.58E-01	2.53E-01	0	0	0.46	0.25	17.9	18.36	18.15
12/16/2004	3.29E-01	1.82E-01	1.39684	0.76547	1.40	0.77	17.9	19.30	18.67
12/17/2004	2.52E+00	1.40E+00	2.69833	1.52778	2.70	1.53	14.2	16.90	15.73
12/18/2004	1.19E+00	6.53E-01	2.64608	1.43444	2.65	1.43	14.2	16.85	15.63
12/19/2004	7.70E-01	4.29E-01	2.77744	1.50328	2.78	1.50	14.2	16.98	15.70
12/20/2004	6.89E-01	3.77E-01	2.62979	1.44567	2.63	1.45	14.2	16.83	15.65
12/21/2004	1.61E+00	8.89E-01	2.51222	1.38	2.51	1.38	14.9	17.41	16.28
12/22/2004	1.63E+00	9.02E-01	6.62814	2.01748	6.63	2.02	14.9	21.53	16.92
12/23/2004	1.27E+00	6.99E-01	2.67611	1.46389	2.68	1.46	25.6	28.28	27.06
12/24/2004	1.23E+00	6.80E-01	6.1309	3.3721	6.13	3.37	25.6	31.73	28.97
12/25/2004	9.09E+00	5.01E+00	2.57263	1.41474	9.09	5.01	25.6	34.69	30.61
12/26/2004	2.80E+00	1.56E+00	0.96091	0.52818	2.80	1.56	25.6	28.40	27.16
12/27/2004	1.08E+00	5.93E-01	0.25472	0.14011	1.08	0.59	25.6	26.68	26.19
12/28/2004	7.68E-01	4.30E-01	3.65916	2.07003	3.66	2.07	6.9	10.56	8.97
12/29/2004	1.16E+01	6.42E+00	0.00145	0.00083	11.57	6.42	6.9	18.47	13.32
12/30/2004	4.28E+00	2.34E+00	0.00096	0.00054	4.28	2.34	6.9	11.18	9.24
12/31/2004	3.79E+00	2.08E+00	0		3.79	2.08	3.3	13.08	12.58
8th highest value								29.38	26.55

FIGURE 8.1B-1A JANUARY PREDOMINANT MEAN CIRCULATION OF THE SURFACE WINDS

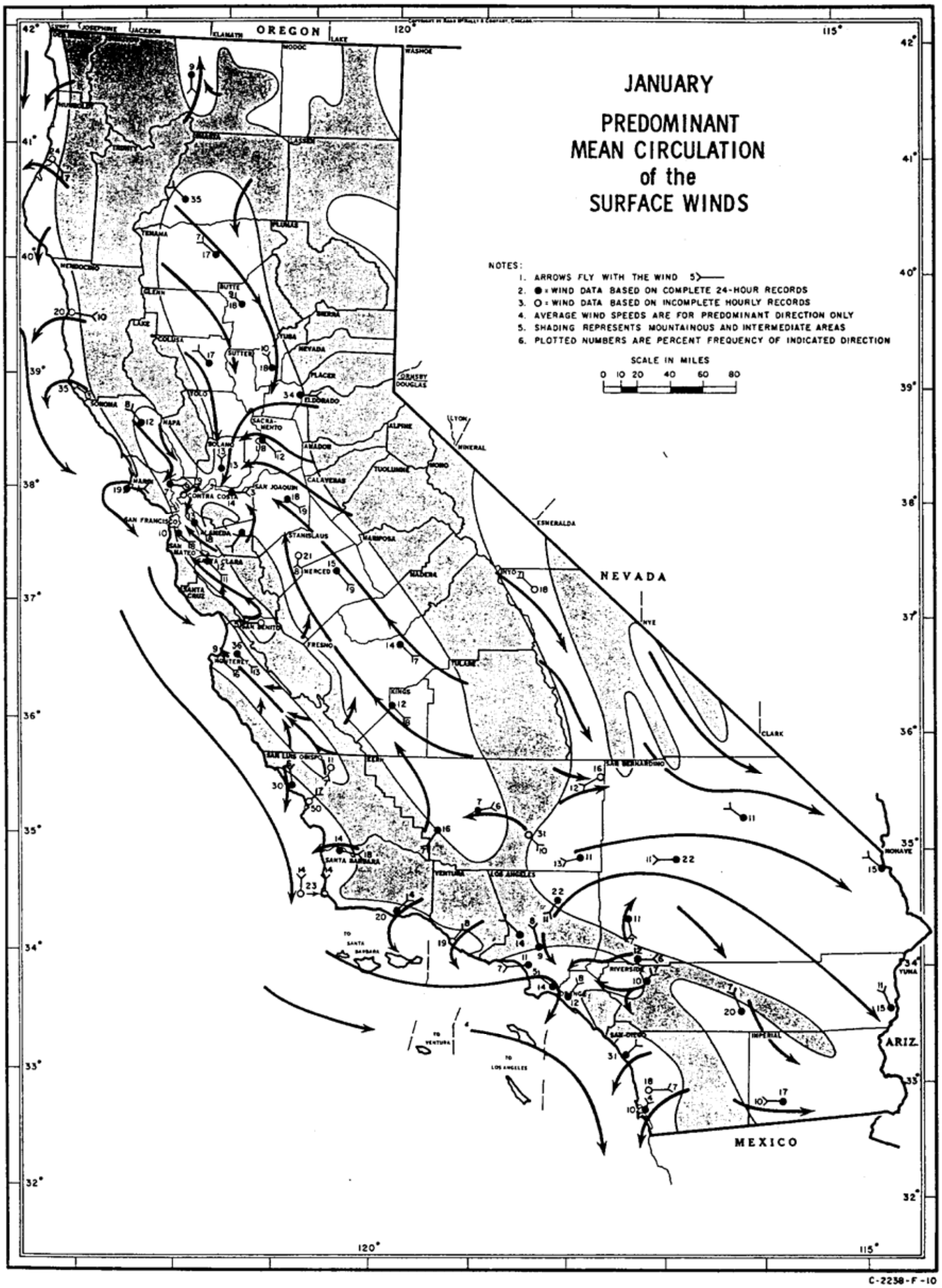


FIGURE 8.1B-1B APRIL PREDOMINANT MEAN CIRCULATION OF THE SURFACE WINDS

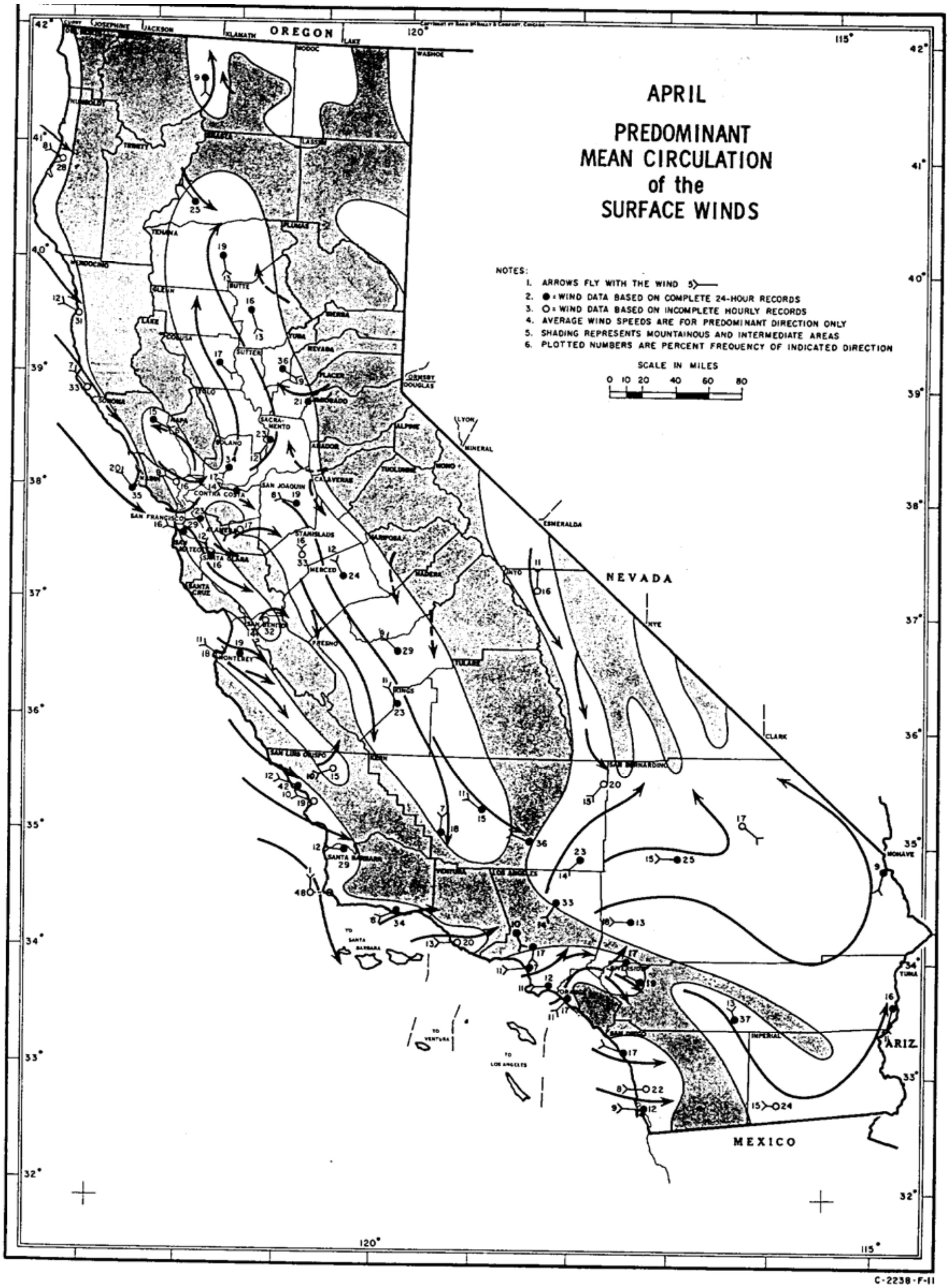


FIGURE 8.1B-1C JULY PREDOMINANT MEAN CIRCULATION OF THE SURFACE WINDS

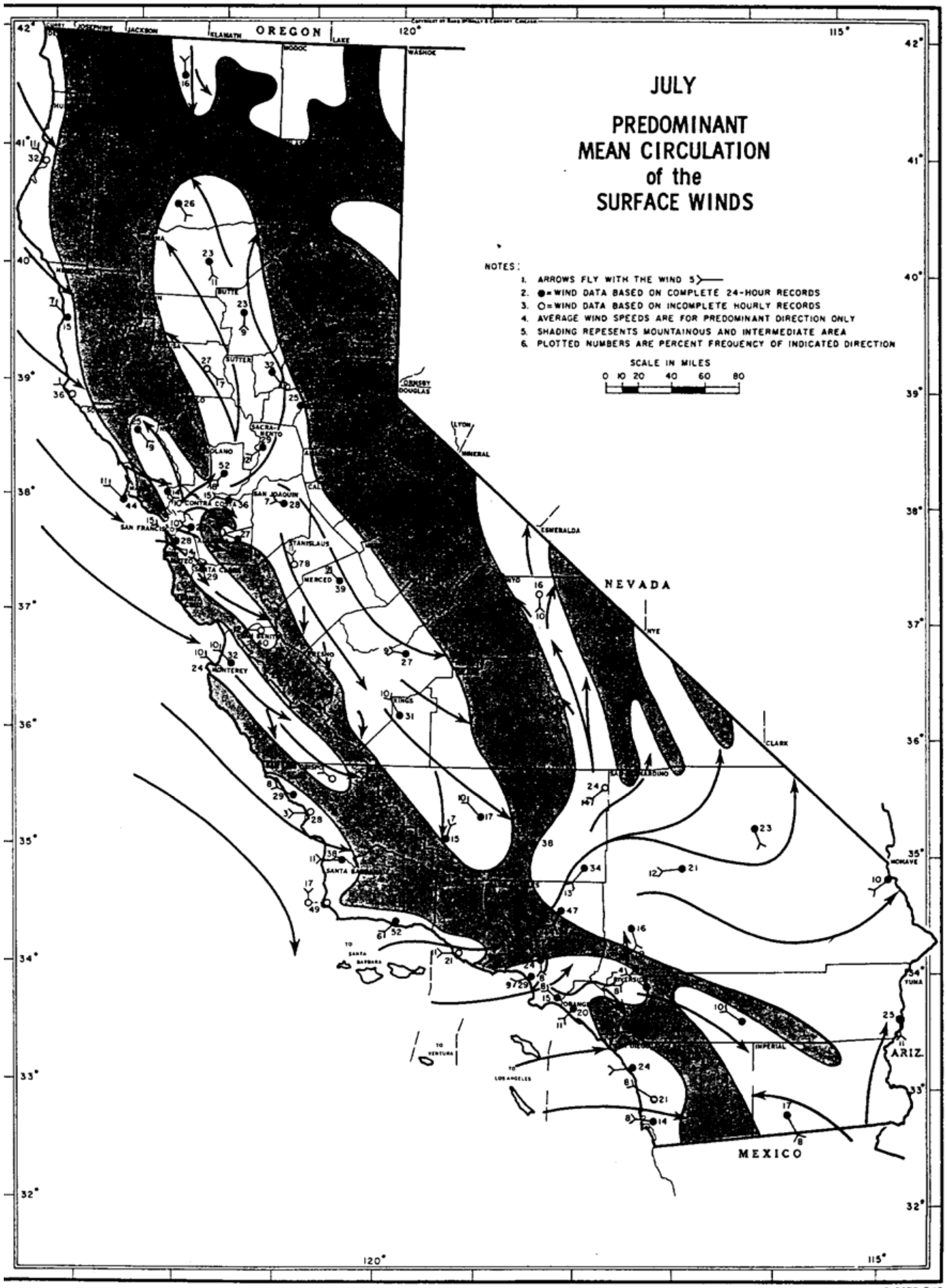
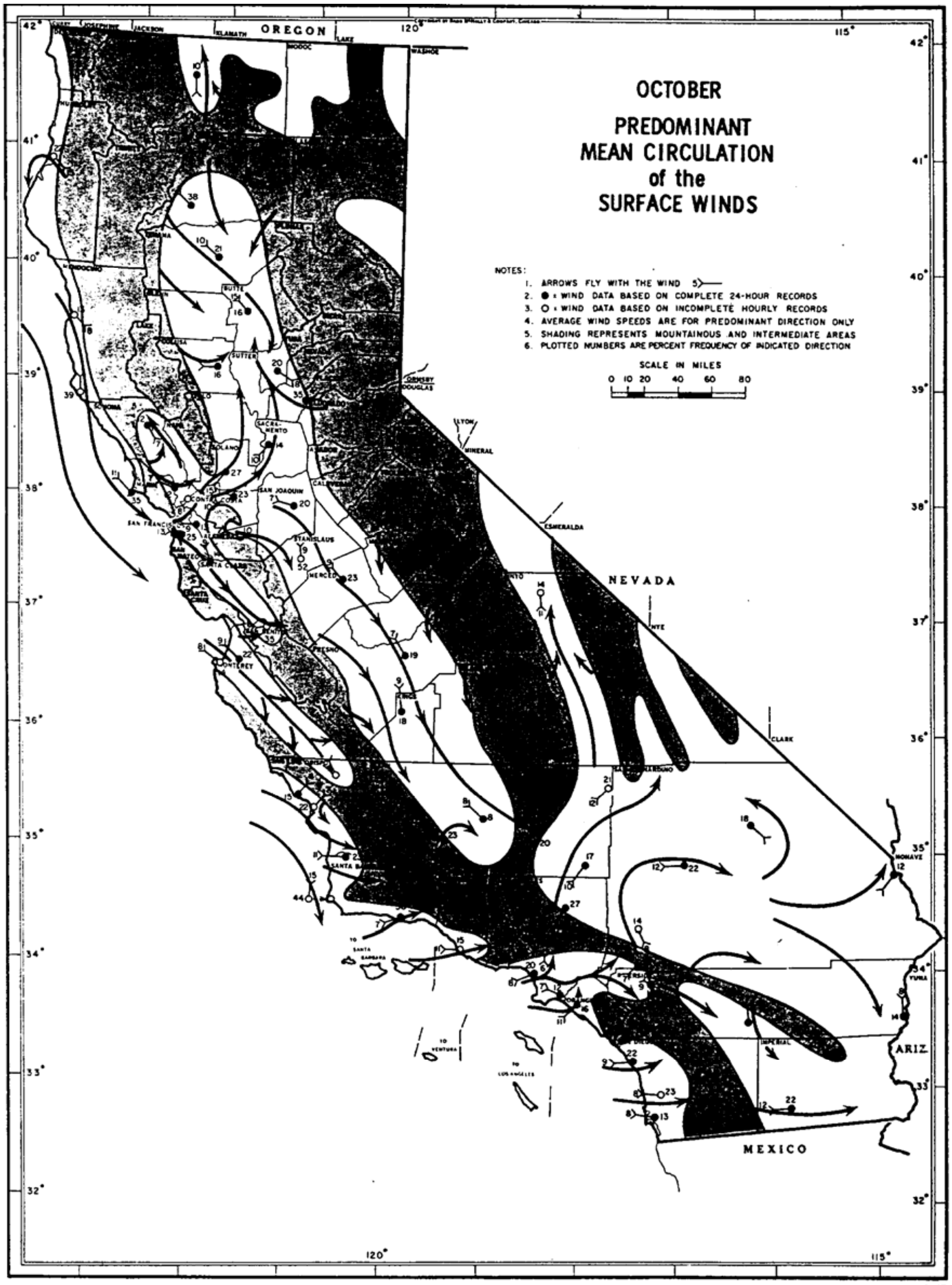


FIGURE 8.1B-1D OCTOBER PREDOMINANT MEAN CIRCULATION OF THE SURFACE WINDS



C-2238-F-13

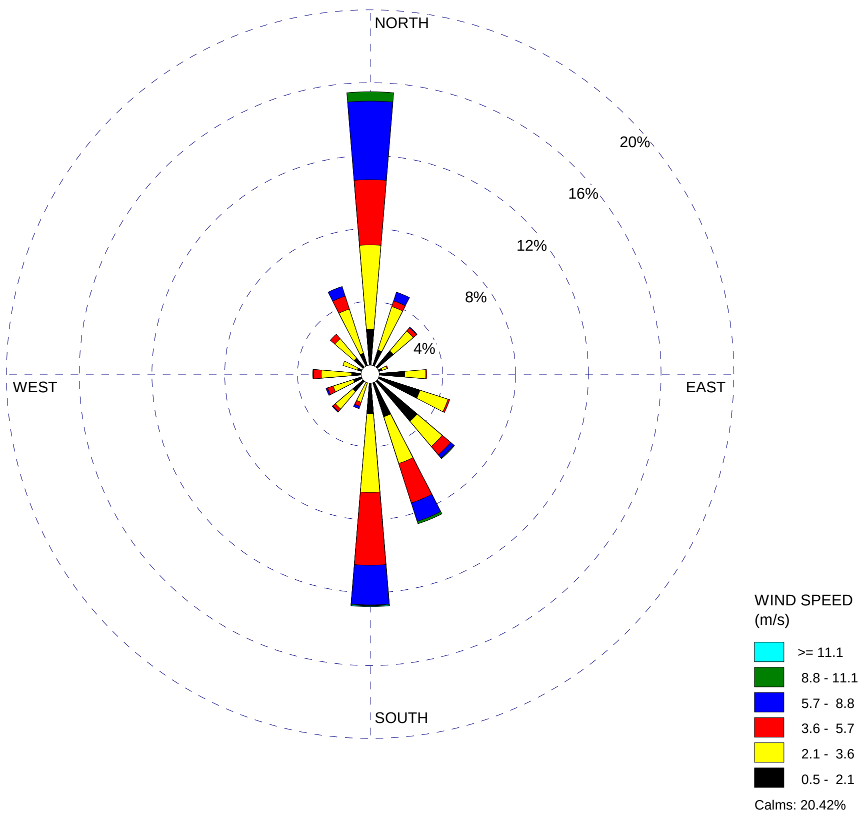
FIGURE 8.1B-2A 2001 1ST QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - First Quarter, 2001
January 1, 2001 through March 31, 2001

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2001 **Jan 1 - Mar 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **20.42%**	TOTAL COUNT: **2160 hrs.**	
	AVG. WIND SPEED: **2.34 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

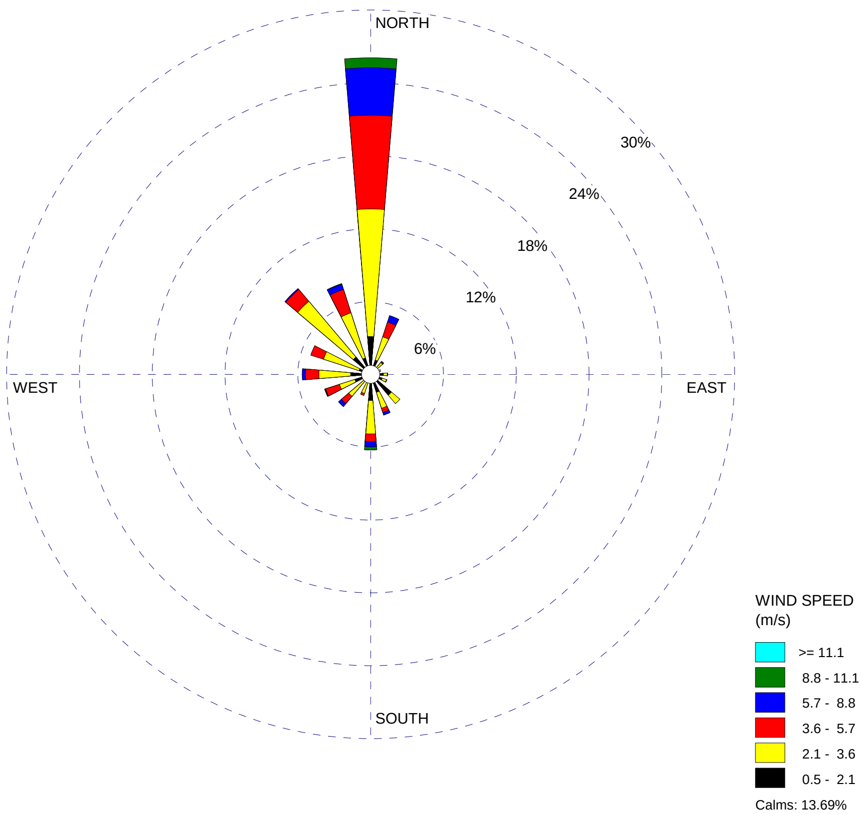
FIGURE 8.1B-2B 2001 2ND QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Second Quarter, 2001
April 1, 2001 through June 30, 2001

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2001 **Apr 1 - Jun 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **13.69%**	TOTAL COUNT: **2184 hrs.**	
	AVG. WIND SPEED: **2.55 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

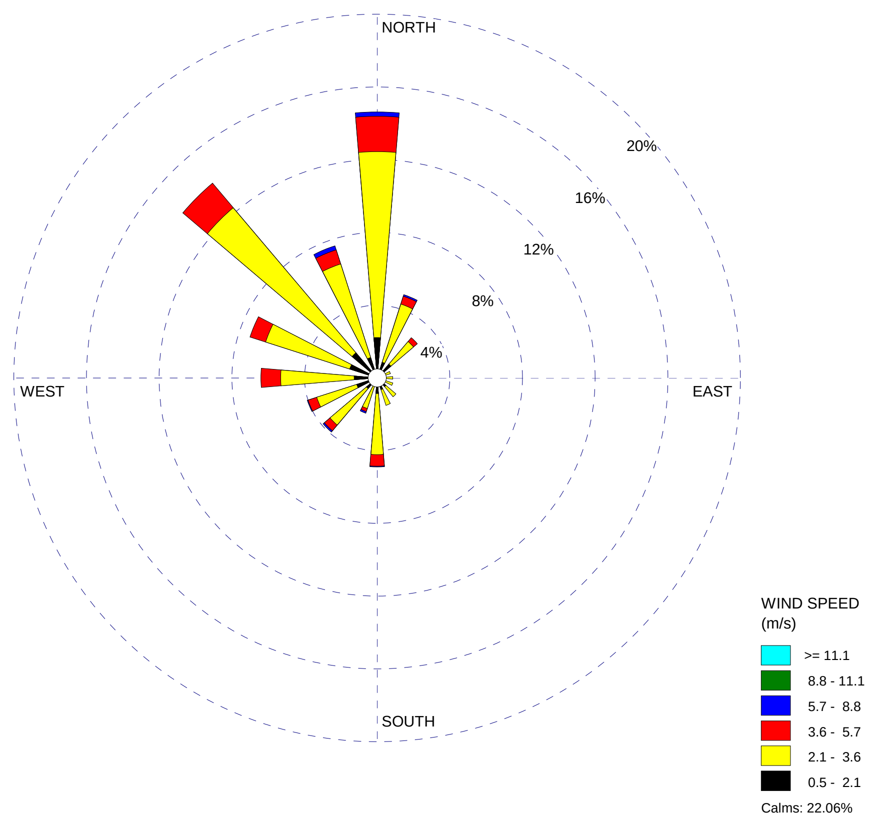
FIGURE 8.1B-2C 2001 3RD QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Third Quarter, 2001
July 1, 2001 through September 30, 2001

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2001
Jul 1 - Sep 30
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

22.06%

TOTAL COUNT:

2208 hrs.

AVG. WIND SPEED:

1.95 m/s

DATE:

7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

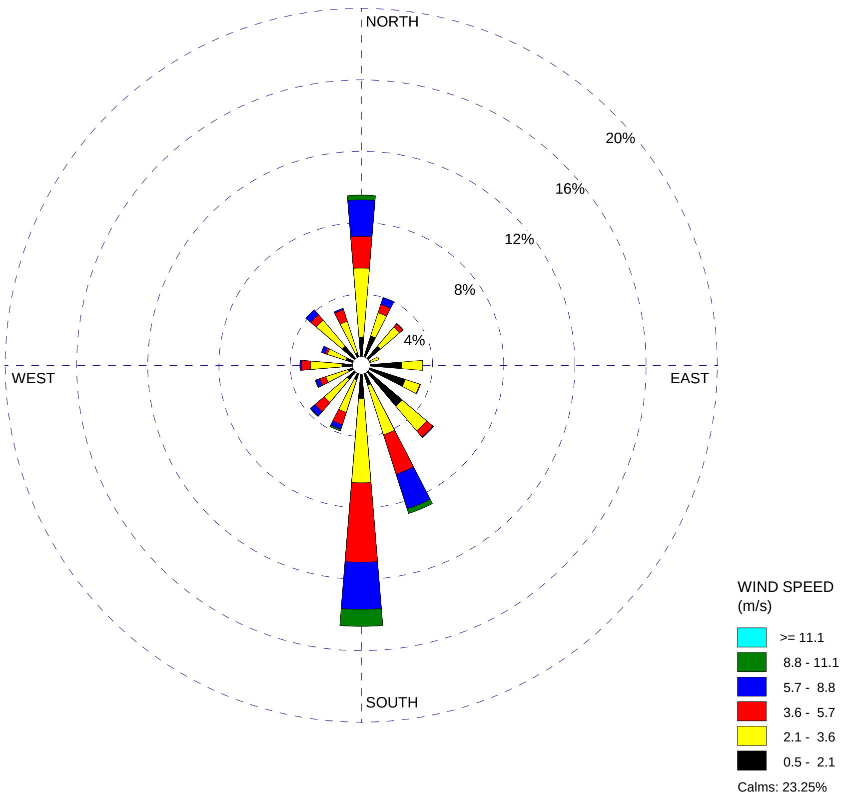
FIGURE 8.1B-2D 2001 4TH QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Fourth Quarter, 2001
October 1, 2001 through December 31, 2001

DISPLAY:

Wind Speed
Direction (blowing from)

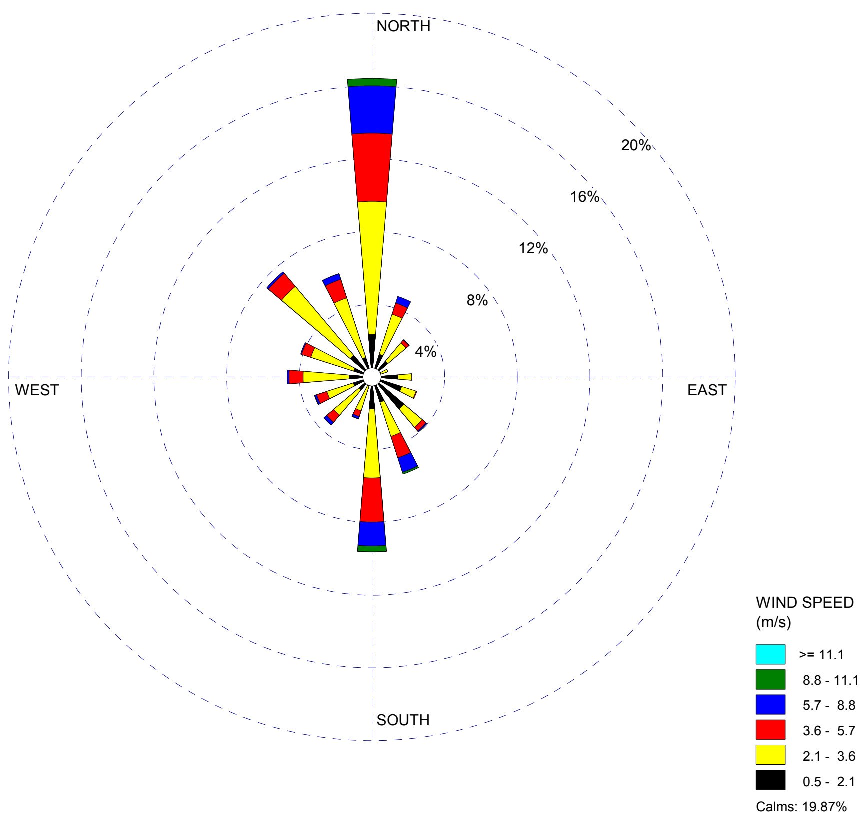


COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2001 **Oct 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **23.25%**	TOTAL COUNT: **2206 hrs.**	
	AVG. WIND SPEED: **2.36 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

FIGURE 8.1B-2E 2001 ANNUAL WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:	DISPLAY:
Woodley Island, CA - 2001 **January 1, 2001 through December 31, 2001**	**Wind Speed** **Direction (blowing from)**

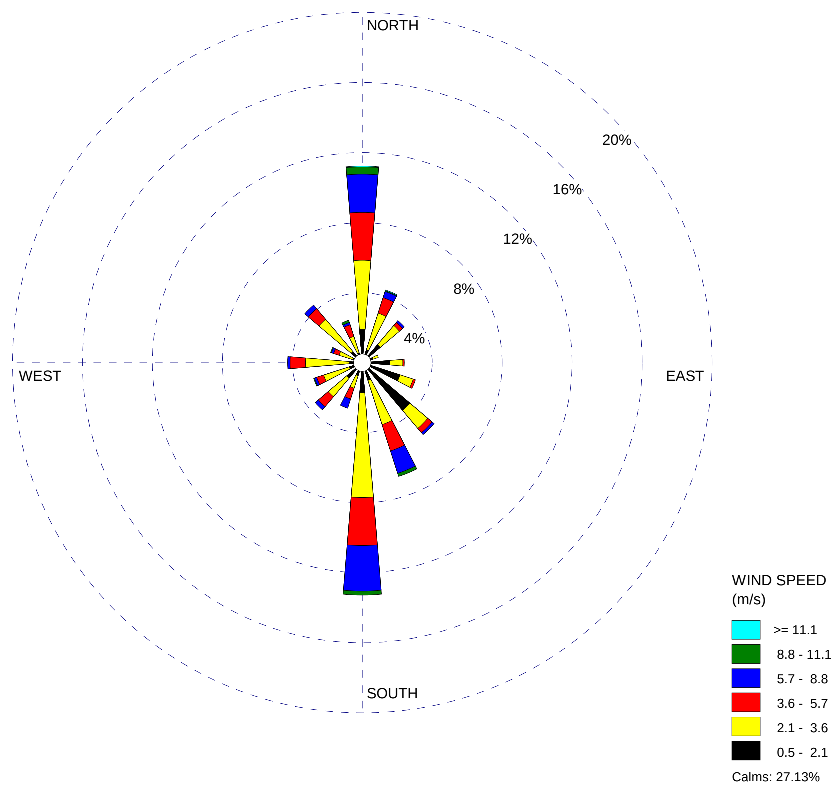


COMMENTS:	DATA PERIOD: **2001** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **19.87%**	TOTAL COUNT: **8758 hrs.**	
	AVG. WIND SPEED: **2.30 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

FIGURE 8.1B-3A 2002 1ST QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:	DISPLAY:
Woodley Island, CA - First Quarter, 2002 **January 1, 2002 through March 31, 2002**	**Wind Speed** **Direction (blowing from)**

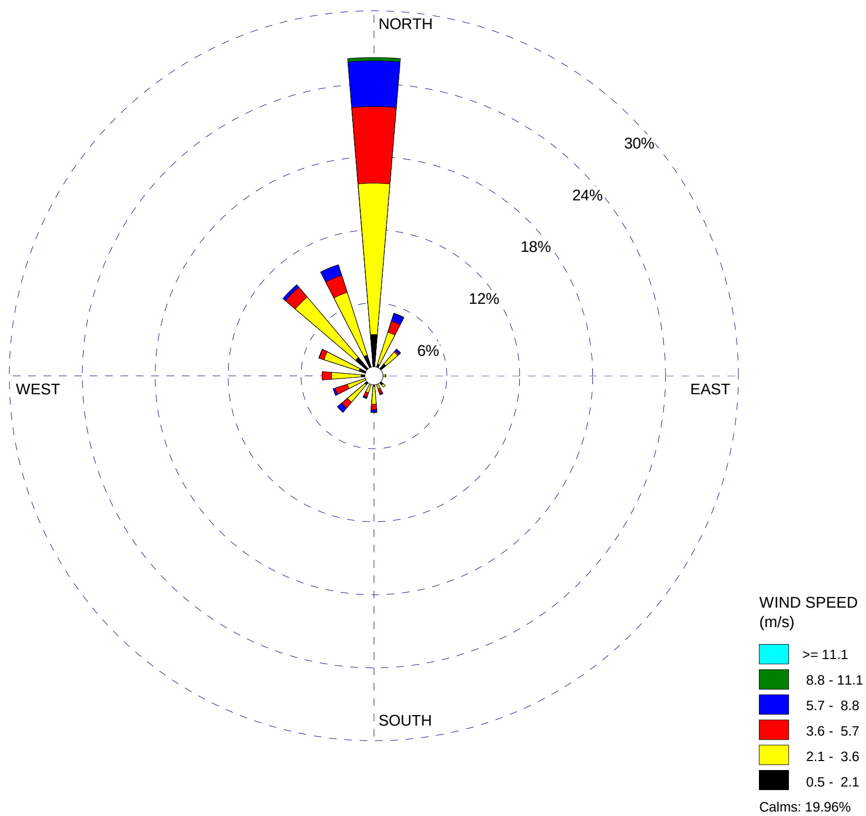


COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2002 **Jan 1 - Mar 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **27.13%**	TOTAL COUNT: **2160 hrs.**	
	AVG. WIND SPEED: **2.22 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

FIGURE 8.1B-3B 2002 2ND QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:	DISPLAY:
Woodley Island, CA - Second Quarter, 2002 **April 1, 2002 through June 30, 2002**	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2002 **Apr 1 - Jun 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **19.96%**	TOTAL COUNT: **2184 hrs.**	
	AVG. WIND SPEED: **2.32 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

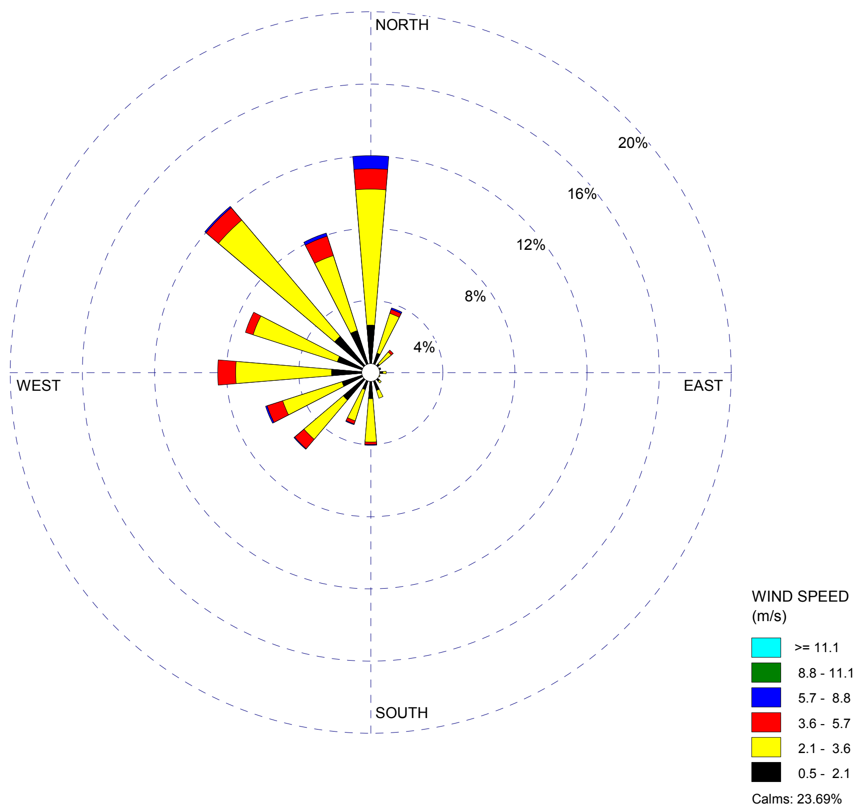
FIGURE 8.1B-3C 2002 3RD QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Third Quarter, 2002
July 1, 2002 through September 30, 2002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2002
Jul 1 - Sep 30
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

23.69%

TOTAL COUNT:

2208 hrs.

AVG. WIND SPEED:

1.77 m/s

DATE:

7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

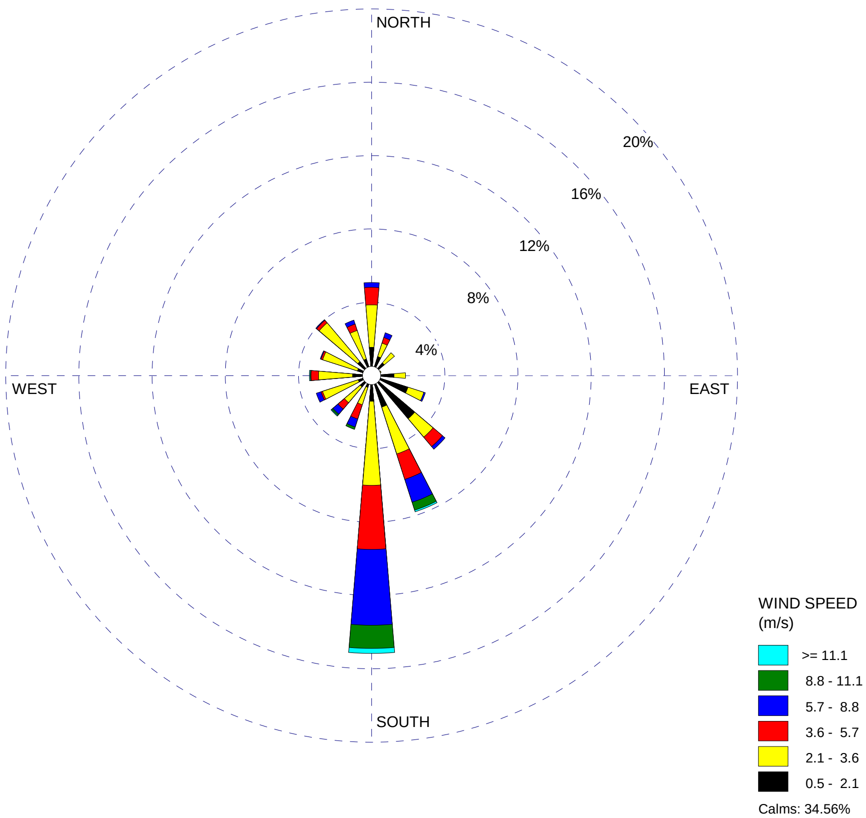
FIGURE 8.1B-3D 2002 4TH QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Fourth Quarter, 2002
October 1, 2002 through December 31, 2002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2002
Oct 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

34.56%

TOTAL COUNT:

2208 hrs.

AVG. WIND SPEED:

2.04 m/s

DATE:

7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

FIGURE 8.1B-3E 2002 ANNUAL WIND ROSE, WOODLEY ISLAND, CA

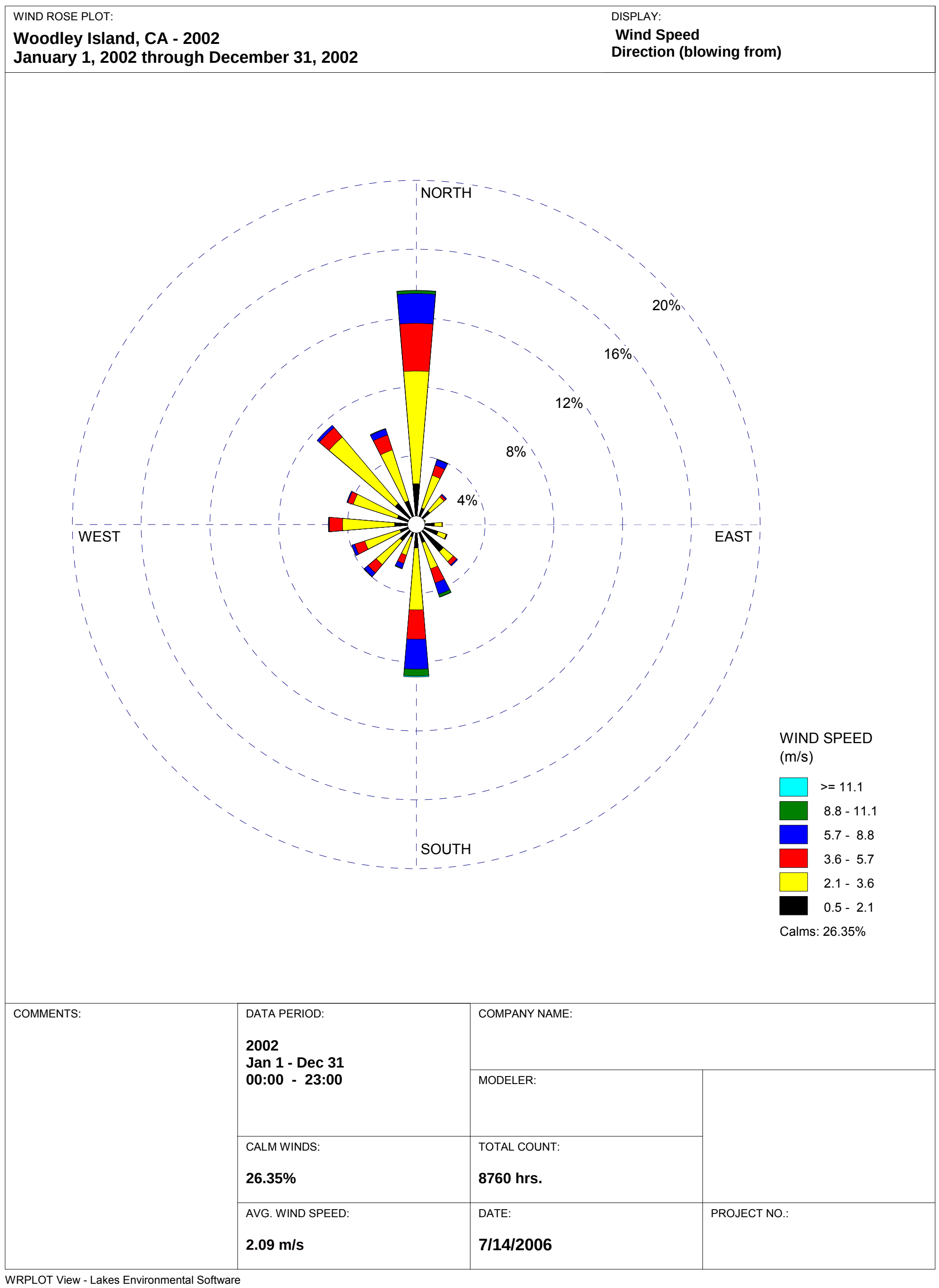


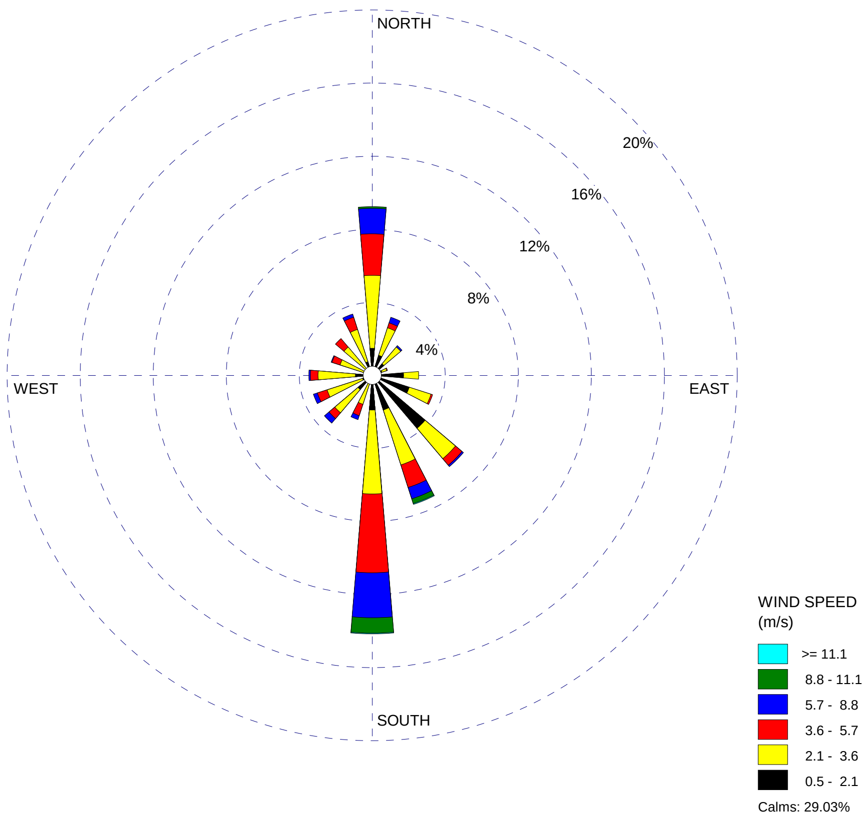
FIGURE 8.1B-4A 2003 1ST QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - First Quarter, 2003
January 1, 2003 through March 31, 2003

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2003** **Jan 1 - Mar 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **29.03%**	TOTAL COUNT: **2160 hrs.**	
	AVG. WIND SPEED: **2.08 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

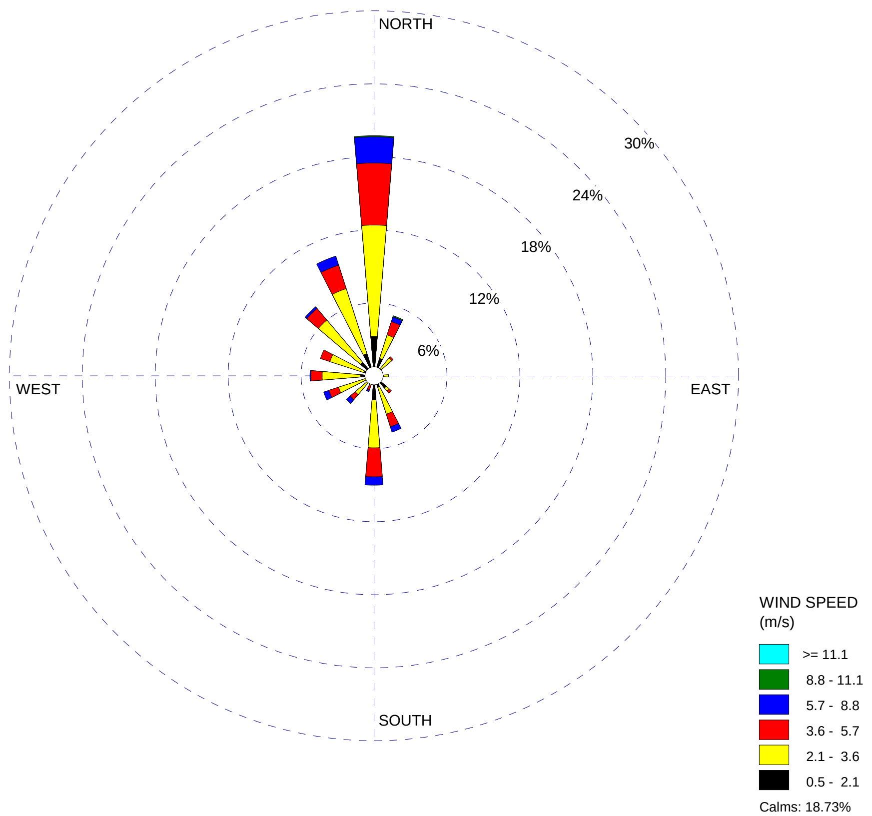
FIGURE 8.1B-4B 2003 2ND QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Second Quarter, 2003
April 1, 2003 through June 30, 2003

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2003
Apr 1 - Jun 30
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

18.73%

TOTAL COUNT:

2184 hrs.

AVG. WIND SPEED:

2.39 m/s

DATE:

7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

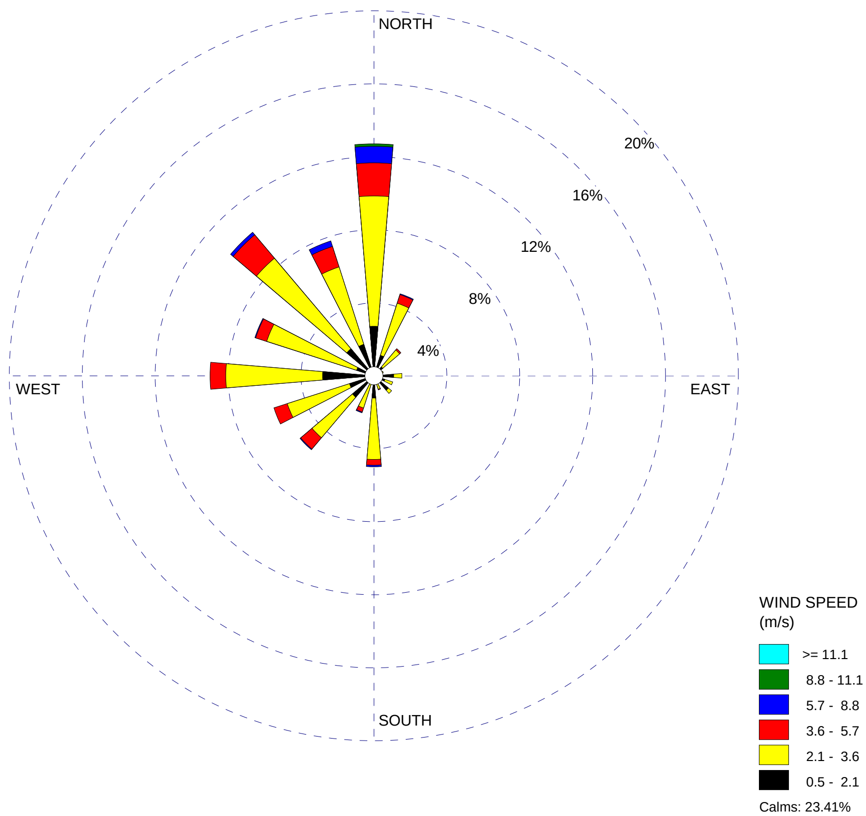
FIGURE 8.1B-4C 2003 3RD QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Third Quarter, 2003
July 1, 2003 through September 30, 2003

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2003 **Jul 1 - Sep 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **23.41%**	TOTAL COUNT: **2208 hrs.**	
	AVG. WIND SPEED: **1.92 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

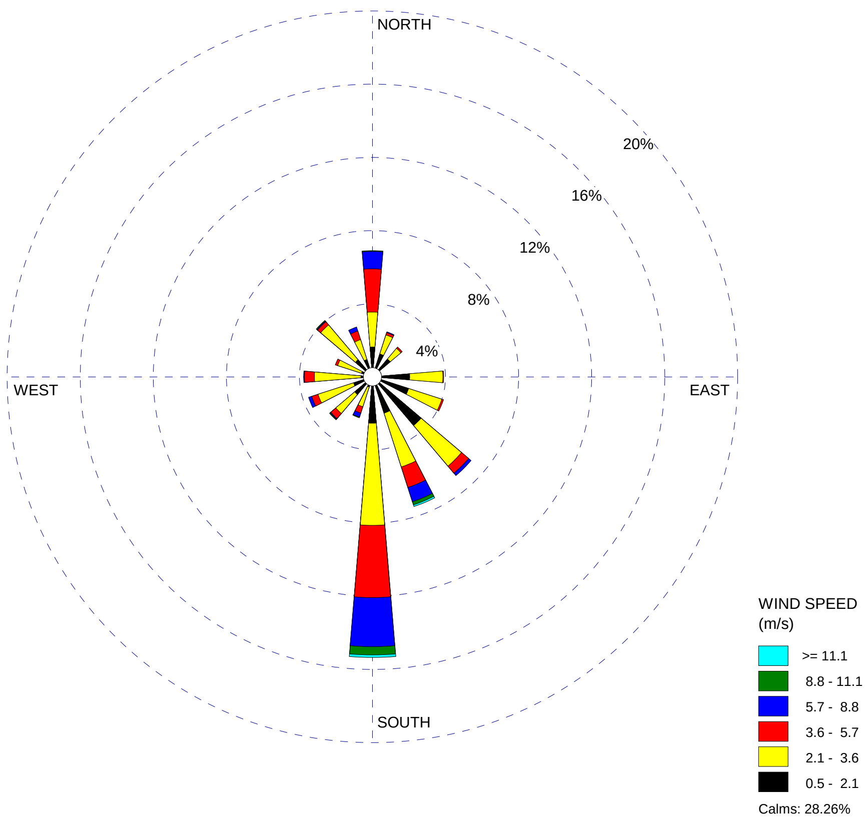
FIGURE 8.1B-4D 2003 4TH QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Fourth Quarter, 2003
October 1, 2003 through December 31, 2003

DISPLAY:

Wind Speed
Direction (blowing from)

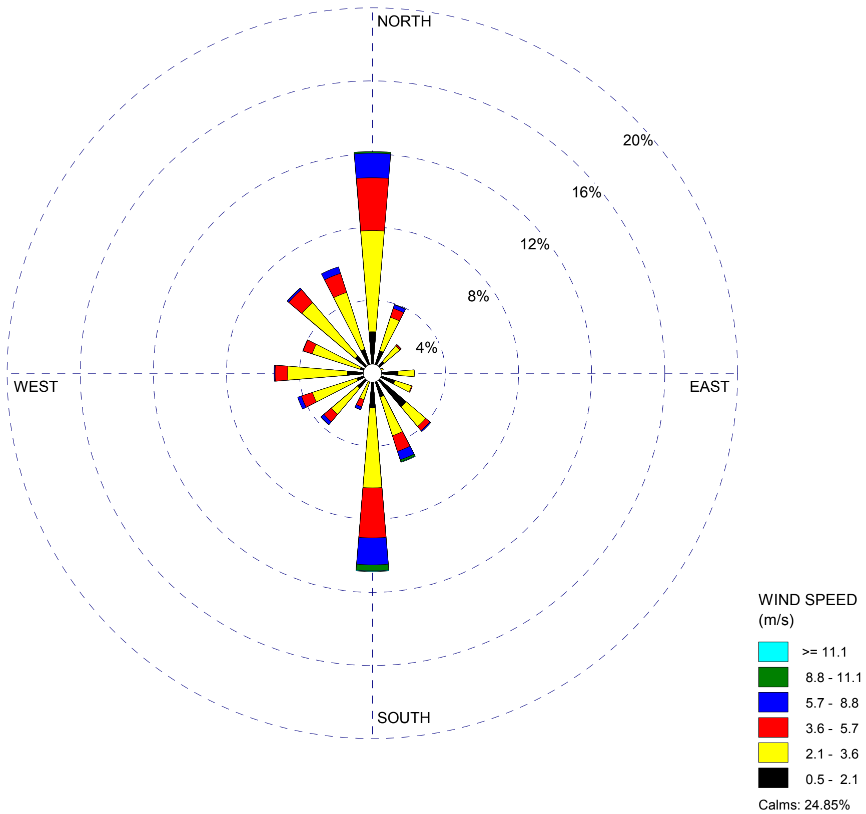


COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2003 **Oct 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **28.26%**	TOTAL COUNT: **2208 hrs.**	
	AVG. WIND SPEED: **1.99 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

FIGURE 8.1B-4E 2003 ANNUAL WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:	DISPLAY:
Woodley Island, CA - 2003 **January 1, 2003 through December 31, 2003**	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2003 **Jan 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **24.85%**	TOTAL COUNT: **8760 hrs.**	
	AVG. WIND SPEED: **2.09 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

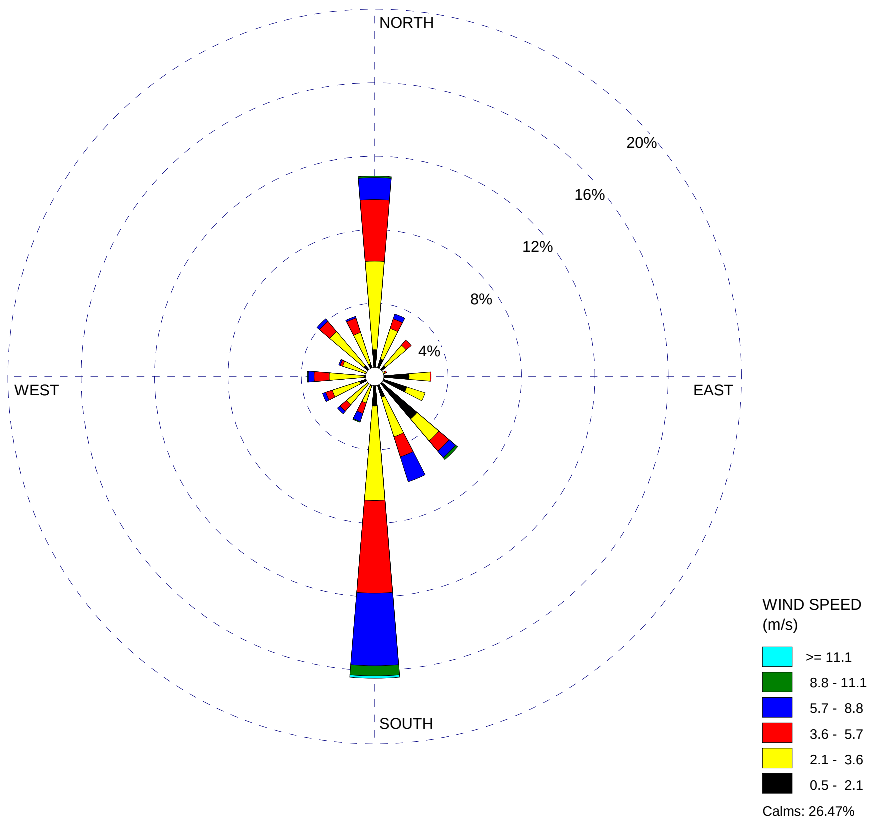
FIGURE 8.1B-5A 2004 1ST QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - First Quarter, 2004
January 1, 2004 through March 31, 2004

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2004 **Jan 1 - Mar 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **26.47%**	TOTAL COUNT: **2184 hrs.**	
	AVG. WIND SPEED: **2.34 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

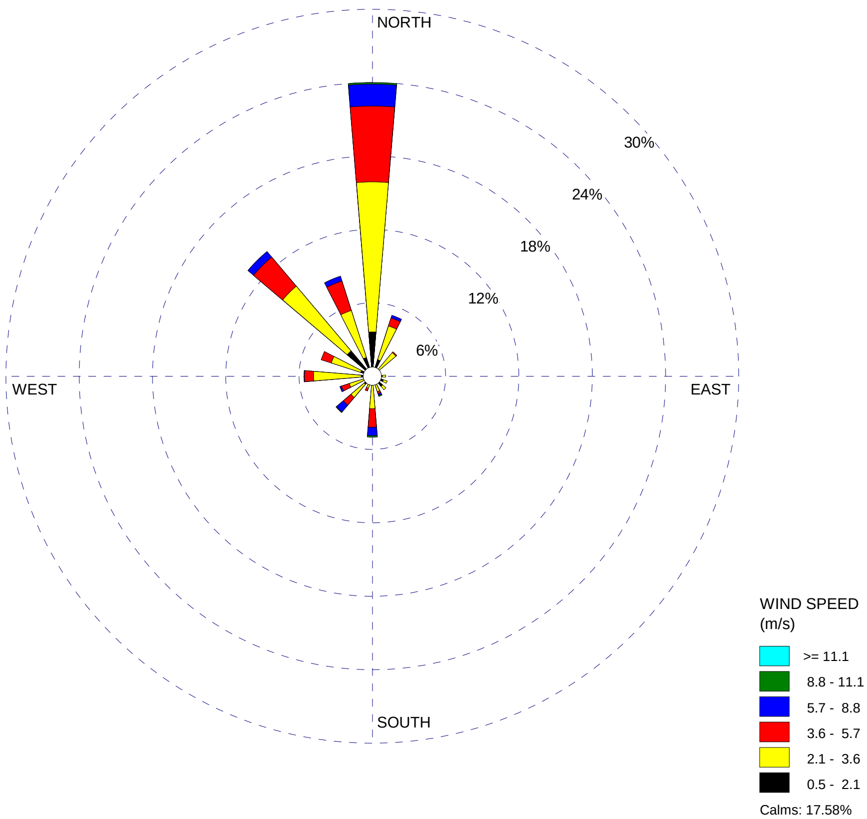
FIGURE 8.1B-5B 2004 2ND QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Second Quarter, 2004
April 1, 2004 through June 30, 2004

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2004
Apr 1 - Jun 30
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

17.58%

TOTAL COUNT:

2184 hrs.

AVG. WIND SPEED:

2.44 m/s

DATE:

7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

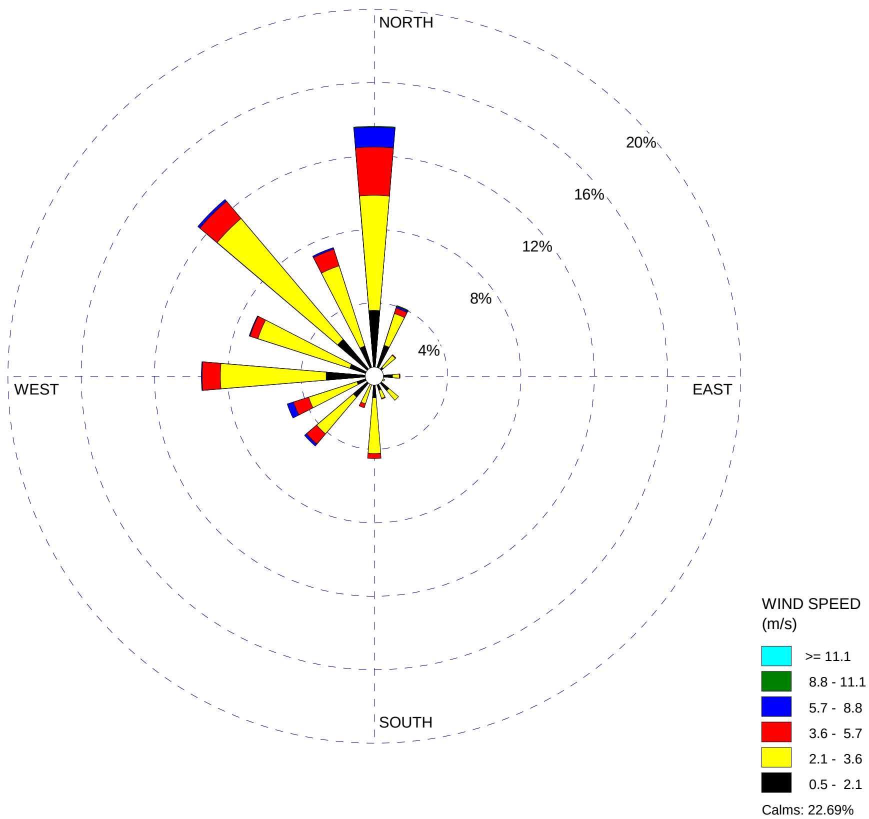
FIGURE 8.1B-5C 2004 3RD QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Third Quarter, 2004
July 1, 2004 through September 30, 2004

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2004
Jul 1 - Sep 30
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

22.69%

TOTAL COUNT:

2208 hrs.

AVG. WIND SPEED:

1.90 m/s

DATE:

7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

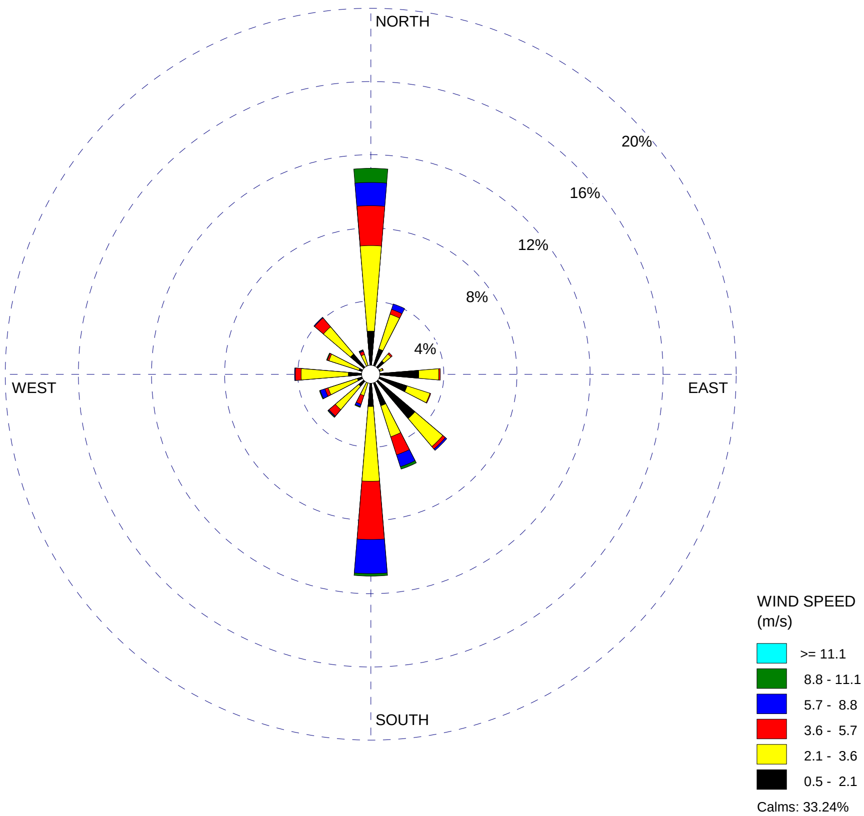
FIGURE 8.1B-5D 2004 4TH QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Fourth Quarter, 2004
October 1, 2004 through December 31, 2004

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2004 **Oct 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **33.24%**	TOTAL COUNT: **2208 hrs.**	
	AVG. WIND SPEED: **1.83 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

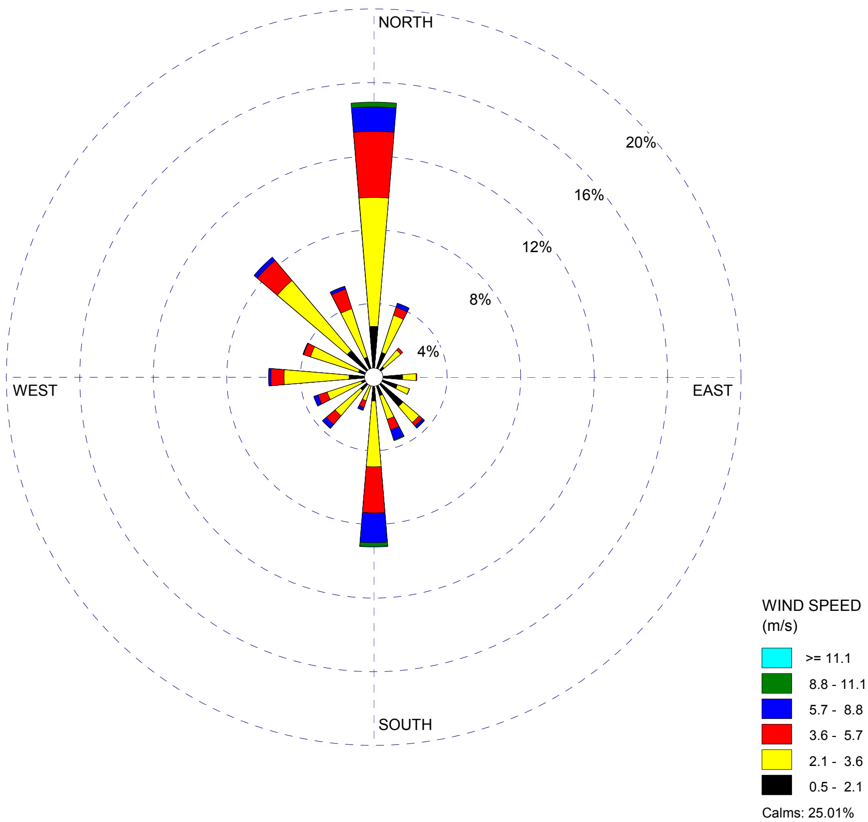
FIGURE 8.1B-5E 2004 ANNUAL WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - 2004
January 1, 2004 through December 31, 2004

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2004** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **25.01%**	TOTAL COUNT: **8784 hrs.**	
	AVG. WIND SPEED: **2.13 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

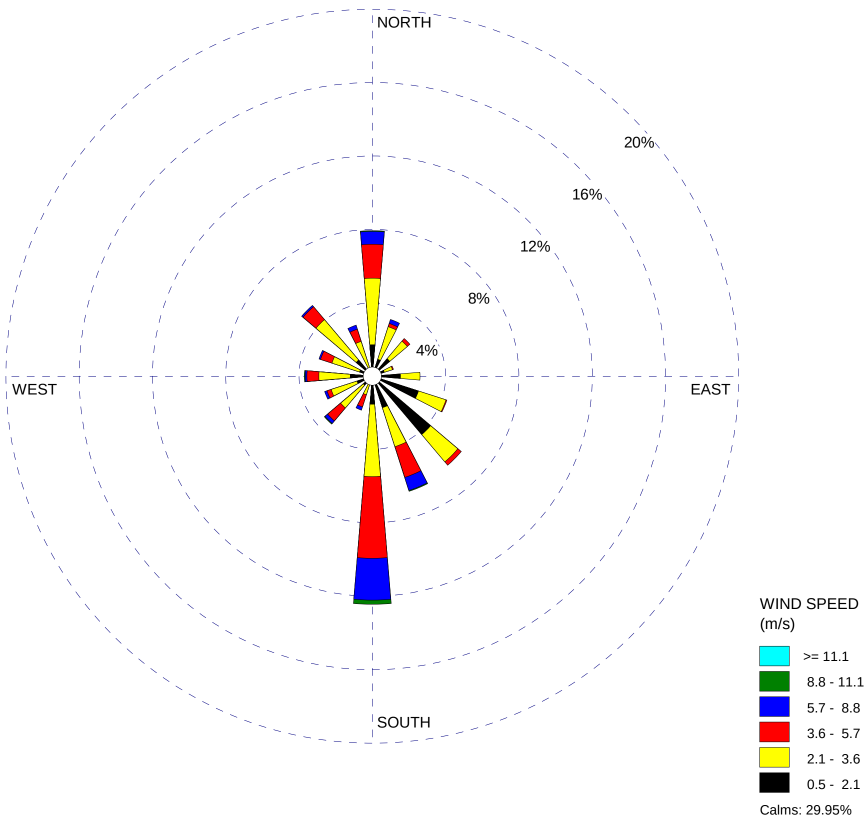
FIGURE 8.1B-6A 2005 1ST QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - First Quarter, 2005
January 1, 2005 through March 31, 2005

DISPLAY:

Wind Speed
Direction (blowing from)



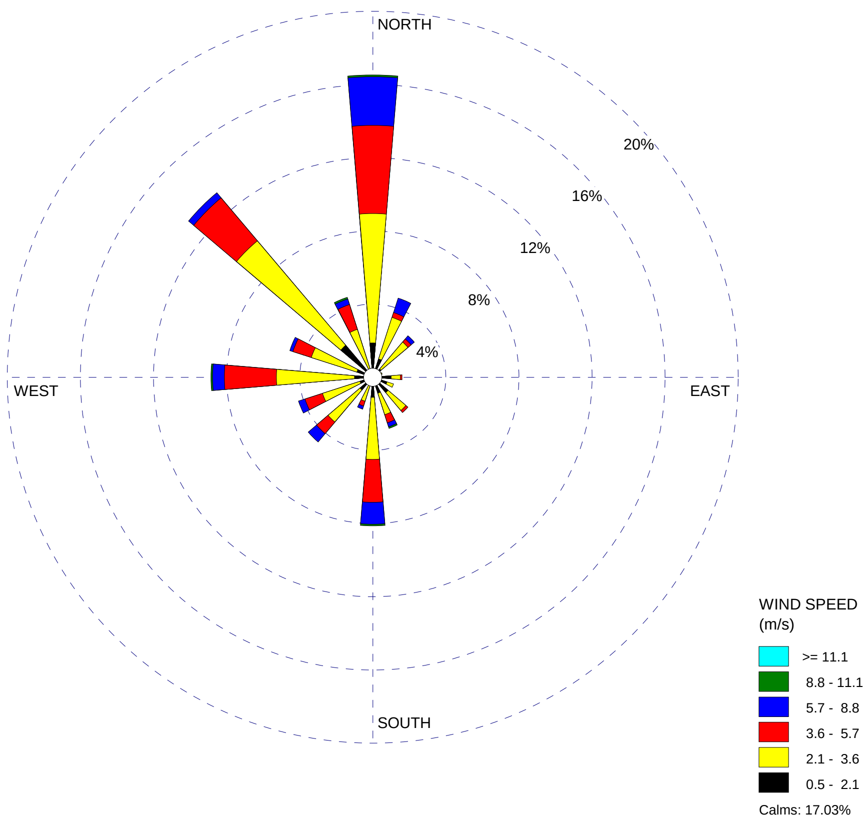
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2005 **Jan 1 - Mar 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **29.95%**	TOTAL COUNT: **2160 hrs.**	
	AVG. WIND SPEED: **1.94 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

FIGURE 8.1B-6B 2005 2ND QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:
Woodley Island, CA - Second Quarter, 2005
April 1, 2005 through June 30, 2005

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:
2005
Apr 1 - Jun 30
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:
17.03%

TOTAL COUNT:
2184 hrs.

AVG. WIND SPEED:
2.58 m/s

DATE:
7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

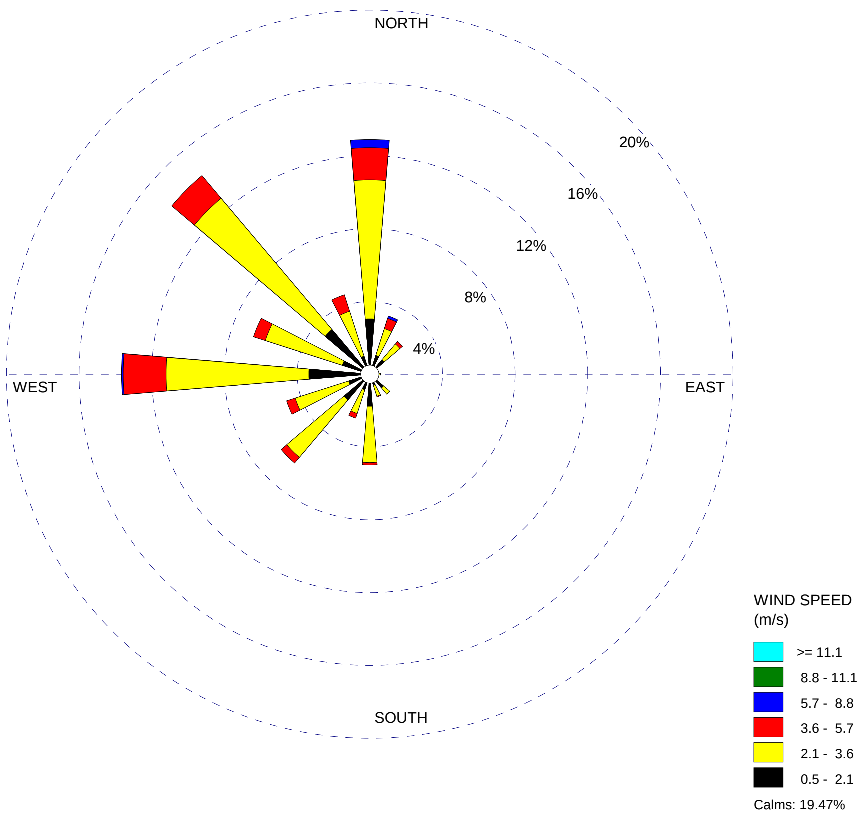
FIGURE 8.1B-6C 2005 3RD QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Third Quarter, 2005
July 1, 2005 through September 30, 2005

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

2005
Jul 1 - Sep 30
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

19.47%

TOTAL COUNT:

2208 hrs.

AVG. WIND SPEED:

1.88 m/s

DATE:

7/14/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

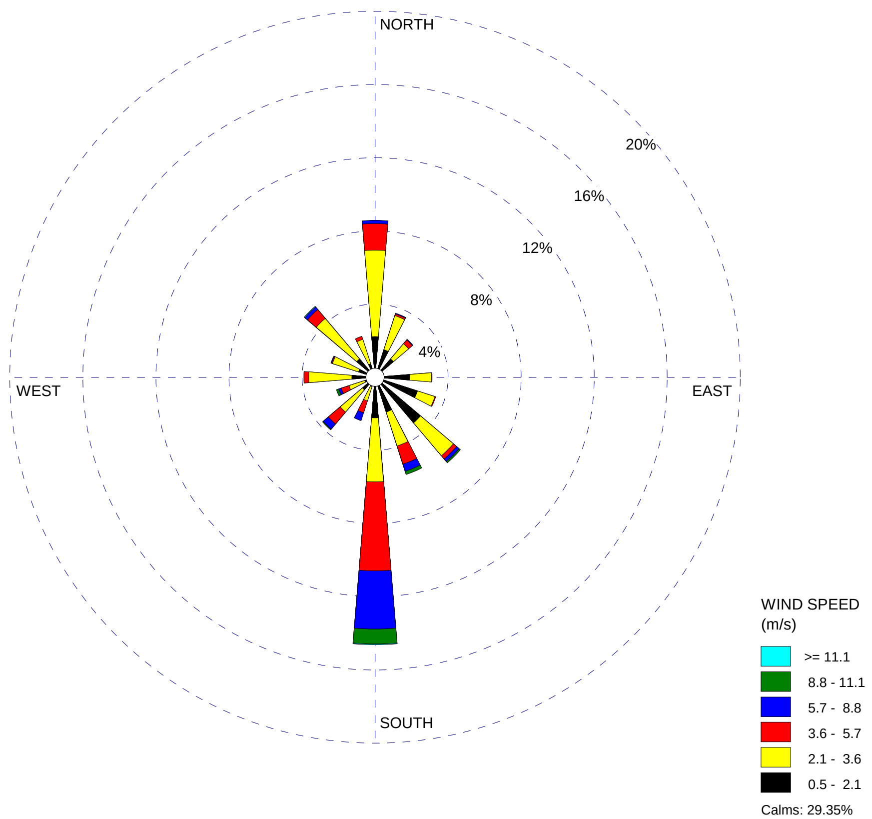
FIGURE 8.1B-6D 2005 4TH QUARTER WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - Fourth Quarter, 2005
October 1, 2005 through December 31, 2005

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2005 **Oct 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **29.35%**	TOTAL COUNT: **2208 hrs.**	
	AVG. WIND SPEED: **1.95 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

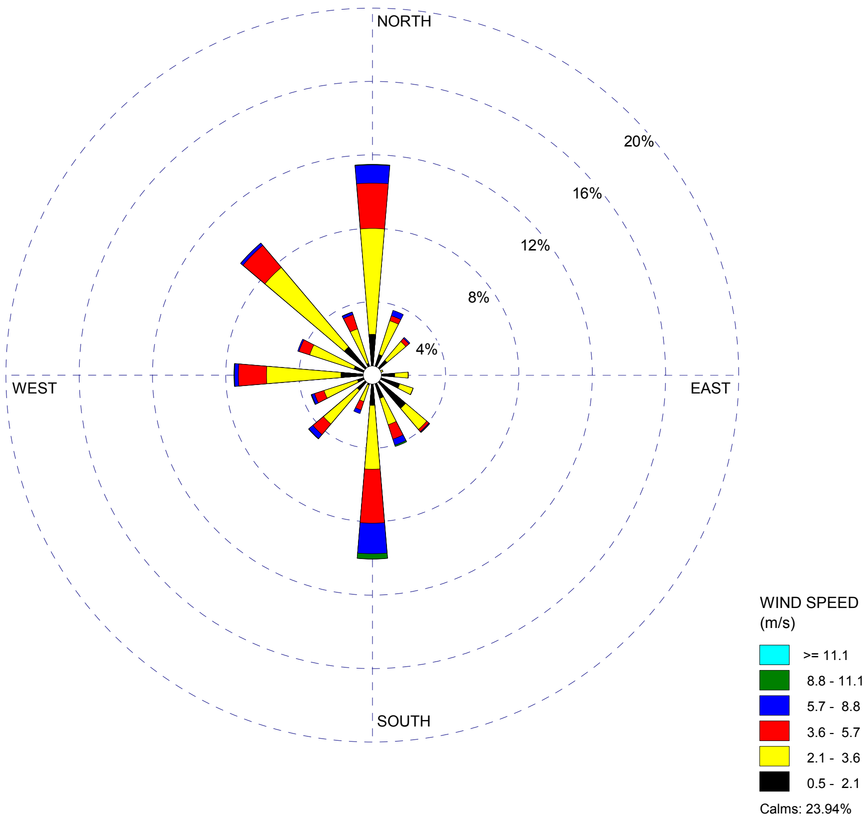
FIGURE 8.1B-6E 2005 ANNUAL WIND ROSE, WOODLEY ISLAND, CA

WIND ROSE PLOT:

Woodley Island, CA - 2005
January 1, 2005 through December 31, 2005

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2005** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **23.94%**	TOTAL COUNT: **8760 hrs.**	
	AVG. WIND SPEED: **2.09 m/s**	DATE: **7/14/2006**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

HBRP METEOROLOGICAL DATA : WOODLEY ISLAND NWS, 2001-2005
WIND FREQUENCY DISTRIBUTIONS

2001: ANNUAL

WIND SPEEDS AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	1753	190	402	321	112	178	116	60	40	3172
NNE	10	105	120	110	15	21	19	7	0	407
NE	11	89	89	35	7	4	1	0	0	236
ENE	6	41	26	9	0	0	0	0	0	82
E	13	112	59	7	2	0	0	0	0	193
ESE	20	130	63	12	2	0	0	0	0	227
SE	27	175	90	31	5	14	4	0	1	347
SSE	19	109	95	111	32	64	38	12	10	490
S	25	129	172	229	70	101	59	26	30	841
SSW	5	43	74	57	11	14	5	2	2	213
SW	10	73	98	74	10	28	8	2	2	305
WSW	7	87	91	63	16	19	5	1	2	291
W	12	98	140	103	26	23	5	1	0	408
WNW	3	90	130	115	15	5	1	2	0	361
NW	6	131	242	234	27	14	6	3	0	663
NNW	8	91	177	157	30	38	16	4	1	522
Sub-Total:	1935	1693	2068	1668	380	523	283	120	88	8758

Average Wind Speed: 2.30 m/s

2001: FIRST QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	444	49	58	56	27	44	49	31	16	774
NNE	3	27	26	30	4	4	5	3	0	102
NE	7	29	25	7	4	0	1	0	0	73
ENE	2	14	5	2	0	0	0	0	0	23
E	4	37	23	2	1	0	0	0	0	67
ESE	13	49	31	4	2	0	0	0	0	99
SE	11	62	29	12	5	8	3	0	1	131
SSE	11	42	29	43	17	26	13	2	3	186
S	13	34	48	74	36	37	27	4	2	275
SSW	3	7	15	10	3	3	1	1	0	43
SW	3	24	18	10	0	3	1	0	0	59
WSW	3	18	18	9	2	3	1	1	0	55
W	4	18	25	16	1	4	0	0	0	68
WNW	0	16	12	6	0	0	0	0	0	34
NW	3	22	20	14	2	1	0	0	0	62
NNW	5	21	28	33	3	9	8	2	0	109
Sub-Total:	529	469	410	328	107	142	109	44	22	2160

Average Wind Speed: 2.34 m/s

2001: SECOND QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	307	59	136	134	59	94	46	13	18	866
NNE	6	21	23	36	7	9	7	2	0	111
NE	0	11	12	6	1	1	0	0	0	31
ENE	2	11	3	3	0	0	0	0	0	19
E	5	18	7	0	1	0	0	0	0	31
ESE	1	21	5	4	0	0	0	0	0	31
SE	12	37	14	6	0	0	0	0	0	69
SSE	6	28	16	19	2	3	3	0	0	77
S	5	42	36	27	6	9	3	2	6	136
SSW	2	13	13	8	2	2	0	0	0	40
SW	6	10	24	18	5	9	4	1	0	77
WSW	3	27	16	21	8	10	1	0	1	87
W	6	30	38	26	10	9	4	0	0	123
WNW	3	19	39	38	12	2	0	0	0	113
NW	2	39	65	80	10	4	2	0	0	202
NNW	1	30	46	50	19	20	3	1	1	171
Sub-Total:	367	416	493	476	142	172	73	19	26	2184

Average Wind Speed: 2.55 m/s

2001: THIRD QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	489	47	158	89	12	13	1	0	0	809
NNE	0	20	46	35	3	0	2	0	0	106
NE	1	21	25	15	1	1	0	0	0	64
ENE	0	6	8	3	0	0	0	0	0	17
E	1	10	5	3	0	0	0	0	0	19
ESE	0	9	10	1	0	0	0	0	0	20
SE	1	13	15	1	0	0	0	0	0	30
SSE	0	15	17	3	0	0	0	0	0	35
S	1	18	49	33	4	2	1	0	0	108
SSW	0	4	21	17	1	1	1	0	0	45
SW	0	17	35	26	3	4	1	0	0	86
WSW	0	26	34	24	3	2	0	0	0	89
W	0	28	53	42	13	5	0	0	0	141
WNW	0	35	68	57	2	0	0	0	0	162
NW	0	40	128	123	14	4	0	0	0	309
NNW	0	26	74	59	4	1	3	1	0	168
Sub-Total:	493	335	746	531	60	33	9	1	0	2208

Average Wind Speed: 1.95 m/s

2001: FOURTH QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	513	35	50	42	14	27	20	16	6	723
NNE	1	37	25	9	1	8	5	2	0	88
NE	3	28	27	7	1	2	0	0	0	68
ENE	2	10	10	1	0	0	0	0	0	23
E	3	47	24	2	0	0	0	0	0	76
ESE	6	51	17	3	0	0	0	0	0	77
SE	3	63	32	12	0	6	1	0	0	117
SSE	2	24	33	46	13	35	22	10	7	192
S	6	35	39	95	24	53	28	20	22	322
SSW	0	19	25	22	5	8	3	1	2	85
SW	1	22	21	20	2	12	2	1	2	83
WSW	1	16	23	9	3	4	3	0	1	60
W	2	22	24	19	2	5	1	1	0	76
WNW	0	20	11	14	1	3	1	2	0	52
NW	1	30	29	17	1	5	4	3	0	90
NNW	2	14	29	15	4	8	2	0	0	74
Sub-Total:	546	473	419	333	71	176	92	56	40	2206

Average Wind Speed: 2.36 m/s

2002: ANNUAL

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	2332	172	358	310	70	113	95	20	16	3486
NNE	19	70	114	78	16	28	19	3	3	350
NE	19	73	72	28	3	5	3	1	0	204
ENE	5	28	15	1	0	0	1	0	0	50
E	29	65	33	7	2	0	0	0	0	136
ESE	15	101	43	3	0	1	2	0	0	165
SE	34	150	56	19	7	7	4	1	1	279
SSE	14	83	84	85	19	40	34	13	16	388
S	23	96	176	186	49	74	97	32	42	775
SSW	14	53	62	49	13	23	12	5	6	237
SW	18	90	97	81	19	22	16	2	4	349
WSW	16	71	124	85	21	15	8	4	1	345
W	17	94	176	122	16	18	3	0	2	448
WNW	18	85	141	113	5	6	2	2	1	373
NW	22	119	286	183	28	14	9	0	0	661
NNW	17	111	154	144	29	34	21	1	3	514
Sub-Total:	2612	1461	1991	1494	297	400	326	84	95	8760

Average Wind Speed: 2.09 m/s

2002: FIRST QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	590	32	47	63	12	31	33	5	10	823
NNE	2	15	26	29	4	9	7	0	2	94
NE	4	25	26	8	1	3	1	0	0	68
ENE	3	11	7	0	0	0	0	0	0	21
E	7	28	13	4	1	0	0	0	0	53
ESE	2	47	17	2	0	1	0	0	0	69
SE	9	70	27	6	1	2	2	1	0	118
SSE	2	21	36	34	8	18	19	5	4	147
S	5	32	66	80	20	28	41	9	5	286
SSW	1	16	7	11	3	12	6	2	1	59
SW	3	22	18	18	5	6	3	1	0	76
WSW	4	13	22	14	2	6	0	1	1	63
W	1	16	37	26	2	8	3	0	0	93
WNW	1	12	8	13	1	4	1	1	1	42
NW	3	15	38	19	9	6	3	0	0	93
NNW	1	12	11	14	7	5	2	0	3	55
Sub-Total:	638	387	406	341	76	139	121	25	27	2160

Average Wind Speed: 2.22 m/s

2002: SECOND QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	445	63	161	159	43	65	49	13	6	1004
NNE	5	17	37	30	7	11	7	3	1	118
NE	8	21	22	8	0	2	2	1	0	64
ENE	1	1	2	0	0	0	0	0	0	4
E	9	8	5	0	1	0	0	0	0	23
ESE	1	10	5	0	0	0	0	0	0	16
SE	12	10	4	1	0	0	0	0	0	27
SSE	3	8	10	6	4	3	2	0	0	36
S	8	11	20	16	3	3	3	1	1	66
SSW	5	8	12	11	3	2	1	0	1	43
SW	4	17	22	23	8	4	6	1	1	86
WSW	2	14	24	18	8	8	3	0	0	77
W	6	17	34	27	7	2	0	0	0	93
WNW	5	23	37	34	3	1	1	0	0	104
NW	10	33	79	75	9	3	5	0	0	214
NNW	6	33	56	73	12	16	12	1	0	209
Sub-Total:	530	294	530	481	108	120	91	20	10	2184

Average Wind Speed: 2.32 m/s

2002: THIRD QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	531	46	112	65	8	12	8	2	0	784
NNE	10	16	39	14	1	3	1	0	0	84
NE	4	10	12	8	2	0	0	0	0	36
ENE	1	10	1	0	0	0	1	0	0	13
E	7	8	4	0	0	0	0	0	0	19
ESE	4	6	2	0	0	0	0	0	0	12
SE	3	12	3	0	0	0	0	0	0	18
SSE	7	16	8	2	0	0	0	0	0	33
S	7	25	41	15	0	0	1	0	0	89
SSW	6	16	28	16	0	1	0	0	0	67
SW	8	36	43	28	4	4	0	0	0	123
WSW	6	31	49	36	10	1	1	1	0	135
W	6	42	74	53	6	6	0	0	0	187
WNW	6	38	62	56	0	0	0	0	0	162
NW	4	54	121	75	9	2	1	0	0	266
NNW	10	45	60	44	9	10	2	0	0	180
Sub-Total:	620	411	659	412	49	39	15	3	0	2208

Average Wind Speed: 1.77 m/s

2002: FOURTH QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	766	31	38	23	7	5	5	0	0	875
NNE	2	22	12	5	4	5	4	0	0	54
NE	3	17	12	4	0	0	0	0	0	36
ENE	0	6	5	1	0	0	0	0	0	12
E	6	21	11	3	0	0	0	0	0	41
ESE	8	38	19	1	0	0	2	0	0	68
SE	10	58	22	12	6	5	2	0	1	116
SSE	2	38	30	43	7	19	13	8	12	172
S	3	28	49	75	26	43	52	22	36	334
SSW	2	13	15	11	7	8	5	3	4	68
SW	3	15	14	12	2	8	7	0	3	64
WSW	4	13	29	17	1	0	4	2	0	70
W	4	19	31	16	1	2	0	0	2	75
WNW	6	12	34	10	1	1	0	1	0	65
NW	5	17	48	14	1	3	0	0	0	88
NNW	0	21	27	13	1	3	5	0	0	70
Sub-Total:	824	369	396	260	64	102	99	36	58	2208

Average Wind Speed: 2.04 m/s

2003: ANNUAL

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	2196	177	276	275	93	114	71	22	11	3235
NNE	7	106	113	67	18	18	13	2	2	346
NE	6	68	71	31	2	1	0	2	0	181
ENE	4	29	19	3	0	0	0	0	0	55
E	13	110	70	8	0	0	0	0	0	201
ESE	8	105	73	14	1	0	0	0	0	201
SE	27	184	99	32	9	10	2	3	0	366
SSE	10	110	114	108	31	33	22	7	13	448
S	18	149	212	271	56	112	72	27	32	949
SSW	3	29	65	51	14	10	8	3	1	184
SW	7	88	104	73	21	15	12	3	1	324
WSW	4	75	134	115	18	16	12	2	0	376
W	10	110	166	146	18	18	3	0	0	471
WNW	3	61	162	104	15	5	2	0	0	352
NW	5	105	197	176	31	15	6	0	1	536
NNW	9	112	169	152	38	29	22	4	0	535
Sub-Total:	2330	1618	2044	1626	365	396	245	75	61	8760

Average Wind Speed: 2.09 m/s

2003: FIRST QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	633	26	56	45	12	29	19	4	2	826
NNE	1	24	24	12	2	3	6	0	0	72
NE	2	16	18	8	0	0	0	2	0	46
ENE	3	9	5	2	0	0	0	0	0	19
E	8	29	16	2	0	0	0	0	0	55
ESE	3	43	19	10	0	0	0	0	0	75
SE	15	67	38	13	5	2	0	1	0	141
SSE	7	36	40	36	9	15	6	4	7	160
S	9	32	49	83	23	46	33	11	19	305
SSW	0	6	25	9	7	4	3	1	0	55
SW	2	20	20	18	2	7	4	1	0	74
WSW	1	11	29	23	1	4	2	2	0	73
W	0	20	24	24	2	3	2	0	0	75
WNW	1	6	23	16	3	1	1	0	0	51
NW	0	7	21	23	2	4	0	0	0	57
NNW	1	16	27	20	5	5	2	0	0	76
Sub-Total:	686	368	434	344	73	123	78	26	28	2160

Average Wind Speed: 2.08 m/s

2003: SECOND QUARTER
WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	413	65	111	121	41	44	23	14	5	837
NNE	3	30	29	21	10	10	6	2	2	113
NE	2	12	21	8	1	1	0	0	0	45
ENE	1	8	4	0	0	0	0	0	0	13
E	1	16	9	0	0	0	0	0	0	26
ESE	1	6	5	0	0	0	0	0	0	12
SE	7	22	5	3	0	4	0	0	0	41
SSE	2	20	24	36	8	10	5	1	0	106
S	4	39	50	59	12	22	7	3	0	196
SSW	0	5	11	3	5	3	3	0	0	30
SW	0	11	18	17	8	3	6	2	0	65
WSW	0	12	25	37	6	8	7	0	0	95
W	2	22	35	41	7	7	1	0	0	115
WNW	2	19	40	34	4	4	0	0	0	103
NW	0	32	53	52	17	5	3	0	0	162
NNW	3	39	70	65	19	15	12	2	0	225
Sub-Total:	441	358	510	497	138	136	73	24	7	2184

Average Wind Speed: 2.39 m/s

2003: THIRD QUARTER
WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	523	54	88	80	18	14	13	4	3	797
NNE	2	24	43	26	5	4	0	0	0	104
NE	0	14	19	9	1	0	0	0	0	43
ENE	0	6	5	1	0	0	0	0	0	12
E	0	24	9	1	0	0	0	0	0	34
ESE	1	13	10	0	0	0	0	0	0	24
SE	2	21	5	0	0	0	0	0	0	28
SSE	0	9	8	1	0	0	0	0	0	18
S	3	24	50	27	3	1	2	0	0	110
SSW	1	7	17	21	0	1	0	0	0	47
SW	4	30	44	29	7	2	1	0	0	117
WSW	3	28	46	41	7	2	0	0	0	127
W	6	56	68	58	7	3	0	0	0	198
WNW	0	22	77	43	8	0	1	0	0	151
NW	3	40	83	86	7	6	2	0	0	227
NNW	5	35	55	55	12	3	4	2	0	171
Sub-Total:	553	407	627	478	75	36	23	6	3	2208

Average Wind Speed: 1.92 m/s

2003: FOURTH QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	627	32	21	29	22	27	16	0	1	775
NNE	1	28	17	8	1	1	1	0	0	57
NE	2	26	13	6	0	0	0	0	0	47
ENE	0	6	5	0	0	0	0	0	0	11
E	4	41	36	5	0	0	0	0	0	86
ESE	3	43	39	4	1	0	0	0	0	90
SE	3	74	51	16	4	4	2	2	0	156
SSE	1	45	42	35	14	8	11	2	6	164
S	2	54	63	102	18	43	30	13	13	338
SSW	2	11	12	18	2	2	2	2	1	52
SW	1	27	22	9	4	3	1	0	1	68
WSW	0	24	34	14	4	2	3	0	0	81
W	2	12	39	23	2	5	0	0	0	83
WNW	0	14	22	11	0	0	0	0	0	47
NW	2	26	40	15	5	0	1	0	1	90
NNW	0	22	17	12	2	6	4	0	0	63
Sub-Total:	650	485	473	307	79	101	71	19	23	2208

Average Wind Speed: 1.99 m/s

2004: ANNUAL

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	2211	226	355	359	93	147	64	26	23	3504
NNE	11	113	122	78	14	14	10	7	1	370
NE	1	64	76	35	3	3	0	0	0	182
ENE	2	26	11	4	0	1	0	0	0	44
E	10	129	59	7	1	0	0	0	0	206
ESE	5	113	59	3	0	0	0	0	0	180
SE	10	173	80	31	2	10	9	1	3	319
SSE	4	89	70	69	10	30	25	15	6	318
S	7	108	176	224	51	112	80	29	23	810
SSW	4	34	46	49	6	14	10	2	2	167
SW	1	81	99	84	12	23	17	2	2	321
WSW	1	61	111	71	24	13	15	4	1	301
W	11	107	189	146	27	12	5	4	1	502
WNW	2	74	137	120	12	8	1	0	1	355
NW	6	161	260	223	42	47	11	0	0	750
NNW	12	88	130	159	37	19	8	1	1	455
Sub-Total:	2298	1647	1980	1662	334	453	255	91	64	8784

Average Wind Speed: 2.13 m/s

2004: FIRST QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	579	30	60	73	22	30	14	5	2	815
NNE	3	19	27	14	5	6	4	0	0	78
NE	0	17	24	12	2	2	0	0	0	57
ENE	0	8	5	1	0	1	0	0	0	15
E	3	38	22	4	0	0	0	0	0	67
ESE	1	39	23	0	0	0	0	0	0	63
SE	4	62	23	18	1	8	9	1	3	129
SSE	0	26	29	27	6	18	15	9	1	131
S	2	33	54	93	31	61	55	12	17	358
SSW	1	11	7	20	3	5	7	2	1	57
SW	1	10	18	20	2	4	3	0	0	58
WSW	1	18	19	16	3	5	2	1	0	65
W	0	13	29	18	11	1	4	3	1	80
WNW	0	8	21	13	1	1	1	0	0	45
NW	1	17	40	20	5	6	2	0	0	91
NNW	4	12	20	26	9	3	0	1	0	75
Sub-Total:	600	361	421	375	101	151	116	34	25	2184

Average Wind Speed: 2.34 m/s

2004: SECOND QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	387	76	158	150	46	60	23	4	3	907
NNE	1	30	37	33	5	3	3	2	0	114
NE	0	13	33	10	1	0	0	0	0	57
ENE	0	3	1	1	0	0	0	0	0	5
E	2	16	6	0	0	0	0	0	0	24
ESE	0	21	7	0	0	0	0	0	0	28
SE	0	24	6	2	0	0	0	0	0	32
SSE	1	8	8	14	1	2	2	0	2	38
S	1	13	24	32	6	20	8	2	3	109
SSW	0	5	11	8	1	3	0	0	0	28
SW	0	19	22	15	7	8	11	2	1	85
WSW	0	4	26	17	10	1	3	0	0	61
W	2	18	39	48	10	5	0	0	0	122
WNW	0	22	25	38	6	5	0	0	0	96
NW	2	57	81	91	27	26	7	0	0	291
NNW	3	32	39	78	16	14	5	0	0	187
Sub-Total:	399	361	523	537	136	147	62	10	9	2184

Average Wind Speed: 2.44 m/s

2004: THIRD QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	510	69	79	79	11	31	13	7	1	800
NNE	7	32	30	13	3	2	1	0	1	89
NE	1	13	13	7	0	0	0	0	0	34
ENE	1	4	3	0	0	0	0	0	0	8
E	5	17	8	0	1	0	0	0	0	31
ESE	1	10	2	0	0	0	0	0	0	13
SE	2	21	13	2	0	0	0	0	0	38
SSE	1	17	9	2	0	0	0	0	0	29
S	3	24	45	26	1	1	0	0	0	100
SSW	3	8	17	10	1	1	0	0	0	40
SW	0	33	39	31	2	3	2	0	0	110
WSW	0	22	42	25	8	6	7	0	0	110
W	9	49	79	60	6	4	1	0	0	208
WNW	2	29	68	52	5	2	0	0	0	158
NW	3	55	111	91	7	9	2	0	0	278
NNW	4	34	60	51	9	2	2	0	0	162
Sub-Total:	552	437	618	449	54	61	28	7	2	2208

Average Wind Speed: 1.90 m/s

2004: FOURTH QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	735	51	58	57	14	26	14	10	17	982
NNE	0	32	28	18	1	3	2	5	0	89
NE	0	21	6	6	0	1	0	0	0	34
ENE	1	11	2	2	0	0	0	0	0	16
E	0	58	23	3	0	0	0	0	0	84
ESE	3	43	27	3	0	0	0	0	0	76
SE	4	66	38	9	1	2	0	0	0	120
SSE	2	38	24	26	3	10	8	6	3	120
S	1	38	53	73	13	30	17	15	3	243
SSW	0	10	11	11	1	5	3	0	1	42
SW	0	19	20	18	1	8	1	0	1	68
WSW	0	17	24	13	3	1	3	3	1	65
W	0	27	42	20	0	2	0	1	0	92
WNW	0	15	23	17	0	0	0	0	1	56
NW	0	32	28	21	3	6	0	0	0	90
NNW	1	10	11	4	3	0	1	0	1	31
Sub-Total:	747	488	418	301	43	94	49	40	28	2208

Average Wind Speed: 1.83 m/s

2005: ANNUAL

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	2100	191	336	248	48	115	47	13	3	3101
NNE	1	102	121	59	4	19	9	9	0	324
NE	1	91	80	47	4	8	4	0	0	235
ENE	1	28	20	5	0	0	0	0	0	54
E	1	106	59	5	1	1	0	0	0	173
ESE	4	133	64	5	0	0	0	0	0	206
SE	4	204	116	23	4	3	2	1	2	359
SSE	7	110	92	57	28	33	14	9	8	358
S	3	142	194	185	75	138	79	35	26	877
SSW	1	49	60	35	16	17	10	4	1	193
SW	1	94	144	88	17	32	13	8	2	399
WSW	3	72	124	61	15	20	6	3	3	307
W	3	147	239	170	38	48	4	8	3	660
WNW	0	92	139	105	19	14	4	1	0	374
NW	3	172	331	231	41	35	10	0	1	824
NNW	0	59	120	77	23	26	7	2	2	316
Sub-Total:	2133	1792	2239	1401	333	509	209	93	51	8760

Average Wind Speed: 2.09 m/s

2005: FIRST QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	648	36	55	40	9	20	5	4	1	818
NNE	0	21	34	9	0	2	2	2	0	70
NE	0	27	22	7	2	0	0	0	0	58
ENE	0	15	7	4	0	0	0	0	0	26
E	1	32	20	3	0	0	0	0	0	56
ESE	0	57	33	2	0	0	0	0	0	92
SE	2	88	39	5	3	0	0	0	0	137
SSE	3	36	31	24	12	20	8	6	2	142
S	2	31	48	67	23	53	26	13	5	268
SSW	0	8	11	8	6	7	1	1	0	42
SW	1	13	22	19	5	9	1	3	1	74
WSW	2	17	28	5	3	1	3	0	0	59
W	0	26	26	14	7	4	0	2	1	80
WNW	0	16	19	19	8	3	1	0	0	66
NW	0	25	47	17	5	13	2	0	0	109
NNW	0	10	22	14	6	8	3	0	0	63
Sub-Total:	659	458	464	257	89	140	52	31	10	2160

Average Wind Speed: 1.94 m/s

2005: SECOND QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	373	40	89	99	20	68	33	8	2	732
NNE	0	23	34	20	1	8	6	7	0	99
NE	0	13	23	20	1	5	3	0	0	65
ENE	0	7	5	0	0	0	0	0	0	12
E	0	22	11	0	1	1	0	0	0	35
ESE	0	18	7	1	0	0	0	0	0	26
SE	0	24	22	8	0	1	0	0	0	55
SSE	0	20	20	13	3	3	2	1	2	64
S	0	24	49	45	14	23	16	4	2	177
SSW	0	10	11	11	3	1	3	1	0	40
SW	0	20	23	34	3	10	9	2	0	101
WSW	0	16	27	30	6	11	0	3	0	93
W	0	22	58	56	16	29	4	6	2	193
WNW	0	20	33	33	7	8	2	1	0	104
NW	0	50	95	107	19	12	5	0	0	288
NNW	0	9	31	33	10	9	4	2	2	100
Sub-Total:	373	338	538	510	104	189	87	35	10	2184

Average Wind Speed: 2.58 m/s

2005: THIRD QUARTER

WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	430	67	120	63	8	17	8	1	0	714
NNE	0	24	26	14	3	6	1	0	0	74
NE	0	23	17	9	0	3	0	0	0	52
ENE	0	3	2	0	0	0	0	0	0	5
E	0	10	3	0	0	0	0	0	0	13
ESE	1	7	3	0	0	0	0	0	0	11
SE	1	21	10	0	0	0	0	0	0	32
SSE	2	12	12	3	0	0	0	0	0	29
S	1	38	60	9	1	1	0	0	0	110
SSW	0	20	25	7	4	0	0	0	0	56
SW	0	41	72	23	3	2	0	0	0	141
WSW	1	26	54	20	4	1	0	0	0	106
W	2	72	114	89	12	12	0	0	0	301
WNW	0	35	63	43	4	3	0	0	0	148
NW	3	68	143	84	13	4	0	0	0	315
NNW	0	23	43	21	7	7	0	0	0	101
Sub-Total:	441	490	767	385	59	56	9	1	0	2208

Average Wind Speed: 1.88 m/s

2005: FOURTH QUARTER
WIND SPEED AT 10 METERS HEIGHT (m/s)

SECTOR	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	>=8	Total
N	649	48	72	46	11	10	1	0	0	837
NNE	1	34	27	16	0	3	0	0	0	81
NE	1	28	18	11	1	0	1	0	0	60
ENE	1	3	6	1	0	0	0	0	0	11
E	0	42	25	2	0	0	0	0	0	69
ESE	3	51	21	2	0	0	0	0	0	77
SE	1	71	45	10	1	2	2	1	2	135
SSE	2	42	29	17	13	10	4	2	4	123
S	0	49	37	64	37	61	37	18	19	322
SSW	1	11	13	9	3	9	6	2	1	55
SW	0	20	27	12	6	11	3	3	1	83
WSW	0	13	15	6	2	7	3	0	3	49
W	1	27	41	11	3	3	0	0	0	86
WNW	0	21	24	10	0	0	1	0	0	56
NW	0	29	46	23	4	6	3	0	1	112
NNW	0	17	24	9	0	2	0	0	0	52
Sub-Total:	660	506	470	249	81	124	61	26	31	2208

Average Wind Speed: 1.95 m/s

FIGURE 8.1B-7 BUILDING LAYOUT USED IN THE AIR QUALITY MODELING ANALYSIS

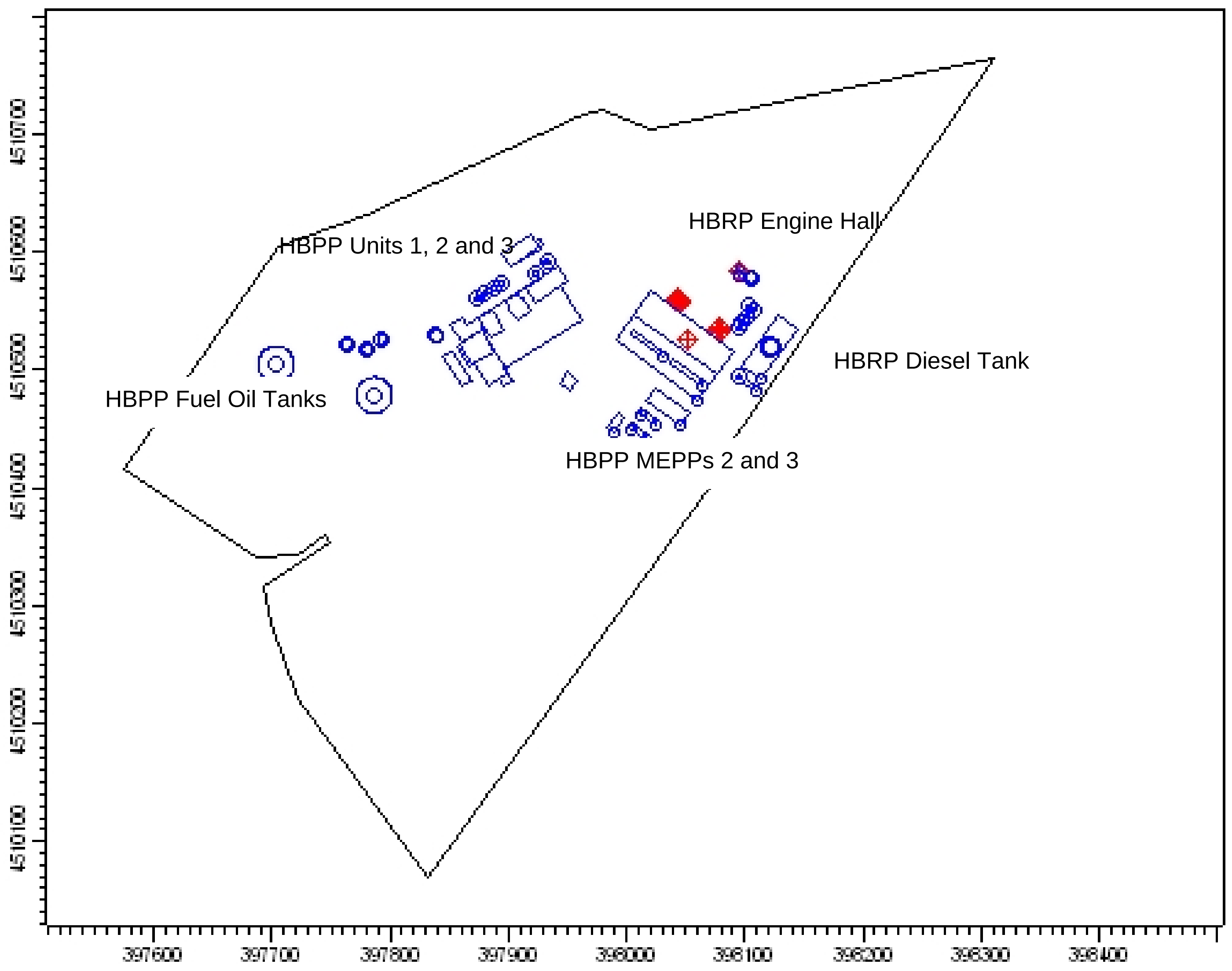


FIGURE 8.1B-8 AERMET SECTORS FOR SURFACE CHARACTERISTICS

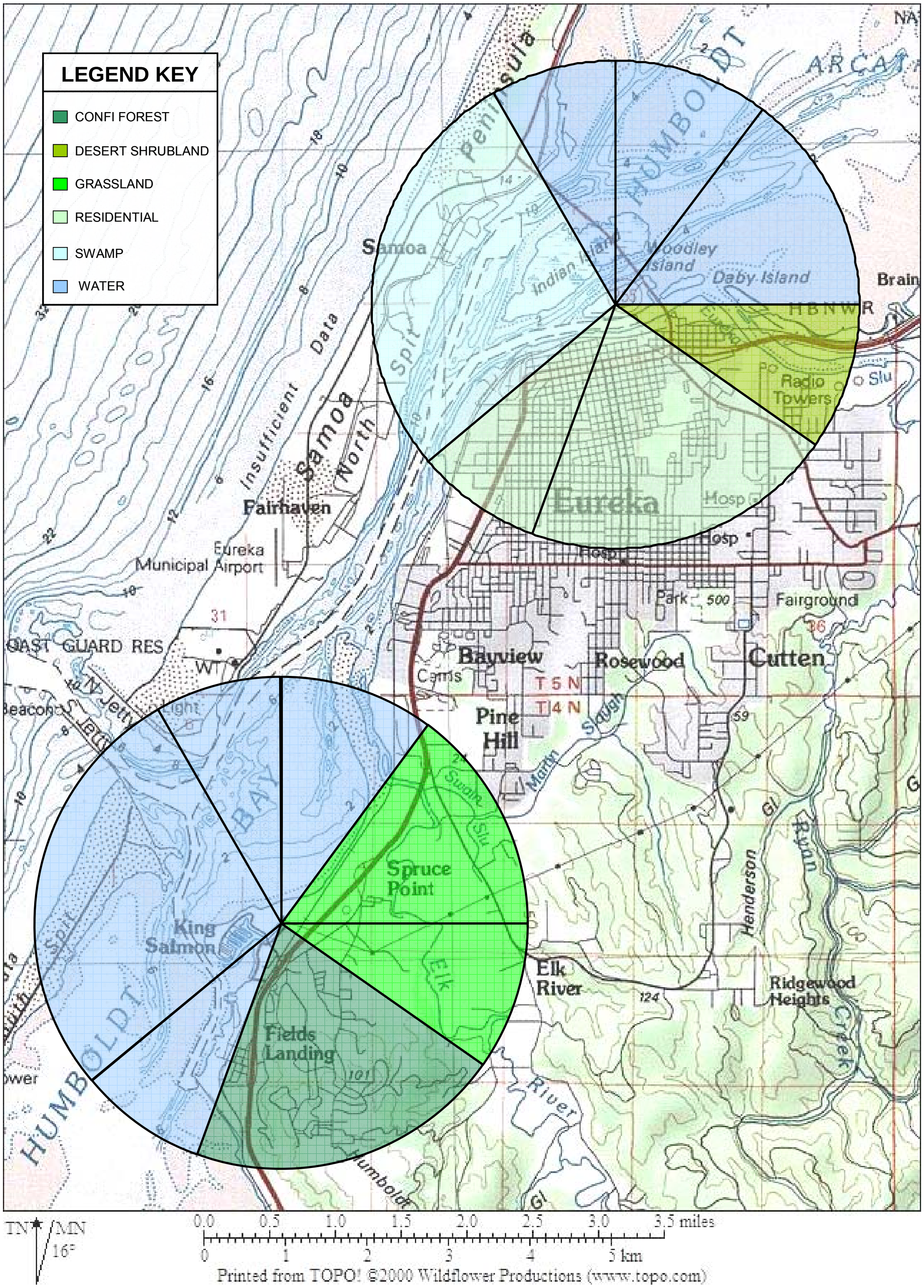


FIGURE 8.1B-9A FULL AERMOD RECEPTOR GRID

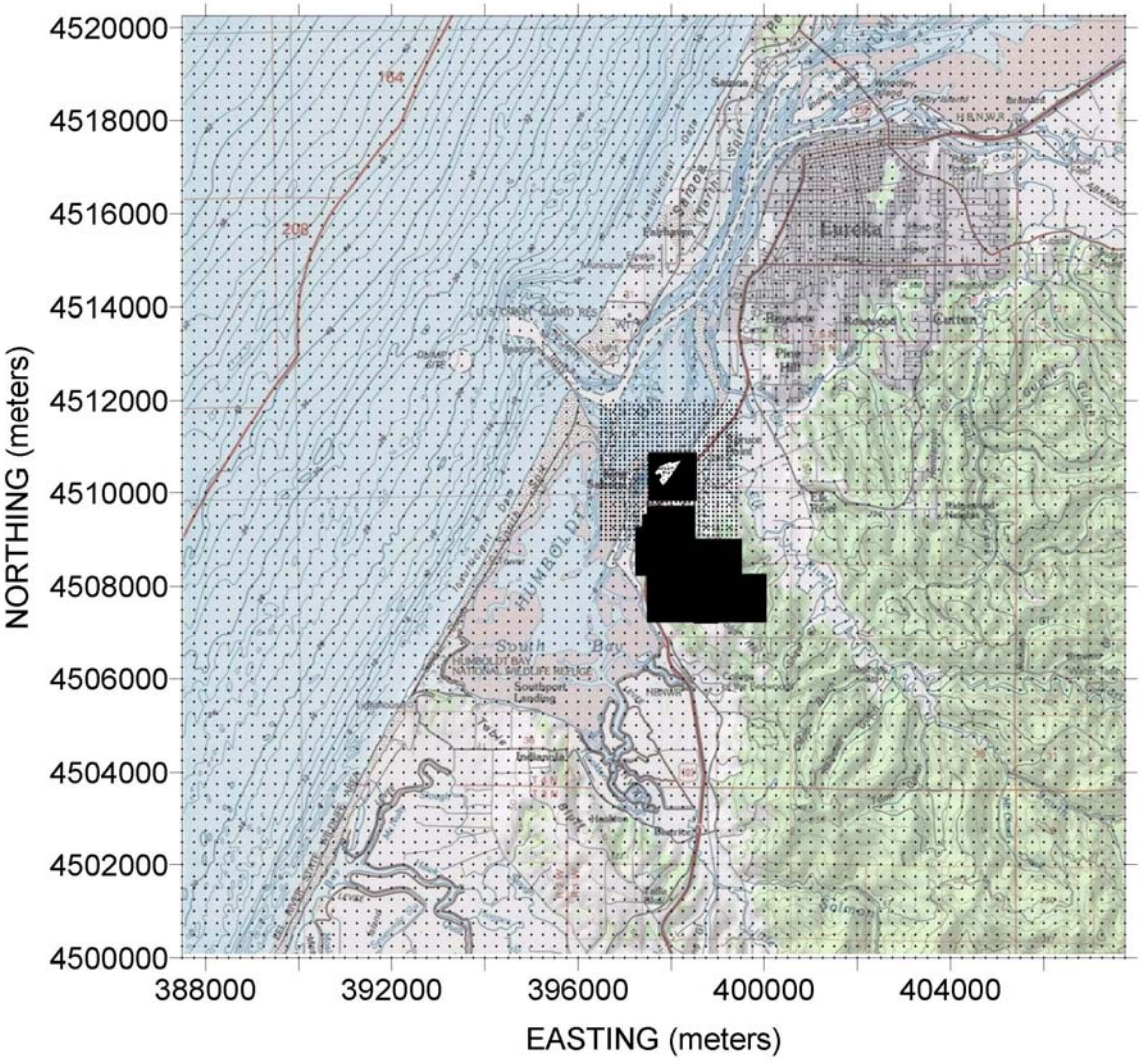


FIGURE 8.1B-9B AERMOD RECEPTOR GRID USED FOR MODELING FLAT TERRAIN (BELOW STACK TOP)

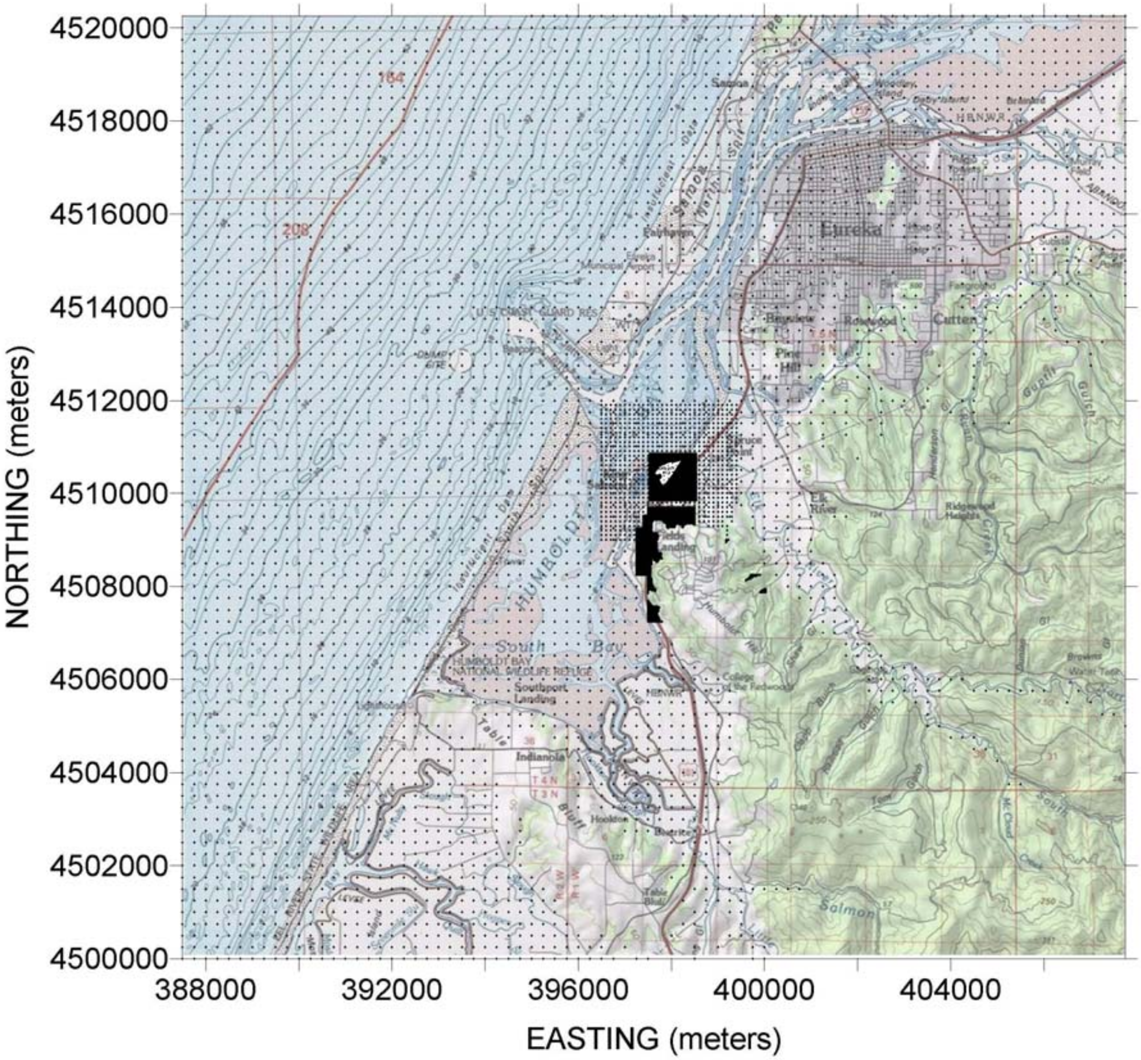


FIGURE 8.1B-9C RECEPTOR GRID FOR CTSCREEN MODELING

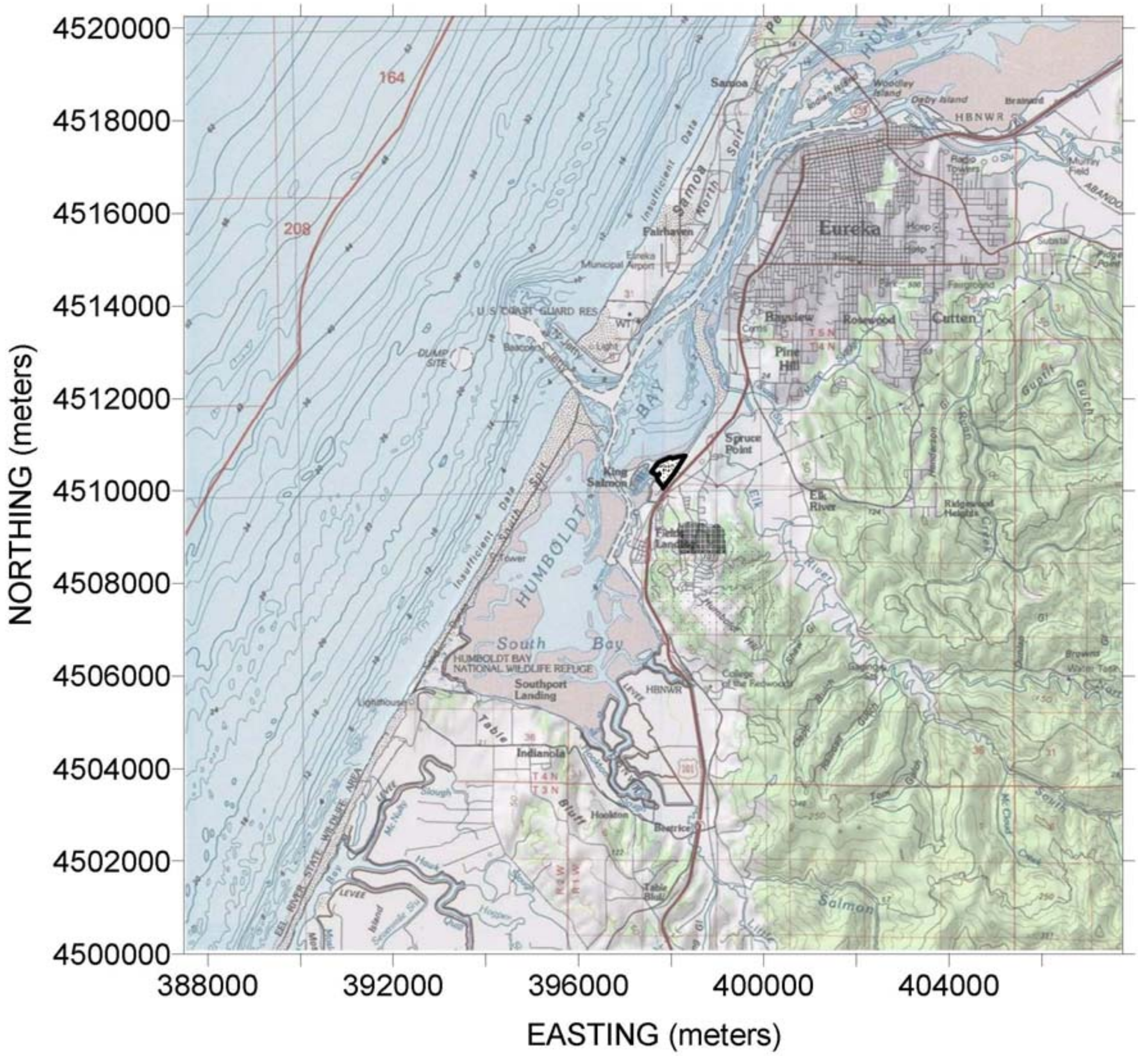
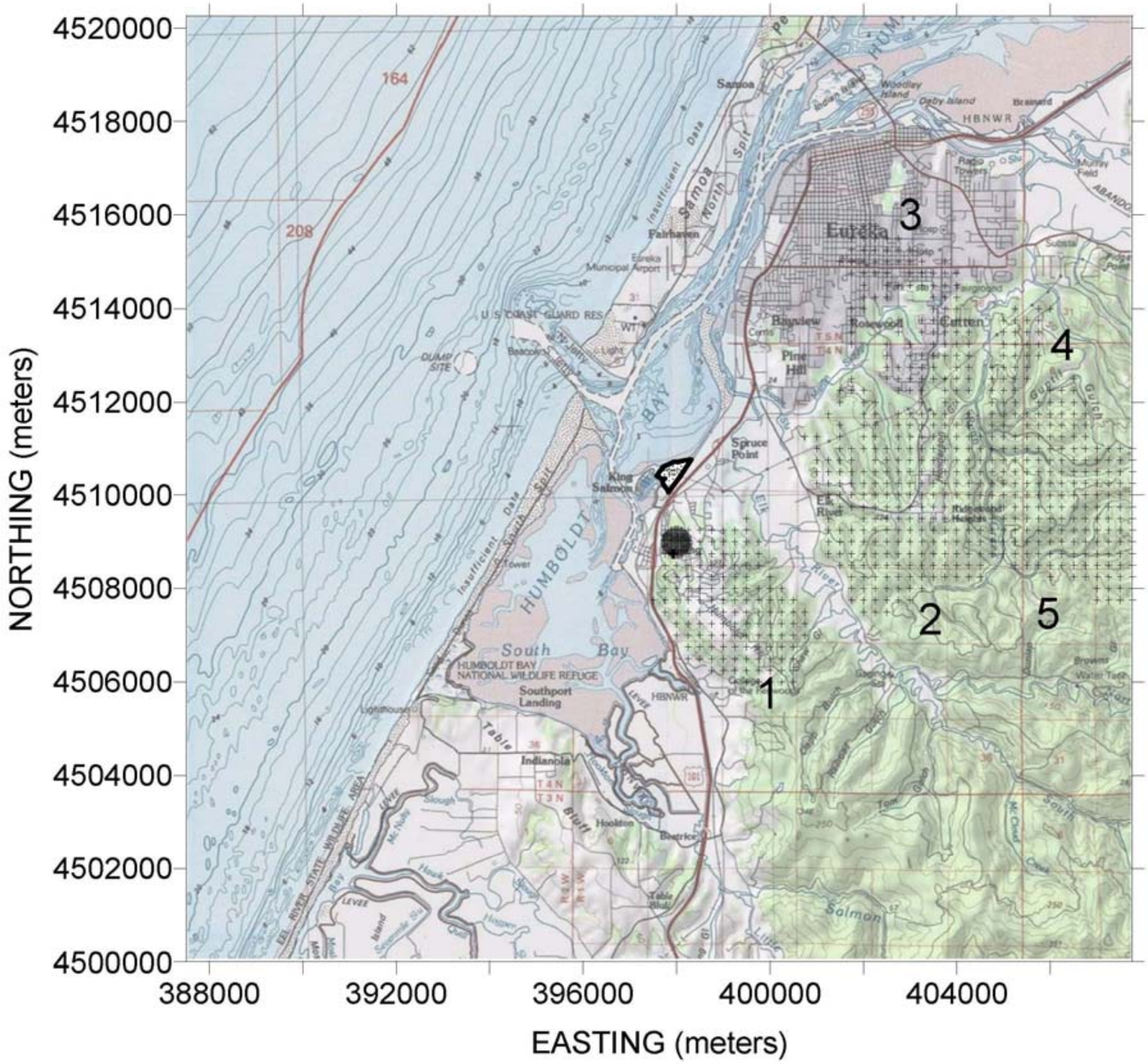


FIGURE 8.1B-9D RECEPTOR GRID FOR CTDMPLUS MODELING



Attachment 8.1B-1

Modeling Protocol

Humboldt Bay Power Plant Repowering Project
Modeling Protocol
Revised August 2007

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Pacific Gas and Electric Company (PG&E) has submitted an Application for Certification and an Application for Determination of Compliance for a repowering project at its Humboldt Bay Power Plant (HBPP) near Eureka. The proposed project will consist of installing ten Wartsila Model 18V50DF engine/generator sets to replace the existing boiler- and turbine-based fossil-fueled generating equipment. The project will also include radiative coolers for engine cooling and minor auxiliary equipment, and will have a total nominal net generating capacity of up to 163 MW. The proposed project will be a major modification under North Coast Unified Air Quality Management District (NCUAQMD or District) regulations.

The applicant has submitted air quality impact analyses to the District. After review of these analyses, the District has requested changes to the analytical protocol. The purpose of this document is to establish the procedure for meeting the District's air quality modeling requirements for the proposed project. Except as directed by the District, EPA modeling guidance[1] will be followed in preparing the ambient air quality impact analyses.

Net increases in emissions of some pollutants are expected to be above the significant increase thresholds for federal Prevention of Significant Deterioration (PSD) requirements (40 CFR 52.21). In accordance with District regulations, the modeling analyses to be prepared in accordance with this protocol will include a demonstration of compliance with many of the applicable PSD requirements.

This modeling protocol outlines the proposed use of air dispersion modeling techniques that will be used to assess impacts from the proposed sources, and has been prepared by Sierra Research on behalf of PG&E.

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

[1] U.S. Environmental Protection Agency (USEPA). "*Guideline on Air Quality Models*" (including supplements), 40 CFR Part 51 Appendix W, November 2005.

Air Quality Criteria	VOC [a]	NO_2	PM_{10}	$PM_{2.5}$	CO	SO_2
PSD Significant Impact Levels	√	√	√		√	√
PSD Monitoring Exemption Levels	√	√	√		√	√
Ambient Air Quality Standards (AAQS)	√	√	√	√[b]	√	√
Class I and Class II Visibility[c]		√	√			√
Impacts to Soils and Vegetation[c]		√	√			√
Class I Area Acid Deposition[c]		√	√			√

Notes:

a. VOC emissions are used as a surrogate for ozone impacts in the PSD review process; no ozone modeling will be carried out.

b. Although EPA guidance (71 FR 6727) provides that compliance with the federal $PM_{2.5}$ NAAQS should be evaluated using the PM_{10} NAAQS and not modeled directly, at the request of CARB compliance with both the federal 24-hour average AAQS and the state and federal annual average AAQS for $PM_{2.5}$ will be addressed based on $PM_{2.5}$ for non-PSD purposes.

c. The visibility, soils and vegetation and acid deposition analyses have been prepared and submitted to the Federal Land Managers (with a copy to the District) on February 2, 2007, in accordance with a protocol submitted to the FLMs in July 2006, and as modified to reflect the FLM's comments. No further revisions to the Class I impacts analysis protocol, or to the Class I impacts analysis, are proposed at this time.

PROJECT LOCATION

Ten new natural gas-fired reciprocating engine/generator sets and associated auxiliaries will be located just south of Eureka, on the site of the existing Humboldt Bay Power Plant. The UTM coordinates of the site are approximately 4,510.57 kilometers northing, 397.88 kilometers easting (NAD 27, Zone 10). The nominal site elevation is 1 meter above mean sea level. The area in the immediate vicinity of the project site is relatively flat with the western edge of the project area bordering on Humboldt Bay.

PROPOSED EMISSION SOURCES

The primary emission sources for the proposed project will be the Wärtsilä Model 18V50DF engine/generator sets. The reciprocating engines will be fired with natural gas and a small amount of ultra low-sulfur CARB Diesel fuel for pilot ignition; ultra low-sulfur CARB Diesel fuel will be used as a backup fuel in the event of a natural gas curtailment. The reciprocating engines will utilize advanced combustion designs and emission controls to limit emissions of NOx and CO. Emissions of PM_{10} and SO_2 will be kept to a minimum through efficient combustion practices and the exclusive use of clean-burning fuels.

Emissions from the new sources will be evaluated for a total of twelve operating conditions determined to represent the most likely potential operating modes for the plant. The 10 engines will be modeled as 10 individual point sources located at their specific physical locations, as shown in Figure 2.3-2 of the AFC. These twelve operating conditions and the specific stack parameters associated with engine operation in each mode are identified in Table 8.1B-3 of the AFC; this table is reproduced below.

HBRP Stack Parameters for Screening Modeling					
Engine Case	Load/ Ambient Temp	Stack Diam (m)	Stack Ht[a] (m)	Exhaust Temp (deg K)	Exhaust Velocity (m/s)
1G	full/87	1.620	22.860	663.556	27.152
2G	low/87	1.620	22.860	697.444	16.441
3G	mid/87	1.620	22.860	692.444	22.686
4G	mid/21	1.620	22.860	686.333	22.784
5G	full/21	1.620	22.860	656.889	27.651
6G	low/21	1.620	22.860	697.444	16.856
1D	full/87	1.620	22.860	635.222	30.806
2D	low/87	1.620	22.860	642.444	18.613
3D	mid/87	1.620	22.860	621.889	25.044
4D	mid/21	1.620	22.860	584.111	25.252
5D	full/21	1.620	22.860	597.444	31.037
6D	low/21	1.620	22.860	599.111	18.223

Notes:

a. The stack height may be revised from this level depending on initial modeling results. A final stack height will be established and will be identified in the modeling documentation; the final stack height must be established before the remainder of the revised modeling analysis can proceed.

Each of the twelve operating modes will be evaluated in sensitivity runs based on AERMOD and the 2001-05 meteorological data collected at the National Weather Service Woodley Island station (discussed in more detail in the following sections). As described in Section 8.1.2.6.3 of the AFC (Screening Procedures for the HBRP Reciprocating Engines), a screening procedure is used to determine which of the potential operating modes produces the maximum modeled impacts for each pollutant and averaging period.[2] The low-load operating cases (2G, 6G, 2D and 6D) will not be evaluated for 24-hour or annual average impacts, and the mid-load cases (3G, 4G, 3D, 4D) will not be evaluated for annual average impacts, because these operating cases are not expected to persist for more than a few hours at any time.

Impacts on 100% Diesel operation for all engines will be evaluated for 1-hour, 3-hour, 8-hour, and 24-hour average impacts, because the project permit will contain a condition prohibiting operation on 100% Diesel fuel for an entire year. Annual average impacts will be determined

[2] The results of the original screening modeling procedures are shown in Table 8.1B-4, Appendix 8.1B, of the AFC.

based on the proposed annual potential to emit for the project. PG&E will eliminate the separate calculation of maximum annual emissions for federal PSD and CEQA (as shown in the last section of Table 8.1-17 of the AFC) and accept annual plantwide emission limits based on the calculation of annual emissions for regulatory compliance (shown in Table 8.1-17 at the bottom of p. 8.1-30 of the AFC). These maximum annual emissions will be the basis for the annual average impact modeling.

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Based on the results of the screening procedure, the operating case that produces the highest modeled ambient concentration for each individual pollutant and averaging period will be used in the refined air quality impact analysis. The revised ambient air quality impact analysis that will be submitted in support of the revised modeling analysis will provide the results of the revised screening analysis, will identify the operating cases that produce the highest concentration for each pollutant and averaging period, and will provide the specific stack parameters (stack height, stack diameter, exhaust temperature and exhaust velocity) that will be used to evaluate compliance with applicable PSD increments and compliance with the AAQS for all applicable pollutants and averaging periods.

Compliance with the ambient air quality standards will be demonstrated in accordance with the procedure outlined in the October 1990 Draft PSD Workshop Manual (p. C.51, "The Compliance Demonstration"). The first step in the compliance demonstration is to determine, for each pollutant and averaging period, whether the proposed new equipment, HBRP, will cause a significant ambient impact anywhere. As indicated in the PSD workshop manual, "If the significant net emissions increase[3] from a proposed source would not result in a significant ambient impact anywhere, the application is usually not required to go beyond a preliminary analysis in order to make the necessary showing of compliance for a particular pollutant." The significance levels for air quality impacts are shown in the following table. If the maximum modeled impact for any pollutant and averaging period is below the appropriate significance level, no further analysis is necessary.

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Significance Levels for Air Quality Impacts in Class II Areas[a] ($\mu g/m^3$)					
	Averaging Period				
Pollutant	**Annual**	**24-hour**	**8-hour**	**3-hour**	**1-hour**
SO_2	1	5	--	25	--
PM_{10}	1	5	--	--	--
NOx	1	--	--	--	--
CO	--	--	500	--	2000
Note: a. From 40 CFR 51.165, shown as Table C-4 in the 1990 draft PSD Workshop Manual.					

3 Note that this guidance requires modeling only for pollutants for which there is a significant net increase. As the proposed project will result in significant net increases only for ROG and PM_{10} emissions, the PSD guidance would require an ambient air quality impact analysis only for PM_{10} (because Gaussian models are not suited to evaluating

If the modeled impacts from HBRP alone are above the PSD significance thresholds shown in the table above, the second step of the compliance demonstration is required to show that the proposed new source, in conjunction with existing sources, will not cause or contribute to a violation of any ambient air quality standard.[4] As discussed in more detail on page 12 of this protocol, the impacts of existing sources are represented by the existing ambient air quality data collected at Eureka (PM_{10} and $PM_{2.5}$), Willits and Ukiah (NO_2 and CO) and San Francisco (SO_2). In accordance with Section 8.2.1 of Appendix W to 40 CFR Part 51,

> "Background concentrations are an essential part of the total air quality concentration to be considered in determining source impacts. Background air quality includes pollutant concentrations due to: (1) Natural sources; (2) nearby sources other than the one(s) currently under consideration; and (3) unidentified sources. Typically, air quality data should be used to establish background concentrations in the vicinity of the source(s) under consideration."

Because ambient PM_{10} and $PM_{2.5}$ levels are the result of secondary pollutant formation as well as directly emitted particulate matter, it is appropriate to rely on the locally monitored air quality data for PM_{10} and $PM_{2.5}$ to represent background concentrations in the project area.

The impact of the proposed new equipment (HBRP) will modeled using the maximum allowable emission limits as proposed in the application and the design capacities of the engines, assuming continuous operation, in accordance with the guidance on Table 8-2 of Appendix W. If the predicted total ground level concentration obtained by adding the maximum impact of the proposed new equipment to the monitored background concentrations is below the state or federal ambient air quality standards for each pollutant and averaging period, no further analysis is required for that pollutant and averaging period.

The increments analysis will include changes in emissions from increment-consuming sources as discussed in the previously-submitted increments analysis. The only changes to the increments analysis that will be made for the revised submittal are: (1) the Wärtsilä engines at HBRP will be modeled as ten individual point sources rather than as two combined sources; (2) the modeled stack heights will reflect the final physical stack height selected for the project; and (3) the amount of increment consumed by the existing Humboldt Bay Power Plant will be adjusted to reflect the updated baseline emissions inventory submitted to the District in March 2007.

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impacts on ozone from individual sources). However, as required under the District NSR rule, this procedure will be used for the ambient air quality impact analyses for NO_2, SO_2, CO and $PM_{2.5}$ as well.

[4] Since the applicable EPA guidance does not define significance levels for $PM_{2.5}$ while the District requires that this analysis be performed, $PM_{2.5}$ impacts will be presumed to be above any applicable significance level regardless of the modeled concentration, and the second step of the process will be performed.

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¶
"For a NAAQS violation to which an applicant contributes significantly, a PSD permit may be granted only if sufficient emissions reductions are obtained to compensate for the adverse ambient impacts caused by the proposed source. ***Emissions reductions are considered to compensate for the proposed source's adverse impact when, at a minimum, (1) the modeled net concentration, resulting from the proposed emissions increase and the federally enforceable emissions reduction, is less than the applicable significant ambient impact level at each affected receptor,*** and (2) no new violations will occur." [emphasis added]¶
¶
In accordance with this guidance, only if the modeled impacts from the proposed new equipment, combined with existing background concentrations, are predicted to cause a new violation of a standard for which the District is currently in attainment will this netting procedure be used. The federally enforceable emissions reductions to be used in the netting procedure will occur from the shutdown of the existing Humboldt Bay Power Plant generating units, using the assumptions outlined below.¶
¶
The applicant proposes to use netting only to demonstrate compliance with state and federal ambient air quality standards and with the Class II increments, and not for the screening health risk assessment. The screening health risk assessment will compare the modeled risks of the proposed new HBRP with established significance criteria and will not consider the existing Humboldt ... [1]

EXISTING EMISSION SOURCES

The existing Humboldt Bay Power Plant (HBPP) consists of two dual-fuel steam boilers (Units 1 and 2), and two liquid-fueled mobile emergency power plants (MEPPs). The steam boilers are normally fired on natural gas, but can be fired on #6 fuel oil as well. Fuel oil firing of the steam boilers normally occurs during curtailment of natural gas supplies to the power plant. The MEPPs are always fired on distillate fuel,[5] and may be operated during natural gas curtailments, periods of high electrical demand, or when one of the steam boilers is undergoing maintenance.

For the 24-hour averaging PM_{10} increments analysis, the existing units will be modeled at loads consistent with the corresponding operation of the new units. For comparison with the new units when operated on gas, the steam boilers will be assumed to be operating on gas, while the MEPPs will operate on distillate fuel.[6] For comparison with the new units when operated on 100% Diesel fuel, the steam boilers will be assumed to be operated on #6 fuel oil, while the MEPPs will operate on Diesel fuel, consistent with a gas curtailment scenario as reflected in the updated baseline calculations provided to the District in March 2007.

The specific operating assumptions for the existing units that will be used to correspond to each of the reciprocating engine operating cases used in evaluating 24-hour average impacts are summarized in the following table.

Existing Unit Operating Assumptions					
HBRP Operating Cases			Assumed HBPP Operations		
Engine Cases	Engine Loads	Output, MW	Boiler Load	MEPP Load	Output, MW
1, 5	100%	163	2@100%	2@100%	135
3, 4	75%	122	2@88%	2@100%	122

For example, if the screening modeling analysis described in the preceding section indicates that Case 5G has the highest modeled 24-hour average PM_{10} impacts, then the 24-hour average PM_{10} impacts from the existing units will be modeled assuming full load operation of both boilers on natural gas and full load operation of both MEPPs on distillate fuel.

For annual average PM_{10} increments analysis, the average emission rates for the historical baseline period (4th quarter 2004 through 3rd quarter 2006) will be used to characterize the existing emission sources.

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[5] The MEPPs are not physically capable of burning natural gas.

[6] As discussed in Section 2.0 of the AFC, the steam boilers, Units 1 and 2, operate on either natural gas or fuel oil while the MEPPs operate only on distillate fuel.

EXISTING METEOROLOGICAL DATA

The project site is at a coastal location southwest of Eureka. There is no ongoing meteorological measurement program at Humboldt Bay Power Plant. Meteorological data were collected at the project site in the mid-1960s (1966-67), but these data are not available in hourly format as needed for modeling, and there are concerns regarding instrument sensitivity and data quality for data collected that long ago. While the data are not considered suitable for modeling, they can be used to create a wind rose to illustrate the prevailing wind speeds and directions at the site. The wind rose in Figure 1, which was developed from onsite data collected in 1966-67, indicates that on an annual basis, prevailing winds at the project site are from the north. The occurrence of high wind speeds (defined here as wind speeds greater than 9.5 m/s) is low. Calm conditions are not observed in this meteorological data set.

Deleted: COMBINED IMPACTS FROM NEW AND EXISTING EMISSION SOURCES¶
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Since the new generating units will result in the shutdown of the existing emission sources, the project's impacts are represented by the net change in concentrations associated with the increase from the new sources and the decrease from the shutdown of the existing sources. To determine the net air quality impact associated with the project for comparison with the state and federal ambient air quality standards as outlined under the third step in the compliance demonstration (discussed above), the emissions from both the new and existing sources will be modeled as positive values using separate source groups.[7] The net impacts from the new HBRP units and the shutdown of the existing generating units will be evaluated on an receptor by receptor, hour by hour basis so that the change in ambient impact due to the replacement of the existing generating units is properly accounted for (per the reference to "each affected receptor" in the PSD Workbook guidance). An electronic file containing period-by-period, receptor-by-receptor impacts[8] will be created for each source group. These impacts will be mathematically combined, with the impacts of the existing sources subtracted from the impacts of the new sources, to determine the net impacts. These net impacts will then be aggregated to obtain annual average net impacts. This net impact analysis will be thoroughly documented and will include identification of models used, discussion of operational assumptions, emission rates and stack parameters for all sources, and sample calculations.¶
¶
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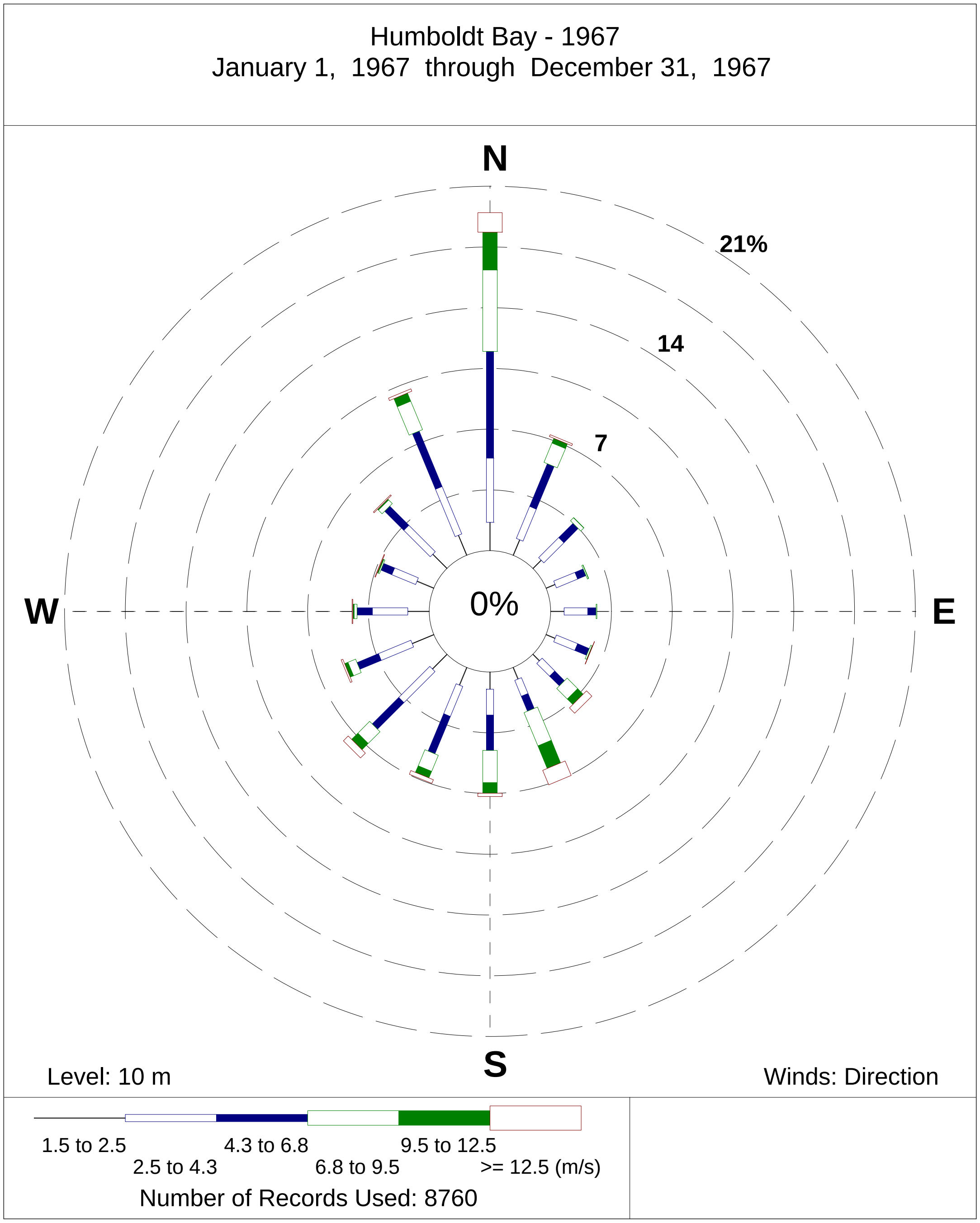
Figure 1
Wind Speeds and Directions Recorded at Humboldt Bay Power Plant



Surface meteorological measurements are made by the National Weather Service (NWS) at Woodley Island. As requested by the District, PG&E will use five years of the surface meteorological data measured at NWS Woodley Island during the period 2001 through 2005 to represent meteorological conditions at HBRP. The Woodley Island monitoring site is about 6 miles northeast of the project site. NWS collects cloud cover readings only during daylight hours at the Woodley Island monitoring site; consistent with the recommendations of the NCUAQMD staff, stability during nighttime hours was determined using data from Arcata airport, about 17 miles north of the project site. Because the Arcata airport is in a similar coastal location, atmospheric stability there is expected to be representative of stability at both the power plant and Woodley Island monitoring sites.

The Woodley Island meteorological data were available only in paper form. Sierra Research contracted with Trinity Consultants to transcribe the data to electronic format, perform quality assurance reviews on the transcription, fill in missing data using EPA-approved procedures (including the Arcata night-time stability data), and create the model-ready meteorological data set. All intermediate work products are available for review by the regulatory agencies.

There is no nearby location where satisfactory upper air data are gathered for the purpose of determining mixing heights and other surface boundary layer parameters. The nearest NWS sounding station is Medford, Oregon, which is 185 km (115 miles) away. That location is inland, and not characteristic of either the meteorological data or project sites. Although the NWS station at Oakland Airport is farther from the site than Medford (378 km, or 235 miles away), it is in a comparable coastal location to the project site, so the upper air data collected there are representative of upper air conditions at the project site. For ISCST3 modeling purposes seasonally-averaged twice-daily mixing heights from Holzworth (1972) might suffice, but for AERMOD, that approach cannot be used. Thus, Oakland sounding data will be used for determining mixing heights and other surface boundary layer parameters.

The preceding discussion has focused on meteorological data needed to run AERMOD. As discussed in a later section, an additional model, CTDMPLUS, may be used in lieu of CTSCREEN for receptors in the terrain above stack-top height that is in close proximity to the south-southeast of the project. CTDMPLUS is an EPA-approved air dispersion model, and is fully supported with user guidance documentation.[9]

CTDMPLUS requires an extensive suite of meteorological data composed not only of wind speed, direction, and temperature, but also horizontal and vertical wind direction standard deviations (sigma theta and sigma phi, respectively) as well as vertical wind speed standard deviation (sigma w). The data set directed by the NCUAQMD for use in modeling the project, derived from measurements taken at Woodley Island, does not include these non-standard measurements.

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9 USEPA. Technology Transfer Network, Support Center for Regulatory Atmospheric Modeling, http://www.epa.gov/scram001/dispersion_prefrec.htm#ctdmplus.

It is possible to develop conservative values for these standard deviation parameters that are consistent with the available meteorological data and use them to prepare a meteorological data set that is usable in CTDMPLUS and yields conservative (i.e., high) ground-level concentrations.

As directed by the NCUAQMD, air quality impact analyses for the project will be based on five years of surface meteorological data measured at the Woodley Island monitoring station. These data were used to produce two processed meteorological data sets: one for AERMET/AERMOD and one for ISCST3[10]. All three of these Gaussian dispersion models, ISCST3, AERMOD and CTDMPLUS, require upper air data as well as surface data. The upper air data will come from Oakland International Airport as discussed earlier.

The following meteorological parameters are needed for CTDMPLUS and can be taken directly from the AERMET files:

- Observed mixing height, provided as the height of the convective or planetary boundary layer (PBL)
- Calculated mixing height, provided as the height of the mechanical, or surface, boundary layer (SBL)
- friction velocity (USTAR)
- Monin-Obukhov length (L), and
- roughness length (Z_O).

The remaining standard deviations (sigma values) are not available from AERMOD and must be obtained from the ISCST3 files. Stability classes determined by MPRM[11] or PCRAMMET[12] from the measured Woodley Island meteorological data will be used to select the most conservative values from the following ranges recommended in EPA's Meteorological Monitoring Guidance document:[13]

Stability Category	Sigma Phi (σ_Φ)/ Regulatory Range (degrees)	Sigma Theta (σ_θ)/ Regulatory Range (degrees)
A	11.5	22.5
B	10.0 – 11.5	17.5 – 22.5
C	7.8 – 10.0	12.5 – 17.5
D	5.0 – 7.8	7.5 – 12.5
E	2.4 – 5.0	3.8 – 7.5
F	< 2.4	< 3.8

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10 The ISCST3 met data set will be used to create a complete CTDMPLUS met data set; see below.

11 The Meteorological Processor for Regulatory Models

12 EPA meteorological preprocessor

13 Tables 6-8a and 6-9a in Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005, US EPA Office of Air and Radiation, Office of Air Quality Planning and Standards, February, 2000.

The most conservative values (that is, the values that produce the highest modeled impacts) for sigma theta and sigma phi within each range will be determined by conducting a sensitivity analysis for all combinations of stack conditions to be modeled using CTDMPLUS and receptor locations for which CTDMPLUS will be used (that is, receptors above stack height). The sensitivity analysis will use the upper and lower values of each range for each stability category. For example, for stability category D, four combinations will be evaluated as follows:

σ_Φ	σ_θ
5.0	7.5
5.0	12.5
7.8	7.5
7.8	12.5

For stability category A, maximum values for σ_Φ and σ_θ of 15.0 and 27.0, respectively, will be evaluated. For stability category F, minimum values for σ_Φ and σ_θ of 1.0 and 2.0, respectively, will be evaluated.

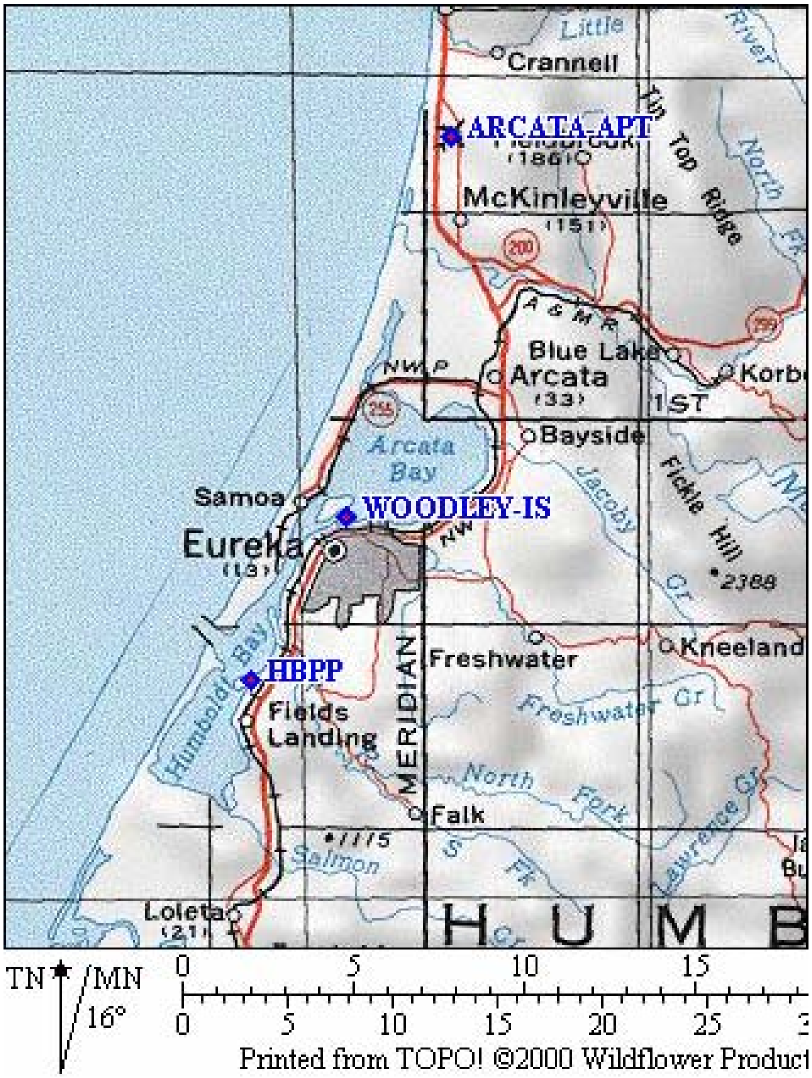
Sigma-w is estimated by multiplying sigma-phi (after conversion from degrees to radians) by the horizontal wind speed.

The relative locations of project site and monitoring stations for meteorological data are presented in Figure 2.

SITE REPRESENTATION – METEOROLOGICAL DATA

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

Figure 2
HBPP Site Location, with Meteorological Data Sites Indicated



This requirement and USEPA's guidance on the use of on-site monitoring data are also outlined in the "*On-Site Meteorological Program Guidance for Regulatory Modeling Applications*" (1987). The representativeness of the data depends on (a) the proximity of the meteorological monitoring site to the area under consideration, (b) the complexity of the topography of the area, (c) the exposure of the meteorological sensors, and (d) the period of time during which the data are collected. As discussed below, either Woodley Island or Arcata Airport meteorological data are representative of conditions at the project site.

Representativeness has been defined in the PSD Monitoring Guideline[14] as data that characterize the air quality for the general area in which the proposed project would be constructed and operated. Because of the reasonably close proximity of the meteorological data sites to the proposed project site (distance between the project site and the two monitoring locations is less than 20 miles), the same large-scale topographic features that influence the meteorological data monitoring stations also influence the proposed project site in the same manner.

The Humboldt Bay Power Plant lies along the southeastern shore of Humboldt Bay, about 6.5 km (4.0 miles) south-southwest of downtown Eureka, near the mouth of the Elk River. A 600-foot-tall ridge along the western edge of the Elk River Valley, called Humboldt Hill, terminates less than 1 km south-southeast of the power plant, and for dispersion purposes, constitutes the most significant terrain obstacle. Other ridges and terrain features, running north-south, parallel to the coast, and constituting the eastern edge of the Elk River Valley, lie 4 km inland.

Nighttime drainage winds pouring down the Elk River and across the southern part of Humboldt Bay are likely to occur, much as drainage winds are observed at the Arcata Airport (Figure 3) and Woodley Island[15]. Such winds are not observed for the onsite wind rose. The occurrence of drainage winds in a particular meteorological set depends on the nature of the immediate terrain. Given the lay of the land, it is likely that such winds occur at the project site.

The general topography at Woodley Island and Arcata Airport is flat, similar to the project site, and the regional topography involving the coastline and hills/mountains is similar for the three areas as well. The intervening area between the Arcata Airport, the Woodley Island site and the project site is a relatively flat plain that lies adjacent to the water's edge in the Humboldt Bay and the Pacific Ocean. Based on proximity and these regional topographic factors, winds measured at Woodley Island are considered by the NCUAQMD staff to be representative of winds at the project site. Based on these same factors, the applicant believes that the Arcata Airport meteorological data would also be representative of winds at the project site.

Terrain height and distance to terrain are also similar at the three locations, although Humboldt Hill is nearer to the project site than higher terrain is to the other two sites. Since the axis of Humboldt Hill points straight at the Humboldt Bay Power Plant, however, it is unlikely that the hill affects the distribution of wind speeds and directions at the project site.

The HBPP project site is also a coastal location, likely with similar daytime wind speeds as at Woodley Island and Arcata airport. Thus, it is our assessment that the wind direction and wind speed data collected at the Woodley Island and Arcata Airport meteorological monitoring stations are similar to the dispersion conditions at the HBRP project site and to the regional area. Thus, the Woodley Island and Arcata Airport meteorological data sets satisfy the definition of representative data.

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14 USEPA, 1987. Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-87-007, May 1987.

15 Wind roses for Woodley Island are presented in the AFC, Appendix 8.1.B, Figures 8.1B-2A through 8.1B-6D.

Representativeness has also been defined in the "*Workshop on the Representativeness of Meteorological Observations*" (Nappo et. al., 1982) as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application." Judgments of representativeness should be made only when sites are climatologically similar, as the project site, the Woodley Island site and the Arcata Airport site clearly are.

EXISTING AMBIENT AIR QUALITY DATA

All ambient air quality data will be taken from the EPA AIRS and AQS databases.[16]

Background ambient air quality data for project area PM_{10} and $PM_{2.5}$ are available for Eureka for 2006 and years prior. For these pollutants, the following readings during the period 2001-2006 will be used to represent project background.

- For PM_{10}, the highest 24-hour average and annual average values between 2004 and 2006 will be used to represent project background.

- For $PM_{2.5}$, contemporaneous (with the meteorological data) 24-hour average concentrations during the period 2001 through 2004[17] will be used to represent project background concentrations. Since $PM_{2.5}$ measurements are taken on a once-in-six-day basis, each $PM_{2.5}$ measurement will be presumed to represent the day of measurement and each of the five subsequent days. Missing data will be filled in by interpolation using data from the data immediately preceding and following the missing data point. These day-specific project background data will be combined with contemporaneous modeled project impacts to evaluate compliance with the $PM_{2.5}$ AAQS for non-PSD purposes. The highest three-year average of the combined project plus background 98^{th} percentile 24-hour average concentrations will be used to evaluate compliance with the 24-hour average $PM_{2.5}$ AAQS for non-PSD purposes. The highest three-year average of the combined project plus background annual average concentrations will be used to evaluate compliance with the annual average $PM_{2.5}$ AAQS for non-PSD purposes.

The nearest monitoring sites that collect ambient O_3, NO_2, and CO data are at Willits and Ukiah, which are located about 100 and 125 miles south-southwest of the project site, respectively. Ambient data collected at Willits and Ukiah are expected to conservatively overestimate existing concentrations of gaseous pollutants at the project. Although the cities themselves have lower populations than Eureka, they are located along State Highway 101 in a more heavily traveled

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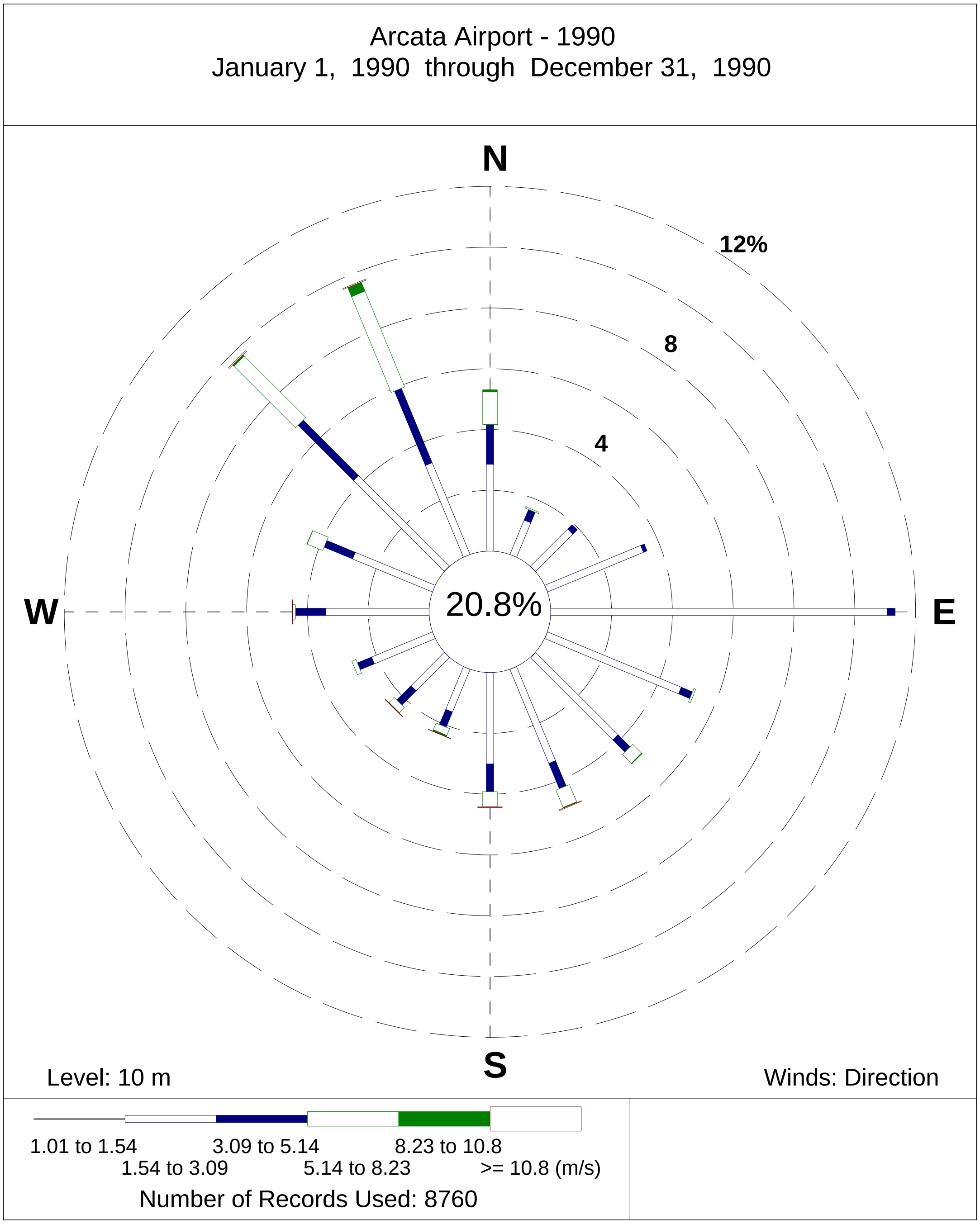
16 http://www.epa.gov/air/data/index.html and http://www.epa.gov/ttn/airs/airsaqs/detaildata/downloadaqsdata.htm

17 No monitored $PM_{2.5}$ concentrations are available for the Eureka monitoring station between June 27 and November 27, 2005. Because of this large amount of missing data, 2005 will not be included in the evaluation of $PM_{2.5}$ impacts.

corridor than the Eureka corridor. For each of these three pollutants and the appropriate averaging periods, the highest of the readings at Willits and Ukiah during the period 2004-2006 will be used.

SO_2 was monitored at Ukiah through 1993 and at Willits only during 1994. The nearest coastal monitoring station providing current SO_2 ambient data is at San Francisco. Because the San Francisco area is much more urbanized than the project area, current SO_2 levels in San Francisco are expected to be much higher than existing ambient levels in Eureka. The highest monitored concentrations at either the Willits or Ukiah stations during the three-year period 1992-1994 or current concentrations (2004-2006) at San Francisco will be used to represent background SO_2 concentrations in the project area.

Figure 3
Wind Speeds and Directions at Arcata Airport



AIR QUALITY DISPERSION MODELS

Overview

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

- Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME, Version 95086);
- American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) model, also known as AERMOD (Version 070206);
- SCREEN3 (Version 96043);
- CTSCREEN (Version 94111);
- CTDMPLUS (Version 93228); and
- CALPUFF (Version 5.711a).

These models, along with options for their use and how they are used, are discussed below.

Simple and Complex Terrain Receptors

For all receptors in simple and complex terrain, modeling will be performed using AERMOD. The stacks will be represented as ten individual stacks, using the stack parameters listed on page 3 of this protocol.

The guideline model AERMOD will be used with hourly meteorological data from the Woodley Island monitoring station, processed as described above. USEPA adopted AERMOD as a guideline model on November 9, 2005. The AERMOD model is a steady-state, multiple-source, Gaussian dispersion model that is appropriate for sources located in rural or urban areas and receptors located in simple or complex terrain. AERMOD accounts for building wake effects (i.e., plume downwash) based on the PRIME building downwash algorithms..[18] The AERMOD model requires hourly meteorological data consisting of wind direction and speed (vector with reference height), temperature (with reference height), Monin-Obukhov length, surface roughness length, heights of the mechanically and convectively generated boundary layers, surface friction velocity, convective velocity scale, and vertical potential temperature gradient in the 500-meter layer above the planetary boundary layer. The model assumes that there is no variability in meteorological parameters over a one-hour time period, hence the term "steady-state." The AERMOD model allows input of multiple sources and source groupings, eliminating

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[18] AERMOD was adopted as a guideline model by USEPA as a replacement for ISCST3. AERMOD incorporates an improved downwash algorithm as compared to ISCST3 (Federal Register, November 9, 2005; Volume 70, Number 216, Pages 68218-68261).

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the need for multiple model runs. Complex phenomena such as building-induced plume downwash are treated in this model.

Standard AERMOD control parameters will be used (stack tip downwash, non-screening mode, non-flat terrain, sequential meteorological data check employed). Stack-tip downwash, which adjusts the effective stack height downward following the methods of Briggs (1972) for cases where the stack exit velocity is less than 1.5 times the wind speed at stack top, will be selected per USEPA guidance.

Two AERMET preprocessors (Stages 1 and 2, and Stage 3) are used to prepare meteorological data for use in AERMOD. In accordance with USEPA guidance for rural sources using rural NWS data,[19] surface roughness characteristics are input for wind direction sectors in the vicinity of the monitoring station at Stage 3 of the meteorological data preparation. Source site values were used for albedo and Bowen ratio. In defining sectors for surface characteristics, USEPA (2000) suggests that a user specify a sector no smaller than a 30-degree arc. The expected wind direction variability over the course of an hour, as well as the encroachment of characteristics from the adjacent sectors with travel time, makes it hard to preserve the identity of a narrow (i.e., < 30 degrees) sector's characteristics. Use of a weighted-average[20] of characteristics by surface area within a 30-degree (or wider) sector makes it possible to have a unique portion of the surface significantly influence the properties of the sector that it occupies.

The length of the upwind fetch for defining the nature of the turbulent characteristics of the atmosphere at the source location has been defined as 3 kilometers in Irwin (1978) and in USEPA's *Guideline on Air Quality Models*[21] for the purpose of defining land-use characteristics.

For the HBPP facility, at least two wind direction sectors are evident: one sector for winds from the Humboldt Bay and the Pacific, and a second wind sector for directions from the land. Thus, at least two wind direction sectors will be employed; more will be used if appropriate. Given the general lack of seasonality at this California coastal location, site characteristics will be varied only seasonally, not monthly.

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19 USEPS, "AERMOD Implementation Guide," September 27, 2005. http://www.epa.gov/scram001/7thconf/aermod.

20 Weighting will be based on wind direction frequency, such as determined from a wind rose.

21 Published as Appendix W to 40 CFR Part 51 (as revised).

Refined Analysis of Impacts at Receptors Above Stack Top

The CTSCREEN, CTDMPLUS and/or CALPUFF models will be used for a more refined evaluation of project impacts on elevated terrain. AERMOD depends on a simplified representation of terrain to establish the location of a dividing streamline with respect to terrain. Pollutants below the dividing streamline are blown around a terrain obstacle, and pollutants above are blown over the obstacle. CTSCREEN and CTDMPLUS process terrain in a more sophisticated way to establish where the dividing streamline should be placed for a given source and will provide a more realistic assessment of plume impaction on elevated terrain.

> If the modeling application involves a well defined hill or ridge and a detailed dispersion analysis of the spatial pattern of plume impacts is of interest, CTDMPLUS, listed in Appendix A, is available. CTDMPLUS provides greater resolution of concentrations about the contour of the hill feature than does AERMOD through a different plume-terrain interaction algorithm.[22]

In the event CTSCREEN is used for a more refined evaluation of $PM_{2.5}$ impacts, the highest second-high (H2H) value[23] will be combined with the highest three-year average 98th percentile background concentration for the period 2001-2004[24] to determine compliance with the $PM_{2.5}$ AAQS for non-PSD purposes. For determining compliance with the annual average $PM_{2.5}$ AAQS for non-PSD purposes, the highest modeled annual average concentration will be combined with the highest three-year average annual average background concentration for the period 2001-2004.

In the event CTDMPLUS is used for a more refined evaluation of $PM_{2.5}$ impacts, day-specific project background data (determined as described above) will be combined with modeled project impacts to evaluate compliance with the $PM_{2.5}$ AAQS for non-PSD purposes. The highest three-year average of the combined project plus background 98th percentile 24-hour average concentrations will be used to evaluate compliance with the 24-hour average $PM_{2.5}$ AAQS for non-PSD purposes. The highest three-year average of the combined project plus background annual average concentrations will be used to evaluate compliance with the annual average $PM_{2.5}$ AAQS for non-PSD purposes.

CALPUFF is a multi-layer, multi-species non-steady-state puff dispersion modeling system that simulates the effects of time- and space-varying meteorological conditions on pollutant transport, transformation, and removal. The CALPUFF modeling system is one of the two USEPA

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22 40 CFR Part 51, Appendix W, Section 4.2.2 (Refined Analytical Techniques).

23 CTSCREEN generates HSH values for 3-hour and 24-hour averaging periods. "Users Guide to CTDMPLUS: Volume 2: The Screening Mode (CTSCREEN), p. 2-6. Available at http://www.epa.gov/scram001/userg/screen/ctscreen.pdf

24 As discussed above, 2005 will not be used because of the multi-month period of missing $PM_{2.5}$ data.

preferred/recommended air dispersion models[25] (AERMOD being the other). CALPUFF is intended for use on scales from tens of meters from a source to hundreds of kilometers. CALPUFF is the only preferred model available for evaluating the effects of chemical transformation on directly emitted pollutants. Because recent studies suggest that secondary particulate matter may account for over half of total ambient $PM_{2.5}$ nationwide, $PM_{2.5}$ modeling should take into account not only the fine particles emitted directly by stationary sources but also the various precursors, emitted by certain sources, which result in secondarily formed fine particles through chemical reactions in the atmosphere.[26] Therefore, a complete and valid assessment of the impact of the proposed project on $PM_{2.5}$ concentrations would account for the effects not only of directly emitted $PM_{2.5}$, but also of $PM_{2.5}$ that is formed as a result of NOx and SO_2 emissions. The large reductions in NOx and SO_2 emissions that will result from shutting down the existing Humboldt Bay Power Plant generating units will provide a reduction in fine particulate precursors sufficient to completely offset the increase in PM emissions from the project at a ratio of 3.58 pounds of NOx to 1 pound of PM_{10}.[27] The CALPUFF model may allow the evaluation of the impacts of NOx and SO_2 emissions reductions on modeled $PM_{2.5}$ levels.

As a refined technique, CALPUFF may be used to simulate the air dispersion between the HBRP and the near-field terrain to the south-southeast. In accordance with EPA guidance in Appendix W,[28] CALPUFF will be run using the single station surface and upper air meteorological data in AERMOD data file format. The meteorological data set used for the AERMOD modeling, which is based on the Woodley Island 2001-2005 surface data and concurrent Oakland upper air data, will be used. This will help to maintain consistency between the meteorological data used in the two modeling analyses. CALPUFF has the ability to simulate chemical reactions in the plume puffs as well as following the path of each puff.

Ambient Ratio Method and Ozone Limiting Method

Annual NO_2 concentrations will be calculated using the Ambient Ratio Method (ARM), adopted in Supplement C to the Guideline on Air Quality Models (USEPA, 1995). The Guideline allows a nationwide default of 75% for the conversion of nitric oxide (NO) to NO_2 on an annual basis and the calculation of NO_2/NOx ratios.

If NO_2 concentrations need to be examined in more detail, the Plume Volume Molar Ratio Method

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25 USEPA, Technology Transfer Network, Support Center for Regulatory Atmospheric Modeling, Air Quality Models, Dispersion Modeling, Preferred/Recommended Models, http://www.epa.gov/scram001/dispersion_prefrec.htm#calpuff, accessed May 19, 2007.

26 Memo from John S. Seitz, Director, Office of Air Quality Planning & Standards, to EPA Regional Directors, New Source Review staff and others, dated October 21, 1997.

27 The applicant proposed an interpollutant offset ratio for NOx to PM_{10} of 2.54, based on an analysis of available ambient data. The ARB staff reviewed additional ambient data and concluded that a more appropriate ratio was 3.58 to 1.

28 40 CFR Part 51, Appendix W, op cit., Appendix A, Section A.4.b, Meteorological Data 2.

(PVMRM)[29,30,31] will be used. Hourly ozone data collected at the Ukiah or Willits monitoring station during the years 2001-2005 will be used in conjunction with PVMRM to calculate hourly NO_2 concentrations from hourly NOx concentrations. The PVMRM involves an initial comparison of the estimated maximum NOx concentration and the ambient O_3 concentration to determine which is the limiting factor to NO_2 formation. If the O_3 concentration is greater than the maximum NOx concentration and if the amount of O_3 in the plume is sufficient, total conversion is assumed. If the NOx concentration is greater than the O_3 concentration, the formation of NO_2 is limited by the ambient O_3 available in the plume. In this case, the NO_2 concentration is set equal to the O_3 concentration plus a correction factor that accounts for in-stack and near-stack thermal conversion within the plume.

Since 1998, the similar Ozone Limiting Method (OLM) has been implemented using the ISCST3-OLM model.[32] The OLM compared the concentrations of NOx and O_3 as described above for PVMRM, but did not limit the conversion to NO_2 by the total amount of O_3 available in the plume. AERMOD PVMRM is now available as a second, non-regulatory option. For this project, AERMOD PVMRM will be used to calculate the NO_2 concentration based on the PVMRM method and hourly ozone data. Missing hourly ozone data will be substituted prior to use with day-appropriate values (e.g., from the previous day, or the next day, for the same hour). Any other missing hourly ozone data (if any) will be substituted with 40 ppb ozone (typical ozone tropospheric background level).

Fumigation

The SCREEN3 model will be used to evaluate inversion breakup and shoreline fumigation impacts for short-term averaging periods (24 hours or less), as appropriate. The methodology in USEPA, 1992 (Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised) will be followed for these analyses. Combined impacts for all sources under fumigation conditions will be evaluated, based on USEPA modeling guidelines.

Screening Level Health Risk Assessment

Consistent with ARB guidance, the screening level health risk assessment will be performed based on an assessment of annual average operations reflecting the maximum 50 hours per year of Diesel operation allowable under the Stationary Diesel Engine Air Toxics Control Measure, with the balance of the year's operations reflecting the combustion of natural gas. The screening level

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29 Hanrahan, P.L., 1999a. "The plume volume molar ratio method for determining NO2/NOx ratios in modeling. Part I: Methodology," J. Air & Waste Manage. Assoc., 49, 1324-1331.

30 Cimorelli, A. J., S. G. Perry, A. Venkatram, J. C. Weil, R. J. Paine, R. B. Wilson, R. F. Lee, W. D. Peters, R. W. Brode, and J. O. Paumier, 2004: AERMOD: Description of Model Formulation. EPA 454/R-03-004. U. S. Environmental Protection Agency, Research Triangle Park, NC.

31 USEPA. Addendum – AERMOD: Model Formulation Document (see previous footnote).

32 Cole, Henry and John Summerhays, "A Review of Techniques Available for Estimating Short-Term NO2 Concentrations," Journal of the Air Pollution Control Association, pp. 812-817, August 1979·

approach accounts for the four following pathways: inhalation, dermal absorption, and soil and mother's milk ingestion.

GOOD ENGINEERING PRACTICE (GEP) STACK HEIGHT AND DOWNWASH

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

RECEPTOR SELECTION

Receptor and source base elevations will be determined from USGS Digital Elevation Model (DEM) data using the 7½-minute format (10- to 30-meter spacing between grid nodes). All coordinates will be referenced to UTM North American Datum 1983 (NAD83), Zone 10. The AERMOD receptor elevations will be interpolated among the DEM nodes according to standard AERMAP procedure. For determining concentrations in elevated terrain, the AERMAP terrain preprocessor receptor-output (ROU) file option will be chosen; hills will not be imported into AERMOD for CTDM-like processing.

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. A 250-meter resolution coarse receptor grid will be developed and will extend outwards at least 10 km (or more as necessary to calculate the significant impact area).

For the full impact analyses, a nested grid will be developed to fully represent the maximum impact area(s). The near-field receptor grid will have 25-meter resolution along the facility fence-line in a single tier of receptors composed of four segments extending out to the distances shown in Figure 4. Beyond the near-field receptor grid, receptors will be placed with 100-meter resolution from the boundary of the near-field receptor grid out to a distance of 1,000 meters from the fenceline, with 250-meter spacing beyond 1000 meters. When maximum first-high or maximum second-high impacts (or, for $PM_{2.5}$, maximum 98^{th} percentile impacts) occur in the 250-meter spaced area, additional refined receptor grids with 25-meter resolution will be placed around the maximum coarse grid impacts and extended out 1,000 meters in all directions. Concentrations within the facility fenceline will not be calculated.

The following 7.5 minute USGS Digital Elevation Model (DEM) quadrangles will be employed for modeling the HBPP Facility:

- Eureka;
- Cannibal Island;
- Fields Landing;
- McWhinney Creek; and
- Arcata South.

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Attachment 8.1B-2

Results of the CTDMPLUS Sensitivity Analysis

August 3, 2007

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Memo to: Rick Martin, Air Pollution Control Officer
North Coast Unified Air Pollution Control District

From: Gary Rubenstein

Subject: Results of CTDMPLUS Input Parameter Sensitivity Analysis
Humboldt Bay Repowering Project

In the May 2007 version of the modeling protocol prepared for the Humboldt Bay Repowering Project (HBRP), we proposed a procedure for deriving sigma values for CTDMPLUS, as follows:

> *CTDMPLUS requires an extensive suite of meteorological data composed not only of wind speed, direction, and temperature, but also horizontal and vertical wind direction standard deviations (sigma theta and sigma phi, respectively) as well as vertical wind speed standard deviation (sigma w). The data set directed by the NCUAQMD for use in modeling the project, derived from measurements taken at Woodley Island, does not include these non-standard measurements.*
>
> *It is possible to reasonably infer conservative (i.e., smallest) values for these standard deviation parameters that are consistent with the available meteorological data, to prepare a meteorological data set usable in CTDMPLUS, yet are also likely to yield conservative (i.e., high) ground-level concentrations.*

The protocol stated, "Small values for the standard deviation parameters decrease modeled dispersion and, hence, increase predicted concentrations."

In June 11, 2007, comments on this portion of the protocol, the staff of the California Air Resources Board (ARB) stated the following:

> *We disagree with the applicant's proposal. Small values for sigma theta and sigma phi do not always infer conservative impacts. In certain situations for tall stacks, a larger value for these standard deviations will disperse the emissions over a larger vertical plane and bring the emissions down to the ground causing higher impacts when compared to smaller values. Therefore, we recommend that the applicant conduct a sensitivity analysis for all combinations of stack conditions and receptor locations to determine the appropriate conservative value for sigma theta and sigma phi.*

In accordance with ARB's recommendations, and as discussed in the July 2007 revised protocol, we conducted a sensitivity analysis to determine the appropriate conservative values for sigma theta and sigma phi. For the sensitivity analysis, we looked at the five hills surrounding the project site (shown in the attached figure) and evaluated stack parameters for the eight operating cases (full load and part load, gas and liquid fuel operation) used for 24-hour average impacts. Four different combinations of the standard deviation parameters were used for each analysis:

- Bottom of both sigma theta and sigma phi ranges;
- Bottom of sigma theta range; top of sigma phi range;
- Top of sigma theta range; bottom of sigma phi range; and
- Top of both sigma theta and sigma phi ranges.

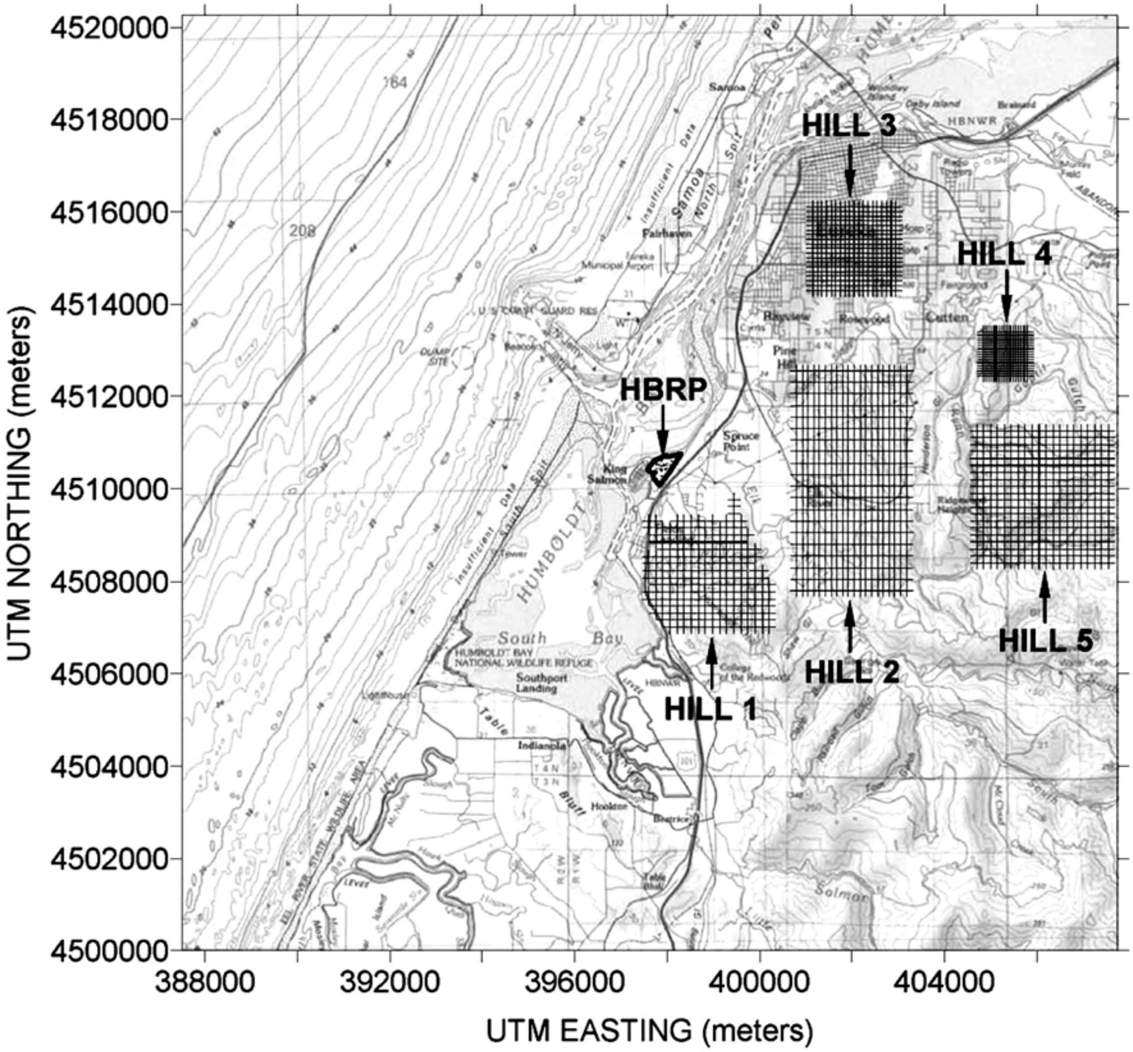
The results of the sensitivity analysis are summarized in the attached table. These results show that while other combinations of parameters sometimes produce higher intermediate results, the project maxima are always associated with the lowest values for the two dispersion parameters, as we had indicated in our initial protocol.

Based on these results, we propose to use the lowest values for the two dispersion parameters in the final CTDMPLUS modeling analysis for the HBRP. If you would like to evaluate our modeling results in more detail, we will provide the modeling files and a more detailed summary of the modeling results.

If you have any questions regarding this proposal, please do not hesitate to call.

Attachments

Receptors Evaluated in CTDMPLUS Sensitivity Analysis



Summary of Sensitivity Analysis Results
CTDMPLUS Input Parameters for HBRP

Case 4D	Max 24-hour average PM10, All Years Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**57.80**	**15.83**	2.34	**6.65**	8.77	**57.80**
Bottom of sigma theta range; top of sigma phi range	53.29	15.63	**2.73**	6.64	7.82	53.29
Top of sigma theta range; bottom of sigma phi range	46.04	15.58	1.74	6.39	**8.79**	46.04
Top of both sigma theta and sigma phi ranges	44.16	15.38	2.02	6.30	7.78	44.16
Maximum	57.80	15.83	2.73	6.65	8.79	57.80

Case 3D	Max 24-hour average PM10, All Years Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**56.01**	**15.27**	2.28	6.41	8.60	**56.01**
Bottom of sigma theta range; top of sigma phi range	51.87	15.14	**2.65**	**6.45**	7.74	51.87
Top of sigma theta range; bottom of sigma phi range	44.78	15.00	1.67	6.16	**8.63**	44.78
Top of both sigma theta and sigma phi ranges	43.27	14.87	1.97	6.12	7.66	43.27
Maximum	56.01	15.27	2.65	6.45	8.63	56.01

Case 4G	Max 24-hour average PM10, All Years Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**25.75**	**7.03**	1.04	2.95	3.92	**25.75**
Bottom of sigma theta range; top of sigma phi range	23.80	6.96	**1.22**	**2.96**	3.53	23.80
Top of sigma theta range; bottom of sigma phi range	20.50	6.91	0.77	2.83	**3.94**	20.50
Top of both sigma theta and sigma phi ranges	19.79	6.84	0.90	2.81	3.49	19.79
Maximum	25.75	7.03	1.22	2.96	3.94	25.75

Case 3G	Max 24-hour average PM10, All Years Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**25.70**	**7.02**	1.04	2.94	3.92	**25.70**
Bottom of sigma theta range; top of sigma phi range	23.76	6.95	**1.21**	**2.96**	3.53	23.76
Top of sigma theta range; bottom of sigma phi range	20.47	6.90	0.77	2.83	**3.94**	20.47
Top of both sigma theta and sigma phi ranges	19.77	6.83	0.90	2.80	3.49	19.77
Maximum	25.70	7.02	1.21	2.96	3.94	25.70

Case 1G	Max 24-hour average PM10, All Years Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**23.11**	6.23	0.95	2.61	**3.77**	**23.11**
Bottom of sigma theta range; top of sigma phi range	21.68	**6.23**	**1.11**	**2.69**	3.37	21.68
Top of sigma theta range; bottom of sigma phi range	18.90	6.09	0.68	2.52	3.75	18.90
Top of both sigma theta and sigma phi ranges	18.33	6.09	0.82	2.55	3.35	18.33
Maximum	23.11	6.23	1.11	2.69	3.77	23.11

Case5G	Max 24-hour average PM10, All Years Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**22.92**	6.17	0.94	2.59	**3.76**	**22.92**
Bottom of sigma theta range; top of sigma phi range	21.53	**6.18**	**1.10**	**2.67**	3.36	21.53
Top of sigma theta range; bottom of sigma phi range	18.78	6.03	0.67	2.49	3.74	18.78
Top of both sigma theta and sigma phi ranges	18.22	6.04	0.81	2.54	3.34	18.22
Maximum	22.92	6.18	1.10	2.67	3.76	22.92

Summary of Sensitivity Analysis Results
CTDMPLUS Input Parameters for HBRP

	Max 24-hour average PM10, All Years					
Case 1D	Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**47.29**	12.61	2.01	5.33	**8.02**	**47.29**
Bottom of sigma theta range; top of sigma phi range	44.80	**12.72**	**2.30**	**5.57**	7.18	44.80
Top of sigma theta range; bottom of sigma phi range	41.77	12.32	1.37	5.13	7.98	41.77
Top of both sigma theta and sigma phi ranges	39.16	12.41	1.71	5.28	7.15	39.16
Maximum	47.29	12.72	2.30	5.57	8.02	47.29

	Max 24-hour average PM10, All Years					
Case 5D	Hill 1	Hill 2	Hill 3	Hill 4	Hill 5	Max
Bottom of both sigma theta and sigma phi ranges	**49.04**	13.14	2.03	5.54	**8.18**	**49.04**
Bottom of sigma theta range; top of sigma phi range	46.25	**13.20**	**2.37**	**5.75**	7.30	46.25
Top of sigma theta range; bottom of sigma phi range	41.47	12.85	1.43	5.33	8.14	41.47
Top of both sigma theta and sigma phi ranges	39.32	12.90	1.76	5.45	7.28	39.32
Maximum	49.04	13.20	2.37	5.75	8.18	49.04

APPENDIX 8.1C

Screening Health Risk Assessment

APPENDIX 8.1C

Screening Health Risk Assessment

The screening level health risk assessment has been prepared using CARB's Hotspots Analysis and Reporting Program (HARP) computer program (Version 1.2a, August 26, 2005) and associated guidance in the OEHHA's *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (August 2003). The HARP model was used to assess cancer risk as well as chronic and acute risk impacts. The following paragraphs describe the procedures used to prepare this risk assessment.

Modeling Inputs

The risk assessment module of the HARP model was run using unit ground level impacts to obtain derived cancer risks for each toxic chemical of interest.[1] Cancer risks were obtained for the derived (OEHHA) method, the derived (adjusted) method, average point estimate and high-end point estimate options. The HARP model output was cancer risk by pollutant and route for each type of analysis, based on an exposure of 1.0 μg/m^3. HARP model output showing the unit values is included as Attachment 8.1C-1. Individual cancer risks are expressed in units of risk per μg/m^3 of exposure. To calculate the weighted risk for each source, the annual average emission rate in g/s for each pollutant was multiplied by the individual cancer risk for that pollutant in (μg/m^3)$^{-1}$. The resulting weighted cancer risks for each pollutant were then summed for the source. An identical approach was used to determine the acute and chronic health impacts associated with the proposed project. Details of the calculations of risk "rates" for modeling are shown in Tables 8.1C-2 through 8.1C-5.

Risk Analysis Method

The results of the engine screening analysis (see Appendix 8.1B, Table 8.1B-4) were used to determine the worst-case full load operating conditions for modeling for the annual and 1-hour averaging periods, used in determining cancer risk and chronic HHI, and acute HHI, respectively. The total weighted risk "rate" for each source was used in place of emission rates in the modeling analysis. The weighted risk "rates" used for the HRA modeling are summarized in Table 8.1C-6. The calculated value was then total cancer risk at each receptor. As discussed in Section 8.1.2.4.3, the screening analysis for the criteria pollutant modeling analysis was performed using the AERMOD, CTSCREEN and CTDMPLUS models, the 2001 through 2005 Woodley Island meteorological data, specific receptor grids, and the stack parameters for six full-load operating cases. The exhaust characteristics for the highest full-load annual average unit impact from the screening analysis, Case 1G, was used to model cancer risks from the engines for the proposed project.[2]

---

[1] Procedure is described in Part B of Topic 8 of the HARP How-To Guides: How to Perform Health Analyses Using a Ground Level Concentration.

[2] Annual average emissions were modeled using gas firing stack parameters because the engines will be fueled on natural gas well over 90% of the time on an annual basis.

The contribution of each toxic compound to total cancer risk and total HHI for each analysis method was then determined using the individual contribution of each compound to the total weighted risk "rate."

Summary of Results

The results of the screening level health risk assessment are summarized in the following table.

Table 8.1C-1
Screening Level Risk Assessment Results

Risk Methodology	HBRP
Modeled Residential Cancer Risk (in one million)	
Residential: Derived (OEHHA) Method	8.6
Residential: Average Point Estimate	5.9
Residential: High-end Point Estimate	8.6
Residential: Derived (adjusted) Method	6.6
Modeled Worker Cancer Risk (in one million)	
Worker Exposure: Derived (OEHHA) Method	1.3
Modeled Acute and Chronic Impacts	
Acute HHI, natural gas mode	0.56
Acute HHI, diesel mode	0.09
Chronic HHI	0.09

Deleted: 6.5
Deleted: 4.4
Deleted: 6.5
Deleted: 5.1
Deleted: 1.1
Deleted: 0.39
Deleted: 0.05

As shown in Table 8.1C-1, the cancer risk from the project is below the significance level of 10 in one million. In addition, the acute and chronic health hazard indices are well below the significance level of one. The analysis of potential cancer risk described in this section employs extremely conservative methods and assumptions, as follows:

- The analysis includes representative weather data over 5 years to ensure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included. The analysis then assumes that these worst-case weather conditions, which in reality occurred only once in 5 years, will occur every year for 70 years.
- The power plant is assumed to operate at hourly, daily, and annual emission conditions that produce the highest ground-level concentrations. In fact, the power plant is expected to operate at a variety of conditions that will produce lower emissions and impacts.
- The analysis assumes that a sensitive individual is at the location of the highest ground-level concentration of power plant emissions continuously over the entire 70-year period. In reality, people rarely live in their homes for 70 years, and even if they do, they leave their homes to attend school, go to work, go shopping, and so on.

70-year period. In reality, people rarely live in their homes for 70 years, and even if they do, they leave their homes to attend school, go to work, go shopping, and so on.

The point of using these unrealistic assumptions is to consciously overstate the potential impacts. No one will experience exposures as great as those assumed for this analysis. By determining that even this highly overstated exposure will not be significant, there is a high degree of confidence that the much lower exposures that actual persons will experience will not result in a significant increase in cancer risk. In short, the analysis ensures that there will not be significant public health impacts at any location, under any weather condition, under any operating condition.

The locations of the three maximum acute, chronic, and cancer risks are shown in Figure 8.1C-1.

FIGURE 8.1C-1 LOCATIONS OF THE HIGHEST MODELED ACUTE, CHRONIC AND CANCER RISKS FROM PROJECT OPERATION

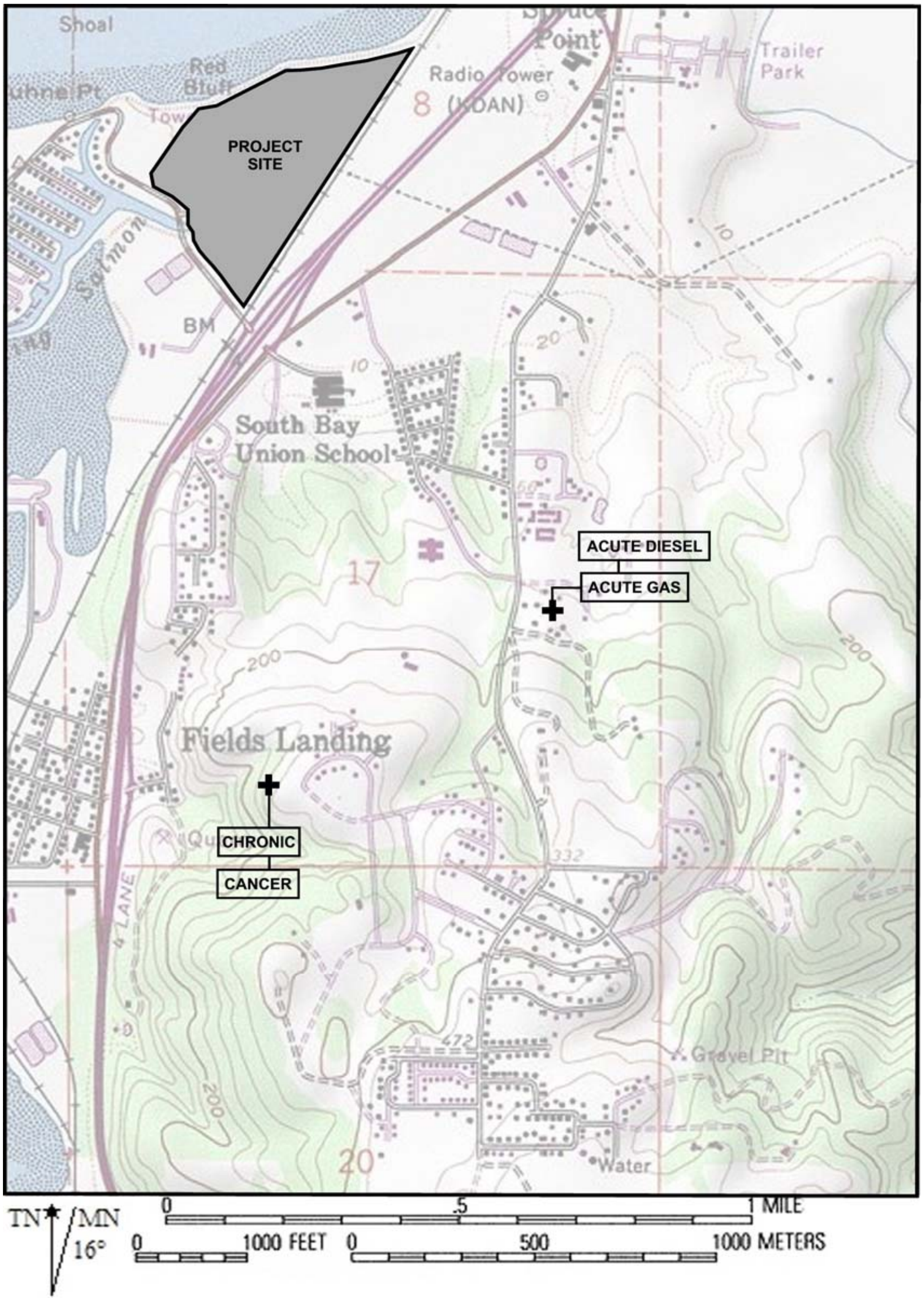


Table 8.1C-2

HBRP

Calculation of Modeling Inputs for Wärtsilä Reciprocating Engine Cancer Risk Assessment

Rev 08/07

		Derived (OEHHA) Method		Average Point Estimate		High-End Point Estimate		Derived (Adjusted) Method		Worker Exp: Derived (OEHHA) Method	
Compound	Annual Average Emissions Per Engine g/s	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)
Ammonia	1.81E-01	0	0	0	0	0	0	0	0	0	0
Propylene	4.22E-02	0	0	0	0	0	0	0	0	0	0
Acetaldehyde	4.15E-03	3.77E-06	1.56E-02	2.60E-06	1.08E-02	3.77E-06	1.56E-02	2.90E-06	1.20E-02	5.72E-07	2.37E-03
Acrolein	4.63E-04	0	0	0	0	0	0	0	0	0	0
Benzene	1.72E-03	3.77E-05	6.48E-02	2.60E-05	4.47E-02	3.77E-05	6.48E-02	2.90E-05	4.99E-02	5.72E-06	9.83E-03
1,3-Butadiene	2.88E-03	2.26E-04	0.65	1.56E-04	4.49E-01	2.26E-04	0.65	1.74E-04	5.01E-01	3.43E-05	9.87E-02
Diesel PM	4.00E-03	4.15E-04	1.66	2.86E-04	1.14	4.15E-04	1.66	3.19E-04	1.28	6.29E-05	2.52E-01
Ethylbenzene	5.57E-04	0	0	0	0	0	0	0	0	0	0
Formaldehyde	3.08E-02	7.91E-06	2.43E-01	5.46E-06	1.68E-01	7.91E-06	2.43E-01	6.08E-06	1.87E-01	1.20E-06	3.69E-02
Hexane	8.88E-03	0	0	0	0	0	0	0	0	0	0
Naphthalene	1.98E-04	4.52E-05	8.97E-03	3.12E-05	6.19E-03	4.52E-05	8.97E-03	3.48E-05	6.90E-03	6.86E-06	1.36E-03
PAHs (Note 1)	1.41E-07	3.98E-02	5.60E-03	8.05E-03	1.13E-03	4.02E-02	5.66E-03	3.98E-02	5.60E-03	1.47E-02	2.07E-03
Toluene	1.88E-03	0	0	0	0	0	0	0	0	0	0
Xylene	5.07E-03	0	0	0	0	0	0	0	0	0	0
			2.65E+00 per ug/m3		1.82E+00 per ug/m3		2.65E+00 per ug/m3		2.04E+00 per ug/m3		4.03E-01 per ug/m3

Notes:

(1) Emission rates for individual PAHs weighted by risk relative to B(a)P. See Table A-8.

Table 8.1C-3
HBRP
Calculation of Modeling Inputs and HHIs for Wärtsilä Reciprocating Engine Acute and Chronic Risk Assessment
Rev 08/07

	Acute Health Impacts, Natural Gas Mode				Acute Health Impacts, Diesel Mode				Chronic Health Impacts			
Compound	Max Hourly Emissions Per Engine g/s	HARP Acute HI (per ug/m3)	Acute HHI Model Input (per ug/m3 per g/s)	Modeled Contribution to Acute HHI	Max Hourly Emissions Per Engine g/s	HARP Acute HI (per ug/m3)	Acute HHI Model Input (per ug/m3 per g/s)	Modeled Contribution to Acute HHI	Annual Average Emissions, g/s	HARP Chronic HI (per ug/m3)	HHI Model Input (per ug/m3 per g/s)	Modeled Contribution to Chronic HHI
Ammonia	0.2436	3.13E-04	7.62E-05	1.11E-02	0.2654	3.13E-04	8.31E-05	1.21E-02	1.81E-01	5.00E-03	9.04E-04	4.00E-03
Propylene	0.0576	--	--	--	0.0317	--	--	--	4.22E-02	3.33E-04	1.41E-05	6.21E-05
Acetaldehyde	5.637E-03	--	--	--	2.853E-04	--	--	--	4.15E-03	1.11E-01	4.60E-04	2.03E-03
Acrolein	6.292E-04	5.26E+00	3.31E-03	4.84E-01	8.798E-05	5.26E+00	4.63E-04	6.76E-02	4.63E-04	1.67E+01	7.73E-03	3.42E-02
Benzene	2.395E-03	7.69E-04	1.84E-06	2.69E-04	8.305E-03	7.69E-04	6.39E-06	9.33E-04	1.72E-03	1.67E-02	2.87E-05	1.27E-04
1,3-Butadiene	3.909E-03	--	--	--	--	--	--	--	2.88E-03	5.00E-02	1.44E-04	6.36E-04
Diesel PM	--	--	--	--	7.007E-01	--	--	--	4.00E-03	2.00E-01	8.00E-04	3.54E-03
Ethylbenzene	7.573E-04	--	--	--	--	--	--	--	5.57E-04	5.00E-04	2.79E-07	1.23E-06
Formaldehyde	4.181E-02	1.06E-02	4.43E-04	6.48E-02	1.809E-03	1.06E-02	1.92E-05	2.80E-03	3.08E-02	3.33E-01	1.02E-02	4.53E-02
Hexane	1.207E-02	--	--	--	--	--	--	--	8.88E-03	1.43E-04	1.27E-06	5.62E-06
Naphthalene	2.792E-04	--	--	--	1.340E-03	--	--	--	1.98E-04	1.11E-01	2.20E-05	9.74E-05
PAHs	2.278E-07	--	--	--	5.107E-06	--	--	--	1.41E-07	--	--	--
Toluene	2.573E-03	2.70E-05	6.95E-08	1.02E-05	3.075E-03	2.70E-05	8.30E-08	1.21E-05	1.88E-03	3.33E-03	6.25E-06	2.76E-05
Xylene	6.900E-03	4.55E-05	3.14E-07	4.59E-05	2.204E-03	4.55E-05	1.00E-07	1.47E-05	5.07E-03	1.43E-03	7.25E-06	3.20E-05
		Total =	3.83E-03	0.56		Total =	5.72E-04	0.09		Total =	2.04E-02	0.09

Table 8.1C-4
HBRP
Cancer Risk Assessment Modeling Inputs and Results for Emergency Units

		Derived (OEHHA) Method		Average Point Estimate		High-End Point Estimate		Derived (Adjusted) Method		Worker Exposure: Derived (OEHHA) Method	
Compound	Annual Average Emissions, g/s	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)	Unit Risk (per ug/m3)	Cancer Risk Model Input (per ug/m3 per g/s)
Emergency Generator											
Diesel Exhaust Particulate	3.79E-05	4.15E-04	1.57E-02 per ug/m3	2.86E-04	1.08E-02 per ug/m3	4.15E-04	1.57E-02 per ug/m3	3.19E-04	1.21E-02 per ug/m3	6.29E-05	2.39E-03 per ug/m3
Diesel Fire Pump Engine											
Diesel Exhaust Particulate	4.66E-05	4.15E-04	1.93E-02 per ug/m3	2.86E-04	1.33E-02 per ug/m3	4.15E-04	1.93E-02 per ug/m3	3.19E-04	1.49E-02 per ug/m3	6.29E-05	2.93E-03 per ug/m3

Table 8.1C-5
HBRP
Calculation of Modeling Inputs and HHIs for Aux Equipment Acute and Chronic Risk Assessment

Compound	Max Hourly Emissions for Em Gen. g/s	HARP Acute HI (per ug/m3)	Acute HHI Model Input (per ug/m3 per g/s)	Annual Average Emissions, g/s	HARP Chronic HI (per ug/m3)	Chronic HHI Model Input (per ug/m3 per g/s)
Emergency Generator						
Particulate Em from Diesel-Fueled Engines	6.647E-03	n/a	n/a	3.79E-05	2.00E-01	7.59E-06
		Total =	0.00E+00		Total =	7.59E-06
Fire Pump Engine						
Particulate Em from Diesel-Fueled Engines	8.17E-03	n/a	n/a	4.66E-05	2.00E-01	9.32E-06
					Total =	9.32E-06

Table 8.1C-6
HBRP
Summary of Modeling Input Values for Screening HRA
Rev 8/07

Unit	Derived (OEHHA) Method Cancer Risk (Res)	Average Point Estimate Cancer Risk (Res)	High-end Point Estimate Cancer Risk (Res)	Derived (Adjusted) Method Cancer Risk (Res)	Derived (OEHHA) Method Cancer Risk (Worker)	Chronic HHI Model Input (per ug/m3)	Natural Gas Acute HHI Model Input (per ug/m3)	Liquid Fuel Acute HHI Model Input (per ug/m3)
Wärtsilä Reciprocating Engines (per engine)	2.648E+00	1.823E+00	2.648E+00	2.038E+00	4.028E-01	2.036E-02	3.831E-03	5.72E-04
Black start Diesel engine	1.574E-02	1.085E-02	1.574E-02	1.210E-02	2.386E-03	7.587E-06	0.0	0.0
Diesel fire pump engine	1.934E-02	1.333E-02	1.934E-02	1.487E-02	2.932E-03	9.323E-06	0.0	0.0

All modeling input values are in units of per ug/m3

Stack Parameters					
	Stack Diam (m)	Stack Ht (m)	Exhaust Temp (deg K)	Exhaust Velocity (m/s)	
Wärtsilä Reciprocating Engines (Case 1G)	1.620	30.480	663.556	27.152	acute gas, chronic and cancer
Wärtsilä Reciprocating Engines (Case 5D)	1.620	30.480	597.444	31.037	acute liquid fuel only
Black start Diesel engine	0.152	3.048	769.611	87.073	
Diesel fire pump engine	0.127	12.192	838.556	44.856	

Attachment 8.1C-1

HARP Model Risk Assessment Module Output

This file: c:\HARP\projects\demo\PointEstimateRisk.txt

Created by HARP Version 1.2a Build 23.03.27
Uses ISC Version 99155
Uses BPIP Version 95086
Creation date: 8/14/2006 11:13:36 AM

EXCEPTION REPORT
(there have been no changes or exceptions)

INPUT FILES:
Source-Receptor file:
Averaging period adjustment factors file: not applicable
Emission rates file: none
Site parameters file: C:\HARP\PROJECTS\DEMO\MSATs.sit

GLC DATA SOURCE:
concentrations loaded from file C:\HARP\PROJECTS\DEMO\MSATs.CML
concentrations read from file C:\HARP\PROJECTS\DEMO\SFAirport.CML
User memo:

Screening mode is OFF

Exposure Duration: 70 year (adult resident)
Analysis Method: Average Point Estimate
Health Effect: Cancer

SITE PARAMETERS

DEPOSITION

Deposition rate (m/s)   0.05

DRINKING WATER

*** Pathway disabled ***

FISH

*** Pathway disabled ***

PASTURE

*** Pathway disabled ***

HOME GROWN PRODUCE

*** Pathway disabled ***

PIGS, CHICKENS AND EGGS

*** Pathway disabled ***

DERMAL ABSORPTION

*** Pathway enabled ***

SOIL INGESTION

*** Pathway enabled ***

MOTHER'S MILK

*** Pathway enabled ***

CHEMICAL GROUND LEVEL CONCENTRATIONS (micrograms/m^3) (*** indicates not a multipathway chemical)

ABBREV	CAS	GLC Avrg	GLC Max	GLC Water	GLC Pasture	GLC Fish
Acetaldehyde	75070	1.000E+00	1.000E+00	***	***	***
Acrolein	107028	1.000E+00	1.000E+00	***	***	***
NH3	7664417	1.000E+00	1.000E+00	***	***	***
Benzene	71432	1.000E+00	1.000E+00	***	***	***
1,3-Butadiene	106990	1.000E+00	1.000E+00	***	***	***
DieselExhPM	9901	1.000E+00	1.000E+00	***	***	***
Formaldehyde	50000	1.000E+00	1.000E+00	***	***	***
Hexane	110543	1.000E+00	1.000E+00	***	***	***
B[a]anthracene	56553	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[a]P	50328	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[b]fluoranthen	205992	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[k]fluoranthen	207089	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Chrysene	218019	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
In[1,2,3-cd]pyr	193395	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Naphthalene	91203	1.000E+00	1.000E+00	***	***	***
Propylene	115071	1.000E+00	1.000E+00	***	***	***
Propylene Oxide	75569	1.000E+00	1.000E+00	***	***	***
Toluene	108883	1.000E+00	1.000E+00	***	***	***
Xylenes	1210	1.000E+00	1.000E+00	***	***	***
Ethyl Benzene	100414	1.000E+00	1.000E+00	***	***	***
Anthracene	120127	1.000E+00	1.000E+00	***	***	***
D[a,h]anthracen	53703	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
PM	11101	0.000E+00	0.000E+00	***	***	***

CHEMICAL CROSS-REFERENCE TABLE

CHEM	CAS	ABBREVIATION	POLLUTANT NAME	BACKGROUND (ug/m^3)
0001	75070	Acetaldehyde	Acetaldehyde	0.000E+00
0002	107028	Acrolein	Acrolein	0.000E+00
0003	7664417	NH3	Ammonia	0.000E+00
0004	71432	Benzene	Benzene	0.000E+00
0005	106990	1,3-Butadiene	1,3-Butadiene	0.000E+00
0006	9901	DieselExhPM	Diesel engine exhaust, particulate matter	0.000E+00
0007	50000	Formaldehyde	Formaldehyde	0.000E+00
0008	110543	Hexane	Hexane	0.000E+00
0009	56553	B[a]anthracene	Benz[a]anthracene	0.000E+00
0010	50328	B[a]P	Benzo[a]pyrene	0.000E+00
0011	205992	B[b]fluoranthen	Benzo[b]fluoranthene	0.000E+00
0012	207089	B[k]fluoranthen	Benzo[k]fluoranthene	0.000E+00
0013	218019	Chrysene	Chrysene	0.000E+00
0014	193395	In[1,2,3-cd]pyr	Indeno[1,2,3-cd]pyrene	0.000E+00
0015	91203	Naphthalene	Naphthalene	0.000E+00
0016	115071	Propylene	Propylene	0.000E+00
0017	75569	Propylene Oxide	Propylene oxide	0.000E+00
0018	108883	Toluene	Toluene	0.000E+00
0019	1210	Xylenes	Xylenes (mixed)	0.000E+00
0020	100414	Ethyl Benzene	Ethyl benzene	0.000E+00
0021	120127	Anthracene	Anthracene	0.000E+00
0022	53703	D[a,h]anthracen	Dibenz[a,h]anthracene	0.000E+00
0023	11101	PM	Particulate Matter	0.000E+00

EMISSIONS DATA SOURCE:
CHEMICALS ADDED OR DELETED: none

AVERAGE DOSE BY PATHWAY (mg/(kg-d)) FOR CANCER CALCULATIONS

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0002	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0005	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0006	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0007	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0008	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	2.60E-04	1.66E-04	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	2.60E-04	1.66E-04	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	2.60E-04	1.66E-04	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	2.60E-04	1.66E-04	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	2.60E-04	1.66E-04	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0014	2.60E-04	1.66E-04	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0016	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0018	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	2.60E-04	1.66E-04	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AVERAGE CANCER RISK

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
0001	2.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-06
0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	2.60E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-05
0005	1.56E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-04
0006	2.86E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-04
0007	5.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.46E-06
0008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	1.01E-04	1.99E-04	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-04	8.05E-04
0010	1.01E-03	1.99E-03	5.05E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-03	8.05E-03
0011	1.01E-04	1.99E-04	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-04	8.05E-04
0012	1.01E-04	1.99E-04	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-04	8.05E-04
0013	1.01E-05	1.99E-05	5.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-05	8.05E-05
0014	1.01E-04	1.99E-04	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-04	8.05E-04
0015	3.12E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-05
0016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	3.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.38E-06
0018	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

0022	1.07E-03	6.80E-04	1.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E-03	3.47E-03
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUM	3.00E-03	3.49E-03	8.84E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-02	1.53E-02

This file: c:\HARP\projects\demo\DerOEHHAMethod.txt

Created by HARP Version 1.2a Build 23.03.27
Uses ISC Version 99155
Uses BPIP Version 95086
Creation date: 8/14/2006 11:17:33 AM

EXCEPTION REPORT
(there have been no changes or exceptions)

INPUT FILES:
Source-Receptor file:
Averaging period adjustment factors file: not applicable
Emission rates file: none
Site parameters file: C:\HARP\PROJECTS\DEMO\MSATs.sit

GLC DATA SOURCE:
concentrations loaded from file C:\HARP\PROJECTS\DEMO\MSATs.CML
concentrations read from file C:\HARP\PROJECTS\DEMO\SFAirport.CML
User memo:

Screening mode is OFF

Exposure Duration: 70 year (adult resident)
Analysis Method: Derived (OEHHA) Method
Health Effect: Cancer, Chronic and Acute

SITE PARAMETERS

DEPOSITION

Deposition rate (m/s)   0.05

DRINKING WATER

*** Pathway disabled ***

FISH

*** Pathway disabled ***

PASTURE

*** Pathway disabled ***

HOME GROWN PRODUCE

*** Pathway disabled ***

PIGS, CHICKENS AND EGGS

*** Pathway disabled ***

DERMAL ABSORPTION

*** Pathway enabled ***

SOIL INGESTION

*** Pathway enabled ***

MOTHER'S MILK

*** Pathway enabled ***

CHEMICAL GROUND LEVEL CONCENTRATIONS (micrograms/m^3) (*** indicates not a multipathway chemical)

ABBREV	CAS	GLC Avrg	GLC Max	GLC Water	GLC Pasture	GLC Fish
Acetaldehyde	75070	1.000E+00	1.000E+00	***	***	***
Acrolein	107028	1.000E+00	1.000E+00	***	***	***
NH3	7664417	1.000E+00	1.000E+00	***	***	***
Benzene	71432	1.000E+00	1.000E+00	***	***	***
1,3-Butadiene	106990	1.000E+00	1.000E+00	***	***	***
DieselExhPM	9901	1.000E+00	1.000E+00	***	***	***
Formaldehyde	50000	1.000E+00	1.000E+00	***	***	***
Hexane	110543	1.000E+00	1.000E+00	***	***	***
B[a]anthracene	56553	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[a]P	50328	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[b]fluoranthen	205992	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[k]fluoranthen	207089	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Chrysene	218019	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
In[1,2,3-cd]pyr	193395	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Naphthalene	91203	1.000E+00	1.000E+00	***	***	***
Propylene	115071	1.000E+00	1.000E+00	***	***	***
Propylene Oxide	75569	1.000E+00	1.000E+00	***	***	***
Toluene	108883	1.000E+00	1.000E+00	***	***	***
Xylenes	1210	1.000E+00	1.000E+00	***	***	***
Ethyl Benzene	100414	1.000E+00	1.000E+00	***	***	***
Anthracene	120127	1.000E+00	1.000E+00	***	***	***
D[a,h]anthracen	53703	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
PM	11101	0.000E+00	0.000E+00	***	***	***

CHEMICAL CROSS-REFERENCE TABLE

CHEM	CAS	ABBREVIATION	POLLUTANT NAME	BACKGROUND (ug/m^3)
0001	75070	Acetaldehyde	Acetaldehyde	0.000E+00
0002	107028	Acrolein	Acrolein	0.000E+00
0003	7664417	NH3	Ammonia	0.000E+00
0004	71432	Benzene	Benzene	0.000E+00
0005	106990	1,3-Butadiene	1,3-Butadiene	0.000E+00
0006	9901	DieselExhPM	Diesel engine exhaust, particulate matter	0.000E+00
0007	50000	Formaldehyde	Formaldehyde	0.000E+00
0008	110543	Hexane	Hexane	0.000E+00
0009	56553	B[a]anthracene	Benz[a]anthracene	0.000E+00
0010	50328	B[a]P	Benzo[a]pyrene	0.000E+00
0011	205992	B[b]fluoranthen	Benzo[b]fluoranthene	0.000E+00
0012	207089	B[k]fluoranthen	Benzo[k]fluoranthene	0.000E+00
0013	218019	Chrysene	Chrysene	0.000E+00
0014	193395	In[1,2,3-cd]pyr	Indeno[1,2,3-cd]pyrene	0.000E+00
0015	91203	Naphthalene	Naphthalene	0.000E+00
0016	115071	Propylene	Propylene	0.000E+00
0017	75569	Propylene Oxide	Propylene oxide	0.000E+00
0018	108883	Toluene	Toluene	0.000E+00
0019	1210	Xylenes	Xylenes (mixed)	0.000E+00
0020	100414	Ethyl Benzene	Ethyl benzene	0.000E+00
0021	120127	Anthracene	Anthracene	0.000E+00
0022	53703	D[a,h]anthracen	Dibenz[a,h]anthracene	0.000E+00
0023	11101	PM	Particulate Matter	0.000E+00

EMISSIONS DATA SOURCE:
CHEMICALS ADDED OR DELETED: none

DOMINANT PATHWAYS FOR CANCER

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	YES	-	-	-	-	-	-	-	-	-	-	-
0002	-	-	-	-	-	-	-	-	-	-	-	-
0003	-	-	-	-	-	-	-	-	-	-	-	-
0004	YES	-	-	-	-	-	-	-	-	-	-	-
0005	YES	-	-	-	-	-	-	-	-	-	-	-
0006	YES	-	-	-	-	-	-	-	-	-	-	-
0007	YES	-	-	-	-	-	-	-	-	-	-	-
0008	-	-	-	-	-	-	-	-	-	-	-	-
0009	-	YES	YES	-	-	-	-	-	-	-	-	-
0010	-	YES	YES	-	-	-	-	-	-	-	-	-
0011	-	YES	YES	-	-	-	-	-	-	-	-	-
0012	-	YES	YES	-	-	-	-	-	-	-	-	-
0013	-	YES	YES	-	-	-	-	-	-	-	-	-
0014	-	YES	YES	-	-	-	-	-	-	-	-	-
0015	YES	-	-	-	-	-	-	-	-	-	-	-
0016	-	-	-	-	-	-	-	-	-	-	-	-
0017	YES	-	-	-	-	-	-	-	-	-	-	-
0018	-	-	-	-	-	-	-	-	-	-	-	-
0019	-	-	-	-	-	-	-	-	-	-	-	-
0020	-	-	-	-	-	-	-	-	-	-	-	-
0021	-	-	-	-	-	-	-	-	-	-	-	-
0022	-	YES	YES	-	-	-	-	-	-	-	-	-
0023	-	-	-	-	-	-	-	-	-	-	-	-

DERIVED DOSE BY PATHWAY (mg/(kg-d)) FOR CANCER CALCULATIONS

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0002	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0005	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0006	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0007	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0008	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0014	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0016	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0018	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

0022	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

DERIVED CANCER RISK

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
0001	3.77E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-06
0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	3.77E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-05
0005	2.26E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-04
0006	4.15E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.15E-04
0007	7.91E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.91E-06
0008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0010	1.01E-03	3.37E-02	5.05E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-02	3.98E-02
0011	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0012	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0013	1.01E-05	3.37E-04	5.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-04	3.98E-04
0014	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0015	4.52E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-05
0016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	4.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.90E-06
0018	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	1.07E-03	1.15E-02	1.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-02	1.43E-02
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUM	3.23E-03	5.90E-02	8.84E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.79E-02	7.11E-02

DOMINANT PATHWAYS FOR CHRONIC

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	YES	-	-	-	-	-	-	-	-	-	-	-
0002	YES	-	-	-	-	-	-	-	-	-	-	-
0003	YES	-	-	-	-	-	-	-	-	-	-	-
0004	YES	-	-	-	-	-	-	-	-	-	-	-
0005	YES	-	-	-	-	-	-	-	-	-	-	-
0006	YES	-	-	-	-	-	-	-	-	-	-	-
0007	YES	-	-	-	-	-	-	-	-	-	-	-
0008	YES	-	-	-	-	-	-	-	-	-	-	-
0009	YES	YES	YES	-	-	-	-	-	-	-	-	-
0010	YES	YES	YES	-	-	-	-	-	-	-	-	-
0011	YES	YES	YES	-	-	-	-	-	-	-	-	-
0012	YES	YES	YES	-	-	-	-	-	-	-	-	-
0013	YES	YES	YES	-	-	-	-	-	-	-	-	-
0014	YES	YES	YES	-	-	-	-	-	-	-	-	-
0015	YES	-	-	-	-	-	-	-	-	-	-	-
0016	YES	-	-	-	-	-	-	-	-	-	-	-
0017	YES	-	-	-	-	-	-	-	-	-	-	-
0018	YES	-	-	-	-	-	-	-	-	-	-	-
0019	YES	-	-	-	-	-	-	-	-	-	-	-
0020	YES	-	-	-	-	-	-	-	-	-	-	-
0021	YES	-	-	-	-	-	-	-	-	-	-	-
0022	YES	YES	YES	-	-	-	-	-	-	-	-	-
0023	-	-	-	-	-	-	-	-	-	-	-	-

INHALATION CONCENTRATION (ug/m^3) AND DERIVED DOSE BY PATHWAY (mg/(kg-d)) FOR CHRONIC CALCULATIONS

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0002	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

0005	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0006	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0007	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0008	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	1.00E+00	2.93E-03	4.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	1.00E+00	2.93E-03	4.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	1.00E+00	2.93E-03	4.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	1.00E+00	2.93E-03	4.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	1.00E+00	2.93E-03	4.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0014	1.00E+00	2.93E-03	4.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0016	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0018	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	1.00E+00	2.93E-03	4.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

DERIVED CHRONIC HI

CHEM	CV	CNS	BONE	DEVEL	ENDO	EYE	GILV	IMMUN	KIDN	REPRO	RESP	SKIN	BLOOD	MAX
0001	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-01	0.00E+00	0.00E+00	1.11E-01
0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E+01	0.00E+00	0.00E+00	1.67E+01
0003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E-03	0.00E+00	0.00E+00	5.00E-03
0004	0.00E+00	1.67E-02	0.00E+00	1.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-02	1.67E-02
0005	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E-02	0.00E+00	0.00E+00	0.00E+00	5.00E-02
0006	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00E+00	2.00E-01
0007	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-01	0.00E+00	0.00E+00	3.33E-01
0008	0.00E+00	1.43E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-04
0009	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0014	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-01	0.00E+00	0.00E+00	1.11E-01
0016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-04	0.00E+00	0.00E+00	3.33E-04
0017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-02	0.00E+00	0.00E+00	3.33E-02
0018	0.00E+00	3.33E-03	0.00E+00	3.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-03	0.00E+00	0.00E+00	3.33E-03
0019	0.00E+00	1.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-03	0.00E+00	0.00E+00	1.43E-03
0020	0.00E+00	0.00E+00	0.00E+00	5.00E-04	5.00E-04	0.00E+00	5.00E-04	0.00E+00	5.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E-04
0021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUM	0.00E+00	2.16E-02	0.00E+00	2.05E-02	5.00E-04	1.70E+01	5.00E-04	0.00E+00	5.00E-04	5.00E-02	1.75E+01	0.00E+00	1.67E-02	1.75E+01

ACUTE HI

CHEM	CV	CNS	BONE	DEVEL	ENDO	EYE	GILV	IMMUN	KIDN	REPRO	RESP	SKIN	BLOOD	MAX
0001	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.26E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.26E+00	0.00E+00	0.00E+00	5.26E+00
0003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.13E-04	0.00E+00	0.00E+00	3.13E-04
0004	0.00E+00	0.00E+00	0.00E+00	7.69E-04	0.00E+00	0.00E+00	0.00E+00	7.69E-04	0.00E+00	7.69E-04	0.00E+00	0.00E+00	7.69E-04	7.69E-04
0005	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0006	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0007	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-02	0.00E+00	1.06E-02	0.00E+00	0.00E+00	1.06E-02	0.00E+00	0.00E+00	1.06E-02
0008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

0014	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	0.00E+00	0.00E+00	0.00E+00	3.23E-04	0.00E+00	3.23E-04	0.00E+00	0.00E+00	0.00E+00	3.23E-04	3.23E-04	0.00E+00	0.00E+00	3.23E-04
0018	0.00E+00	2.70E-05	0.00E+00	2.70E-05	0.00E+00	2.70E-05	0.00E+00	0.00E+00	0.00E+00	2.70E-05	2.70E-05	0.00E+00	0.00E+00	2.70E-05
0019	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-05	0.00E+00	0.00E+00	4.55E-05
0020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUM	0.00E+00	2.70E-05	0.00E+00	1.12E-03	0.00E+00	5.27E+00	0.00E+00	1.14E-02	0.00E+00	1.12E-03	5.27E+00	0.00E+00	7.69E-04	5.27E+00

This file: c:\HARP\projects\demo\HEndPointEstimateRisk.txt

Created by HARP Version 1.2a Build 23.03.27
Uses ISC Version 99155
Uses BPIP Version 95086
Creation date: 8/14/2006 11:16:28 AM

EXCEPTION REPORT
(there have been no changes or exceptions)

INPUT FILES:
Source-Receptor file:
Averaging period adjustment factors file: not applicable
Emission rates file: none
Site parameters file: C:\HARP\PROJECTS\DEMO\MSATs.sit

GLC DATA SOURCE:
concentrations loaded from file C:\HARP\PROJECTS\DEMO\MSATs.CML
concentrations read from file C:\HARP\PROJECTS\DEMO\SFAirport.CML
User memo:

Screening mode is OFF

Exposure Duration: 70 year (adult resident)
Analysis Method: High-end Point Estimate
Health Effect: Cancer

SITE PARAMETERS

DEPOSITION

Deposition rate (m/s)   0.05

DRINKING WATER

*** Pathway disabled ***

FISH

*** Pathway disabled ***

PASTURE

*** Pathway disabled ***

HOME GROWN PRODUCE

*** Pathway disabled ***

PIGS, CHICKENS AND EGGS

*** Pathway disabled ***

DERMAL ABSORPTION

*** Pathway enabled ***

SOIL INGESTION

*** Pathway enabled ***

MOTHER'S MILK

*** Pathway enabled ***

CHEMICAL GROUND LEVEL CONCENTRATIONS (micrograms/m^3) (*** indicates not a multipathway chemical)

ABBREV	CAS	GLC Avrg	GLC Max	GLC Water	GLC Pasture	GLC Fish
Acetaldehyde	75070	1.000E+00	1.000E+00	***	***	***
Acrolein	107028	1.000E+00	1.000E+00	***	***	***
NH3	7664417	1.000E+00	1.000E+00	***	***	***
Benzene	71432	1.000E+00	1.000E+00	***	***	***
1,3-Butadiene	106990	1.000E+00	1.000E+00	***	***	***
DieselExhPM	9901	1.000E+00	1.000E+00	***	***	***
Formaldehyde	50000	1.000E+00	1.000E+00	***	***	***
Hexane	110543	1.000E+00	1.000E+00	***	***	***
B[a]anthracene	56553	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[a]P	50328	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[b]fluoranthen	205992	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[k]fluoranthen	207089	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Chrysene	218019	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
In[1,2,3-cd]pyr	193395	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Naphthalene	91203	1.000E+00	1.000E+00	***	***	***
Propylene	115071	1.000E+00	1.000E+00	***	***	***
Propylene Oxide	75569	1.000E+00	1.000E+00	***	***	***
Toluene	108883	1.000E+00	1.000E+00	***	***	***
Xylenes	1210	1.000E+00	1.000E+00	***	***	***
Ethyl Benzene	100414	1.000E+00	1.000E+00	***	***	***
Anthracene	120127	1.000E+00	1.000E+00	***	***	***
D[a,h]anthracen	53703	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
PM	11101	0.000E+00	0.000E+00	***	***	***

CHEMICAL CROSS-REFERENCE TABLE

CHEM	CAS	ABBREVIATION	POLLUTANT NAME	BACKGROUND (ug/m^3)
0001	75070	Acetaldehyde	Acetaldehyde	0.000E+00
0002	107028	Acrolein	Acrolein	0.000E+00
0003	7664417	NH3	Ammonia	0.000E+00
0004	71432	Benzene	Benzene	0.000E+00
0005	106990	1,3-Butadiene	1,3-Butadiene	0.000E+00
0006	9901	DieselExhPM	Diesel engine exhaust, particulate matter	0.000E+00
0007	50000	Formaldehyde	Formaldehyde	0.000E+00
0008	110543	Hexane	Hexane	0.000E+00
0009	56553	B[a]anthracene	Benz[a]anthracene	0.000E+00
0010	50328	B[a]P	Benzo[a]pyrene	0.000E+00
0011	205992	B[b]fluoranthen	Benzo[b]fluoranthene	0.000E+00
0012	207089	B[k]fluoranthen	Benzo[k]fluoranthene	0.000E+00
0013	218019	Chrysene	Chrysene	0.000E+00
0014	193395	In[1,2,3-cd]pyr	Indeno[1,2,3-cd]pyrene	0.000E+00
0015	91203	Naphthalene	Naphthalene	0.000E+00
0016	115071	Propylene	Propylene	0.000E+00
0017	75569	Propylene Oxide	Propylene oxide	0.000E+00
0018	108883	Toluene	Toluene	0.000E+00
0019	1210	Xylenes	Xylenes (mixed)	0.000E+00
0020	100414	Ethyl Benzene	Ethyl benzene	0.000E+00
0021	120127	Anthracene	Anthracene	0.000E+00
0022	53703	D[a,h]anthracen	Dibenz[a,h]anthracene	0.000E+00
0023	11101	PM	Particulate Matter	0.000E+00

EMISSIONS DATA SOURCE:
CHEMICALS ADDED OR DELETED: none

HIGH-END DOSE BY PATHWAY (mg/(kg-d)) FOR CANCER CALCULATIONS

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0002	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0005	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0006	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0007	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0008	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	3.77E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	3.77E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	3.77E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	3.77E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	3.77E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0014	3.77E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0016	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0018	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	3.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	3.77E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

HIGH-END CANCER RISK

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
0001	3.77E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-06
0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	3.77E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-05
0005	2.26E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-04
0006	4.15E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.15E-04
0007	7.91E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.91E-06
0008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	1.47E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	4.02E-03
0010	1.47E-03	3.37E-02	5.05E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-02	4.02E-02
0011	1.47E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	4.02E-03
0012	1.47E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	4.02E-03
0013	1.47E-05	3.37E-04	5.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-04	4.02E-04
0014	1.47E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	4.02E-03
0015	4.52E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-05
0016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	4.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.90E-06
0018	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

0022	1.55E-03	1.15E-02	1.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-02	1.48E-02
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUM	4.36E-03	5.90E-02	8.84E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.79E-02	7.22E-02

This file: c:\HARP\projects\demo\DerAdjMethod.txt

Created by HARP Version 1.2a Build 23.03.27
Uses ISC Version 99155
Uses BPIP Version 95086
Creation date: 8/14/2006 11:18:33 AM

EXCEPTION REPORT
   (there have been no changes or exceptions)

INPUT FILES:
   Source-Receptor file:
   Averaging period adjustment factors file: not applicable
   Emission rates file: none
   Site parameters file: C:\HARP\PROJECTS\DEMO\MSATs.sit

GLC DATA SOURCE:
  concentrations loaded from file C:\HARP\PROJECTS\DEMO\MSATs.CML
  concentrations read from file C:\HARP\PROJECTS\DEMO\SFAirport.CML
  User memo:

Screening mode is OFF

Exposure Duration: 70 year (adult resident)
Analysis Method: Derived (Adjusted) Method
Health Effect: Cancer

SITE PARAMETERS

DEPOSITION

   Deposition rate (m/s)   0.05

DRINKING WATER

*** Pathway disabled ***

FISH

*** Pathway disabled ***

PASTURE

*** Pathway disabled ***

HOME GROWN PRODUCE

*** Pathway disabled ***

PIGS, CHICKENS AND EGGS

*** Pathway disabled ***

DERMAL ABSORPTION

*** Pathway enabled ***

SOIL INGESTION

*** Pathway enabled ***

MOTHER'S MILK

*** Pathway enabled ***

CHEMICAL GROUND LEVEL CONCENTRATIONS (micrograms/m^3) (*** indicates not a multipathway chemical)

ABBREV	CAS	GLC Avrg	GLC Max	GLC Water	GLC Pasture	GLC Fish
Acetaldehyde	75070	1.000E+00	1.000E+00	***	***	***
Acrolein	107028	1.000E+00	1.000E+00	***	***	***
NH3	7664417	1.000E+00	1.000E+00	***	***	***
Benzene	71432	1.000E+00	1.000E+00	***	***	***
1,3-Butadiene	106990	1.000E+00	1.000E+00	***	***	***
DieselExhPM	9901	1.000E+00	1.000E+00	***	***	***
Formaldehyde	50000	1.000E+00	1.000E+00	***	***	***
Hexane	110543	1.000E+00	1.000E+00	***	***	***
B[a]anthracene	56553	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[a]P	50328	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[b]fluoranthen	205992	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[k]fluoranthen	207089	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Chrysene	218019	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
In[1,2,3-cd]pyr	193395	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Naphthalene	91203	1.000E+00	1.000E+00	***	***	***
Propylene	115071	1.000E+00	1.000E+00	***	***	***
Propylene Oxide	75569	1.000E+00	1.000E+00	***	***	***
Toluene	108883	1.000E+00	1.000E+00	***	***	***
Xylenes	1210	1.000E+00	1.000E+00	***	***	***
Ethyl Benzene	100414	1.000E+00	1.000E+00	***	***	***
Anthracene	120127	1.000E+00	1.000E+00	***	***	***
D[a,h]anthracen	53703	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
PM	11101	0.000E+00	0.000E+00	***	***	***

CHEMICAL CROSS-REFERENCE TABLE

CHEM	CAS	ABBREVIATION	POLLUTANT NAME	BACKGROUND (ug/m^3)
0001	75070	Acetaldehyde	Acetaldehyde	0.000E+00
0002	107028	Acrolein	Acrolein	0.000E+00
0003	7664417	NH3	Ammonia	0.000E+00
0004	71432	Benzene	Benzene	0.000E+00
0005	106990	1,3-Butadiene	1,3-Butadiene	0.000E+00
0006	9901	DieselExhPM	Diesel engine exhaust, particulate matter	0.000E+00
0007	50000	Formaldehyde	Formaldehyde	0.000E+00
0008	110543	Hexane	Hexane	0.000E+00
0009	56553	B[a]anthracene	Benz[a]anthracene	0.000E+00
0010	50328	B[a]P	Benzo[a]pyrene	0.000E+00
0011	205992	B[b]fluoranthen	Benzo[b]fluoranthene	0.000E+00
0012	207089	B[k]fluoranthen	Benzo[k]fluoranthene	0.000E+00
0013	218019	Chrysene	Chrysene	0.000E+00
0014	193395	In[1,2,3-cd]pyr	Indeno[1,2,3-cd]pyrene	0.000E+00
0015	91203	Naphthalene	Naphthalene	0.000E+00
0016	115071	Propylene	Propylene	0.000E+00
0017	75569	Propylene Oxide	Propylene oxide	0.000E+00
0018	108883	Toluene	Toluene	0.000E+00
0019	1210	Xylenes	Xylenes (mixed)	0.000E+00
0020	100414	Ethyl Benzene	Ethyl benzene	0.000E+00
0021	120127	Anthracene	Anthracene	0.000E+00
0022	53703	D[a,h]anthracen	Dibenz[a,h]anthracene	0.000E+00
0023	11101	PM	Particulate Matter	0.000E+00

EMISSIONS DATA SOURCE:
CHEMICALS ADDED OR DELETED: none

DOMINANT PATHWAYS FOR CANCER

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	A	-	-	-	-	-	-	-	-	-	-	-
0002	-	-	-	-	-	-	-	-	-	-	-	-
0003	-	-	-	-	-	-	-	-	-	-	-	-
0004	A	-	-	-	-	-	-	-	-	-	-	-
0005	A	-	-	-	-	-	-	-	-	-	-	-
0006	A	-	-	-	-	-	-	-	-	-	-	-
0007	A	-	-	-	-	-	-	-	-	-	-	-
0008	-	-	-	-	-	-	-	-	-	-	-	-
0009	-	YES	YES	-	-	-	-	-	-	-	-	-
0010	-	YES	YES	-	-	-	-	-	-	-	-	-
0011	-	YES	YES	-	-	-	-	-	-	-	-	-
0012	-	YES	YES	-	-	-	-	-	-	-	-	-
0013	-	YES	YES	-	-	-	-	-	-	-	-	-
0014	-	YES	YES	-	-	-	-	-	-	-	-	-
0015	A	-	-	-	-	-	-	-	-	-	-	-
0016	-	-	-	-	-	-	-	-	-	-	-	-
0017	A	-	-	-	-	-	-	-	-	-	-	-
0018	-	-	-	-	-	-	-	-	-	-	-	-
0019	-	-	-	-	-	-	-	-	-	-	-	-
0020	-	-	-	-	-	-	-	-	-	-	-	-
0021	-	-	-	-	-	-	-	-	-	-	-	-
0022	-	YES	YES	-	-	-	-	-	-	-	-	-
0023	-	-	-	-	-	-	-	-	-	-	-	-

DERIVED DOSE BY PATHWAY (mg/(kg-d)) FOR CANCER CALCULATIONS

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	2.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0002	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	2.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0005	2.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0006	2.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0007	2.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0008	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0014	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	2.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0016	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	2.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0018	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	2.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

0022	2.60E-04	2.81E-03	4.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

DERIVED CANCER RISK

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
0001	2.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-06
0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	2.90E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E-05
0005	1.74E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-04
0006	3.19E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-04
0007	6.08E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.08E-06
0008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0010	1.01E-03	3.37E-02	5.05E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-02	3.98E-02
0011	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0012	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0013	1.01E-05	3.37E-04	5.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-04	3.98E-04
0014	1.01E-04	3.37E-03	5.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-03	3.98E-03
0015	3.48E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-05
0016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	3.76E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.76E-06
0018	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	1.07E-03	1.15E-02	1.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-02	1.43E-02
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUM	3.06E-03	5.90E-02	8.84E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.79E-02	7.09E-02

This file: c:\HARP\projects\demo\WorkerExp.txt

Created by HARP Version 1.2a Build 23.03.27
Uses ISC Version 99155
Uses BPIP Version 95086
Creation date: 8/14/2006 11:19:30 AM

EXCEPTION REPORT
(there have been no changes or exceptions)

INPUT FILES:
Source-Receptor file:
Averaging period adjustment factors file: not applicable
Emission rates file: none
Site parameters file: C:\HARP\PROJECTS\DEMO\MSATs.sit

GLC DATA SOURCE:
concentrations loaded from file C:\HARP\PROJECTS\DEMO\MSATs.CML
concentrations read from file C:\HARP\PROJECTS\DEMO\SFAirport.CML
User memo:

Screening mode is OFF

Exposure Duration: Standard work schedule (49 wks/yr, 5 days/wk, 8 hrs/day, 40 yrs)
Analysis Method: Point estimate
Health Effect: Cancer

SITE PARAMETERS

DEPOSITION

Deposition rate (m/s)   0.05

DRINKING WATER

*** Pathway disabled ***

FISH

*** Pathway disabled ***

PASTURE

*** Pathway disabled ***

HOME GROWN PRODUCE

*** Pathway disabled ***

PIGS, CHICKENS AND EGGS

*** Pathway disabled ***

DERMAL ABSORPTION

*** Pathway enabled ***

SOIL INGESTION

*** Pathway enabled ***

MOTHER'S MILK

*** Pathway enabled ***

CHEMICAL GROUND LEVEL CONCENTRATIONS (micrograms/m^3) (*** indicates not a multipathway chemical)

ABBREV	CAS	GLC Avrg	GLC Max	GLC Water	GLC Pasture	GLC Fish
Acetaldehyde	75070	1.000E+00	1.000E+00	***	***	***
Acrolein	107028	1.000E+00	1.000E+00	***	***	***
NH3	7664417	1.000E+00	1.000E+00	***	***	***
Benzene	71432	1.000E+00	1.000E+00	***	***	***
1,3-Butadiene	106990	1.000E+00	1.000E+00	***	***	***
DieselExhPM	9901	1.000E+00	1.000E+00	***	***	***
Formaldehyde	50000	1.000E+00	1.000E+00	***	***	***
Hexane	110543	1.000E+00	1.000E+00	***	***	***
B[a]anthracene	56553	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[a]P	50328	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[b]fluoranthen	205992	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
B[k]fluoranthen	207089	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Chrysene	218019	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
In[1,2,3-cd]pyr	193395	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Naphthalene	91203	1.000E+00	1.000E+00	***	***	***
Propylene	115071	1.000E+00	1.000E+00	***	***	***
Propylene Oxide	75569	1.000E+00	1.000E+00	***	***	***
Toluene	108883	1.000E+00	1.000E+00	***	***	***
Xylenes	1210	1.000E+00	1.000E+00	***	***	***
Ethyl Benzene	100414	1.000E+00	1.000E+00	***	***	***
Anthracene	120127	1.000E+00	1.000E+00	***	***	***
D[a,h]anthracen	53703	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
PM	11101	0.000E+00	0.000E+00	***	***	***

CHEMICAL CROSS-REFERENCE TABLE

CHEM	CAS	ABBREVIATION	POLLUTANT NAME	BACKGROUND (ug/m^3)
0001	75070	Acetaldehyde	Acetaldehyde	0.000E+00
0002	107028	Acrolein	Acrolein	0.000E+00
0003	7664417	NH3	Ammonia	0.000E+00
0004	71432	Benzene	Benzene	0.000E+00
0005	106990	1,3-Butadiene	1,3-Butadiene	0.000E+00
0006	9901	DieselExhPM	Diesel engine exhaust, particulate matter	0.000E+00
0007	50000	Formaldehyde	Formaldehyde	0.000E+00
0008	110543	Hexane	Hexane	0.000E+00
0009	56553	B[a]anthracene	Benz[a]anthracene	0.000E+00
0010	50328	B[a]P	Benzo[a]pyrene	0.000E+00
0011	205992	B[b]fluoranthen	Benzo[b]fluoranthene	0.000E+00
0012	207089	B[k]fluoranthen	Benzo[k]fluoranthene	0.000E+00
0013	218019	Chrysene	Chrysene	0.000E+00
0014	193395	In[1,2,3-cd]pyr	Indeno[1,2,3-cd]pyrene	0.000E+00
0015	91203	Naphthalene	Naphthalene	0.000E+00
0016	115071	Propylene	Propylene	0.000E+00
0017	75569	Propylene Oxide	Propylene oxide	0.000E+00
0018	108883	Toluene	Toluene	0.000E+00
0019	1210	Xylenes	Xylenes (mixed)	0.000E+00
0020	100414	Ethyl Benzene	Ethyl benzene	0.000E+00
0021	120127	Anthracene	Anthracene	0.000E+00
0022	53703	D[a,h]anthracen	Dibenz[a,h]anthracene	0.000E+00
0023	11101	PM	Particulate Matter	0.000E+00

EMISSIONS DATA SOURCE:
CHEMICALS ADDED OR DELETED: none

AVERAGE DOSE BY PATHWAY (mg/(kg-d)) FOR CANCER CALCULATIONS

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0002	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0005	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0006	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0007	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0008	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	5.72E-05	1.07E-03	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0010	5.72E-05	1.07E-03	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0011	5.72E-05	1.07E-03	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0012	5.72E-05	1.07E-03	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0013	5.72E-05	1.07E-03	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0014	5.72E-05	1.07E-03	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0015	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0016	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0018	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	5.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0022	5.72E-05	1.07E-03	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

AVERAGE CANCER RISK

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	MEAT	ORAL	TOTAL
0001	5.72E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.72E-07
0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0004	5.72E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.72E-06
0005	3.43E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-05
0006	6.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.29E-05
0007	1.20E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-06
0008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0009	2.23E-05	1.28E-03	1.66E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-03	1.47E-03
0010	2.23E-04	1.28E-02	1.66E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-02	1.47E-02
0011	2.23E-05	1.28E-03	1.66E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-03	1.47E-03
0012	2.23E-05	1.28E-03	1.66E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-03	1.47E-03
0013	2.23E-06	1.28E-04	1.66E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-04	1.47E-04
0014	2.23E-05	1.28E-03	1.66E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-03	1.47E-03
0015	6.86E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.86E-06
0016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0017	7.43E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.43E-07
0018	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0019	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

0022	2.34E-04	4.37E-03	5.68E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-03	5.17E-03
0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUM	6.61E-04	2.24E-02	2.91E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.53E-02	2.60E-02

APPENDIX 8.1D

Construction Emissions and Impact Analysis

APPENDIX 8.1D

Construction Emissions and Impact Analysis

Onsite Construction

The initial construction of the HBRP is expected to last approximately 21 months, including 1 month of road construction, 2 months of site clearing and 18 months of project construction. Construction activities will occur in the following main phases:

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

Road Construction

Construction of the new access road along the east side of the Intake Canal will occur over approximately a 1-month period. Road construction activities will generate combustion and fugitive dust emissions similar to those described below for construction activities. The following table summarizes the emissions associated with road construction activities. Because emissions during this phase are lower than emissions during the construction phase, no further evaluation was performed.

Table 8.1D-2

Maximum Daily Emissions During Road Construction, Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}	$PM_{2.5}$
Onsite						
Construction Equipment	23.9	19.5	2.9	0.0	0.7	0.7
Fugitive Dust	--	--	--	--	9.0	2.6
Offsite						
Worker Travel, Truck Deliveries[a]	45.5	54.7	6.3	0.1	1.0	1.0
Total Emissions						
Total	69.4	74.2	9.2	0.1	10.7	4.3

Note:

a. Offsite emissions.

Site Preparation

The demolition of the painting and sandblasting building, storage building and diesel tank basin from the HBRP project site to prepare the site for construction will occur over approximately a 2-month period prior to commencement of any construction activities related to the HBRP. As with road construction and project construction activities, site preparation will generate combustion and fugitive dust emissions. The following table summarizes the emissions associated with site preparation activities. Because emissions during this phase are lower than emissions during the construction phase, no further evaluation was performed.

Table 8.1D-1

Maximum Daily Emissions During Site Preparation, Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}	$PM_{2.5}$
Onsite						
Construction Equipment	37.1	23.8	3.8	0.1	1.0	1.0
Fugitive Dust	--	--	--	--	9.5	1.7
Offsite						
Worker Travel, Truck Deliveries[a]	37.8	67.4	7.7	0.1	0.9	0.9
Total Emissions						
Total	74.9	91.2	11.5	0.2	11.4	3.6

Note:
a. Offsite Emissions

Construction Activities

The construction of HBRP will begin with site preparation activities, which include installation of drainage systems, underground utilities and conduits, grading and backfilling operations, and installation of pilings. 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 the project 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, trenching, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from portable welding machines;
- 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; 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. Maximum short-term impacts are calculated based on the equipment mix expected during Month 7 of the construction schedule. Annual emissions are based on the average equipment mix during the peak 12-month period out of the overall 18-month construction period.

Linear Facilities

The linear facilities that were constructed for the existing Humboldt Power Plant have adequate capacity to supply process water, natural gas fuel, and potable water for the HBRP project. A new 4 to 6–inch potable water pipeline will be constructed in the location of the temporary access road. The pipeline will interconnect with an existing Humboldt Community Services District (HCSD) pipeline in King Salmon Avenue. The pipeline will be constructed prior to or simultaneously with the construction of the temporary access road and not concurrently with project construction.

Transport of Heavy Equipment to HBRP Project Site

As discussed in Section 8.12, Traffic and Transportation, the Wärtsilä engines and generators will be transported to the project site by barge and heavy truck. After offloading from the ocean freighter that will deliver the engines and generators to Eureka, the heavy equipment will be loaded onto barges and transported across Humboldt Bay to Fields Landing. At Fields Landing, the equipment will be transferred to heavy haul tractors and transported north on Highway 1 to HBRP.

The tug vessels that tow the barges and the heavy haul tractor trailers will generate exhaust emissions. The following table summarizes emissions associated with the heavy equipment transportation.

Table 8.1D-3

Maximum Daily Emissions During Heavy Equipment Transportation, Pounds Per Day[a]

	NOx	CO	ROC	SOx	PM_{10}	$PM_{2.5}$
Offsite						
Barge Transport	253.9	0.2	312.8	36.8	14.7	14.7
Truck Transport	12.6	4.6	0.4	0.0	0.4	0.4
Total	266.5	4.8	313.2	36.8	15.1	15.1

Note:

a. Offsite emissions.

Available Mitigation Measures

The following typical mitigation measures are proposed to control exhaust emissions from the diesel heavy equipment and potential emissions of fugitive dust during construction of the project.

- Unpaved roads and disturbed areas in the project construction site will be watered as frequently as necessary to prevent fugitive dust plumes. The frequency of watering can be reduced or eliminated during periods of precipitation.
- The vehicle speed limit will be 15 miles per hour within the construction site.
- The construction site entrances shall be posted with visible speed limit signs.
- Construction equipment vehicle tires will be inspected and washed as necessary to be cleaned free of dirt prior to entering paved roadways.
- Gravel ramps of at least 20 feet in length will be provided at the tire washing/cleaning station.
- Unpaved exits from the construction site will be graveled or treated to prevent track-out to public roadways.
- Construction vehicles will enter the construction site through the treated entrance roadways, unless an alternative route has been submitted to and approved by the Compliance Project Manager.
- Construction areas adjacent to any paved roadway will be provided with sandbags or other measures as specified in the Storm Water Pollution Prevention Plan (SWPPP) to prevent run-off to roadways.
- Paved roads within the construction site will be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs to prevent the accumulation of dirt and debris.
- At least the first 500 feet of any public roadway exiting from the construction site shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs or on any other day when dirt or runoff from the construction site is visible on public roadways.
- Soil storage piles and disturbed areas that remain inactive for longer than 10 days will be covered or treated with appropriate dust suppressant compounds.
- Vehicles used to transport solid bulk material on public roadways and having the potential to cause visible emissions will be provided with a cover, or the materials will be sufficiently wetted and loaded onto the trucks in a manner to provide at least one foot of freeboard.
- Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) will be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition shall remain in place until the soil is stabilized or permanently covered with vegetation.

An on-site Air Quality Construction Mitigation Manager will be responsible for directing and documenting compliance with construction-related mitigation conditions.

Estimates of Emissions with Mitigation Measures - Onsite Construction

Tables 8.1D-4 and 8.1D-5 show the estimated maximum daily and annual heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures for onsite construction activities. Detailed emission calculations are included as Attachment 8.1D-1.

Table 8.1D-4

Maximum Daily Emissions During Construction, Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}	$PM_{2.5}$
Onsite						
Construction Equipment	111.9	321.4	27.5	0.2	3.4	3.4
Fugitive Dust	--	--	--	--	12.5	1.6
Offsite						
Worker Travel, Truck Deliveries[a]	240.6	411.4	47.0	0.4	5.5	5.5
Total Emissions						
Total	352.5	732.8	74.5	0.6	21.4	10.5

Note:

a. Offsite emissions.

Table 8.1D-5

Peak Annual Emissions During Project Construction, Tons Per Year

	NOx	CO	VOC	SOx	PM_{10}	$PM_{2.5}$
Onsite						
Construction Equipment	10.9	26.9	2.3	0.0	0.3	0.3
Fugitive Dust	--	--	--	--	1.1	0.1
Offsite						
Worker Travel, Truck Deliveries [a]	13.5	31.7	3.6	0.0	0.3	0.3
Total Emissions						
Total	24.4	58.6	5.9	0.0	1.7	0.7

Note:

a. Offsite emissions.

Analysis of Ambient Impacts from Onsite Construction

Ambient air quality impacts from emissions during construction of the project 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.

Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 8.1.2.5), ambient monitoring data collected from monitoring stations in the project area were used to establish the ambient background levels for the construction impact modeling analysis. Table 8.1D-6 shows the maximum concentrations of NOx, SO_2, CO, and PM_{10} recorded for 2004 through 2006.

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TABLE 8.1D-6
Maximum Background Concentrations, 2004-2006 ($\mu g/m^3$)

Pollutant	Averaging Time	2004	2005	2006
NO_2	1-hour, Willits	67.7	52.6	75.2
	1-hour, Ukiah	69.6	69.6	73.3
	Annual, Willits	15.1	15.1	17.0
	Annual, Ukiah	17.0	15.1	15.1
SO_2[a]	1-hour, SF	114.4	49.4	65.0
	3-hour, SF	70.2	33.8	39.0
	24-hour, SF	21.0	18.4	15.3
	Annual, SF	5.3	5.3	5.8
CO	1-hour, Willits	2250	2125	2,375
	1-hour, Ukiah	2875	3250	2,750
	8-hour, Willits	1300	1167	1,211
	8-hour, Ukiah	1978	1678	1,800
PM_{10}[b]	24-Hour	64	71	72.2
	Annual	20.7	13.6	21.1
$PM_{2.5}$[b]	24-Hour[c]	23	32	22
	Annual	8.1	9.1	7.6

Note:

a. SO_2 background data collected at San Francisco Arkansas Street.

b. PM_{10} and $PM_{2.5}$ data collected at Eureka I Street.

c. 24-hour average $PM_{2.5}$ value shown is 98th percentile value as that is the basis of the ambient air quality standard.

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Dispersion Model

The EPA guideline Industrial Source Complex Short Term (ISCST) model was used to estimate ambient impacts from construction activities.

The emission sources for the construction site were grouped into three categories: exhaust emissions, construction dust emissions, and windblown dust emissions. The exhaust and construction dust emissions were modeled as volume sources. The windblown dust emissions were modeled as area sources. For the volume sources, the vertical dimension was set to 6 meters. For combustion sources in the project site area, the horizontal dimension was set to 104 meters, with sigma-y = 24 meters (based on the width of the construction area).

For the windblown dust sources, the area covers the active construction area. An effective plume height of 0.5 meters was used in the modeling analysis. The construction impacts modeling analysis receptor set excluded the areas under the applicant's control, including the existing Humboldt Bay Power Plant property.

To determine the construction impacts on short-term ambient standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Table 8.1D-4 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Table 8.1D-5 were used.

As with the refined modeling discussed in Section 8.1, the construction impact modeling was performed using the 2001 to 2005 Woodley Island monitoring station meteorological data set.

Modeling Results

Based on the emission rates of NOx, SO_2, CO, and PM_{10} and the meteorological data, the ISCST 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 NOx, SO_2, CO, and PM_{10}. The annual impacts are based on the annual emission rates of these pollutants.

The 1-hour and annual average concentrations of NO_2 were computed following the revised EPA guidance for computing these concentrations (August 9, 1995 *Federal Register*, 60 FR 40465). The ISCST_OLM model was used for the 1-hour average NO_2 impacts; uncorrected 1-hour impacts are also reported for comparison. 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/NOx ratio.

The modeling analysis results are shown in Table 8.1D-7. Also included in the table are the maximum background levels that have occurred in the last 3 years and the resulting total ambient impacts. Construction impacts alone for all modeled pollutants are expected to be below the most stringent state and national standards. With the exception of the 24-hour and annual average PM_{10}, construction activities are not expected to cause an exceedance of state or federal ambient air quality standards. However, the state 24-hour and annual PM_{10} standards are exceeded in the absence of the construction emissions for the project.

The dust mitigation measures already proposed by the applicant are expected to be effective in minimizing fugitive dust emissions. The attached isopleth diagrams show the extent of the modeled impacts from construction PM_{10} for the 24-hour and annual averaging periods. The attached isopleth diagrams also show 1-hour average NO_2 modeled impacts.

Table 8.1D-7

Modeled Maximum Onsite Construction Impacts

Pollutant	Averaging Time	Maximum Impacts (µg/m³)	Background (µg/m³)	Total Impact (µg/m³)	State Standard (µg/m³)	Federal Standard (µg/m³)
NO_2 [a]	1-hour	227	75.2	302	338	--
	Annual	20	17.0	37	--	100
SO_2	1-hour	3	114.4	117	650	--
	3-hour	1	70.2	71	--	1300
	24-hour	0.3	21.0	21	109	365
	Annual	0.04	5.8	6	--	80
CO	1-hour	5,231	3,250	8,481	23,000	40,000
	8-hour	1,138	1,978	3,116	10,000	10,000
PM_{10} [b]	24-hour	27	72.2	99	50	150
	Annual	3	21.1	24	20	50
$PM_{2.5}$ [b]	24-hour	8	32	40	--	35
	Annual	1	9.1	10	12	15

Notes:

a. Ozone limiting method applied for 1-hour average, using concurrent O_3 data (1990). ARM applied for annual average, using national default 0.75 ratio.

b. PM_{10} and $PM_{2.5}$ impacts shown are from fugitive dust as well as combustion sources. Annual average $PM_{2.5}/PM_{10}$ impact from combustion sources only is 0.8 µg/m³.

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As shown on these isopleth diagrams, maximum impacts occur on the project site fenceline, and concentrations decrease rapidly within a couple of hundred meters of the project site. For example, maximum modeled 24-hour average PM_{10} impacts along the fenceline are approximately 27 µg/m³. However, impacts are reduced by half within 100 meters of the facility fenceline. Maximum impacts are reduced to about 10 µg/m³ at the freeway.

It is also important to note that emissions in an exhaust plume are dispersed through the entrainment of ambient air, which dilutes the concentration of the emissions as they are carried away from the source by winds. The process of mixing the pollutants with greater and greater volumes of cleaner air is controlled primarily by the turbulence in the atmosphere. This dispersion occurs both horizontally, as the exhaust plume rises above the emission point, and vertically, as winds carry the plume horizontally away from its source.

The rise of a plume above its initial point of release is a significant contributing factor to the reductions in ground-level concentrations, both because a rising plume entrains more ambient air as it travels downwind, and because it travels farther downwind (and thus also undergoes more horizontal dispersion) before it impacts the ground. Vertical plume rise occurs as a result of buoyancy (plume is hotter than ambient air, and hot air, being less dense, tends to rise) and/or momentum (plume has an initial vertical velocity).

In ISCST3, area sources are not considered to have either buoyant or momentum plume rise, and therefore the model assumes that there is no vertical dispersion taking place. Thus a significant source of plume dilution is ignored when sources are modeled as area sources. The project construction site impacts are not unusual in comparison to most construction project analyses. Construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause exceedances of air quality standards. The input and output modeling files are being provided electronically.

Health Risk of Diesel Exhaust

The combustion portion of annual PM_{10} emissions from Table 8.1D-5 above was modeled separately to determine the annual average Diesel PM_{10} exhaust concentration. This was used with HARP-derived risk values for Diesel exhaust particulate[3] for a 70-year lifetime to determine the potential carcinogenic risk from Diesel exhaust during construction. The exposure was also adjusted by a factor of 19/840, or 0.0226, to adjust a 70-year (840 month) lifetime to the 19-month construction exposure period.

The maximum modeled annual average concentration of Diesel exhaust PM_{10} at any location is 0.78 $\mu g/m^3$. The risk values obtained from HARP range from $2.86x10^{-4}$ (average point estimate value) to $4.15x10^{-4}$ (derived OEHHA and high end risk estimates). Using the range of risk values and adjustment factors described above, the carcinogenic risk due to exposure to Diesel exhaust during construction activities is expected to be between approximately 5 and 8 in one million. These risk estimates are less than the significance level of 10 in one million.

It is also important to note that these impacts are highly localized near the project site. The annual average Diesel combustion PM_{10} isopleth diagram in Figure 8.1D-3 shows that the area in which the risk may exceed 1 in one million (Diesel PM_{10} impact greater than or equal to approximately 0.1 $\mu g/m^3$) extends only about 700 meters beyond the facility fenceline and does not include any residences. This analysis remains conservative because, as discussed above, the modeled PM_{10} concentrations from construction operations are overpredicted by the ISCST3 model.

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At the request of ARB staff, cancer risk from DPM during construction activities was also evaluated for a 9-year exposure period. Using the high end risk estimate for DPM from HARP of $4.15x10^{-4}$ per $\mu g/m^3$ for a 70-year exposure period, the unit risk value is $9/70*4.15x10^{-4} = 5.34x10^{-5}$ per $\mu g/m^3$ for a 9-year exposure period. Therefore, the risk to the MEI based on the 9-year exposure period is

$$5.34x10^{-5} \text{ per } \mu g/m^3 * 0.78\ \mu g/m^3 = 4.16x10^{-5}$$

or about 42 in one million.

Based on the high end risk estimate, cancer risk, based on the 9-year exposure, would exceed 10 in one million where the modeled concentration exceeds

$$1x10^{-5} \div 5.34x10^{-5} \text{ per } \mu g/m^3 = 0.187\ \mu g/m^3$$

The isopleth diagram in Figure 8.1D-8 shows that even using this extremely conservative approach to assessing potential cancer risk during project construction, the area where the risk would exceed 10 in one million barely extends beyond the freeway

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[3] See Section 8.1.2.8 for a discussion of the use of the HARP model to derive cancer risk values.

area where the risk would exceed 10 in one million barely extends beyond the freeway east of the Humboldt Bay Power Plant and does not include any residences, schools or other potentially sensitive receptors.

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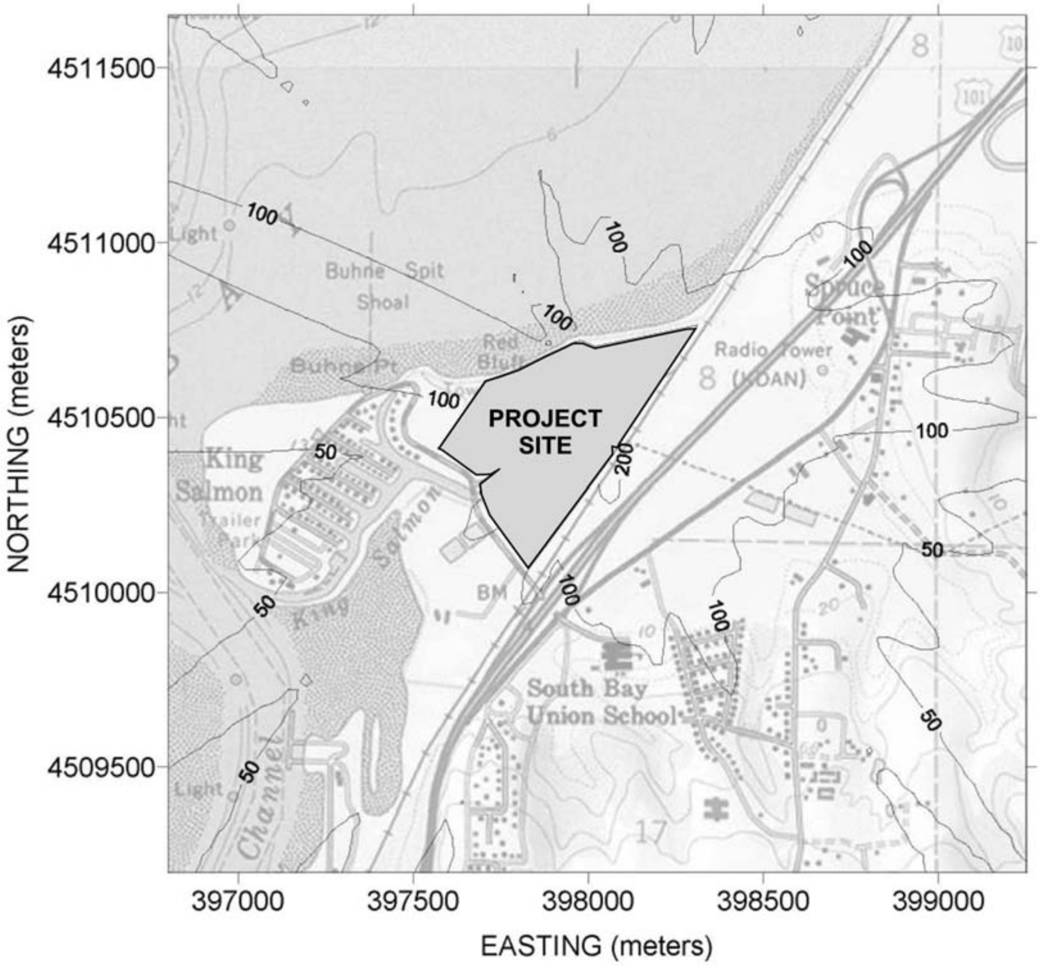
FIGURE 8.1D-1

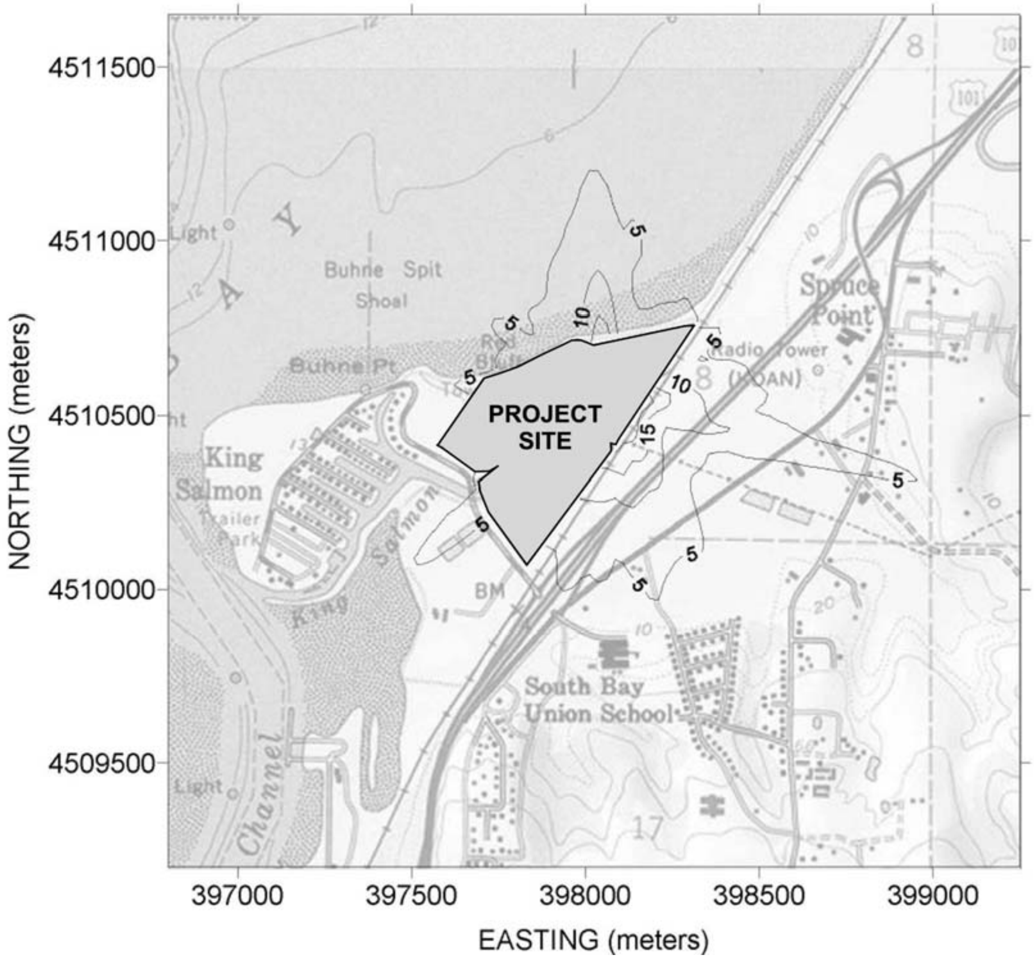
MAXIMUM 1-HOUR AVERAGE NO_2 IMPACTS DURING CONSTRUCTION ACTIVITIES (OZONE-LIMITED)



Concentrations are shown in $\mu g/m^3$.

FIGURE 8.1D-2

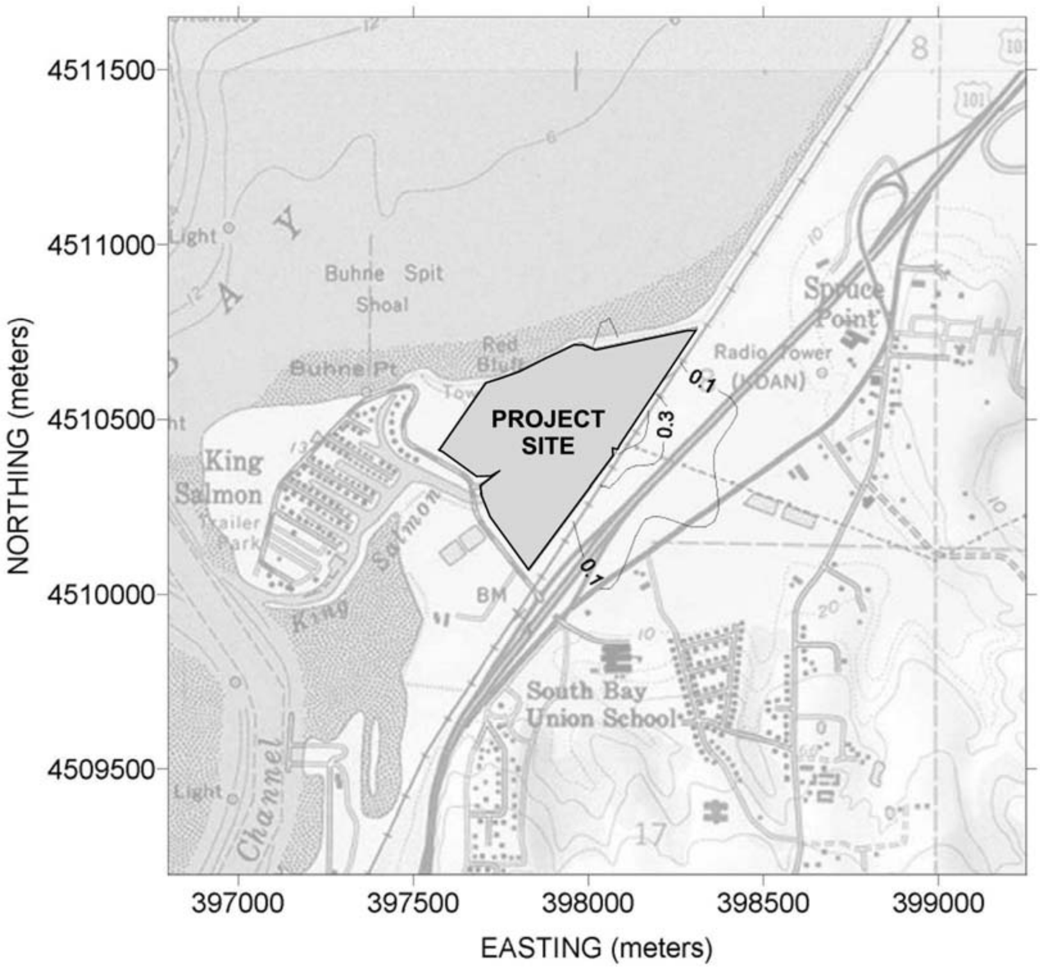
MAXIMUM 24-HOUR AVERAGE PM_{10} IMPACTS DURING CONSTRUCTION ACTIVITIES, ALL SOURCES



Concentrations are shown in $\mu g/m^3$.

FIGURE 8.1D-3

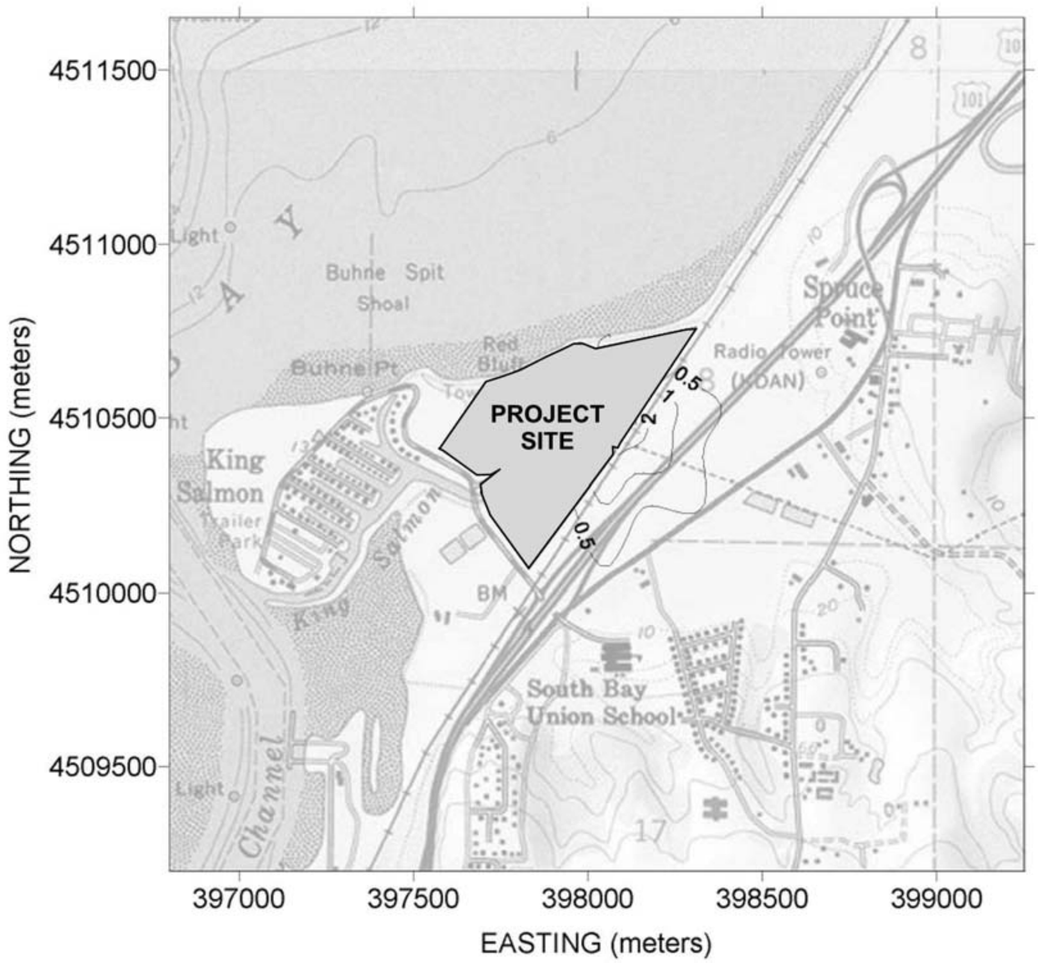
MAXIMUM ANNUAL AVERAGE $PM_{10}/PM_{2.5}$ IMPACTS DURING CONSTRUCTION ACTIVITIES, COMBUSTION SOURCES



Concentrations are shown in μg/m³.

FIGURE 8.1D-4

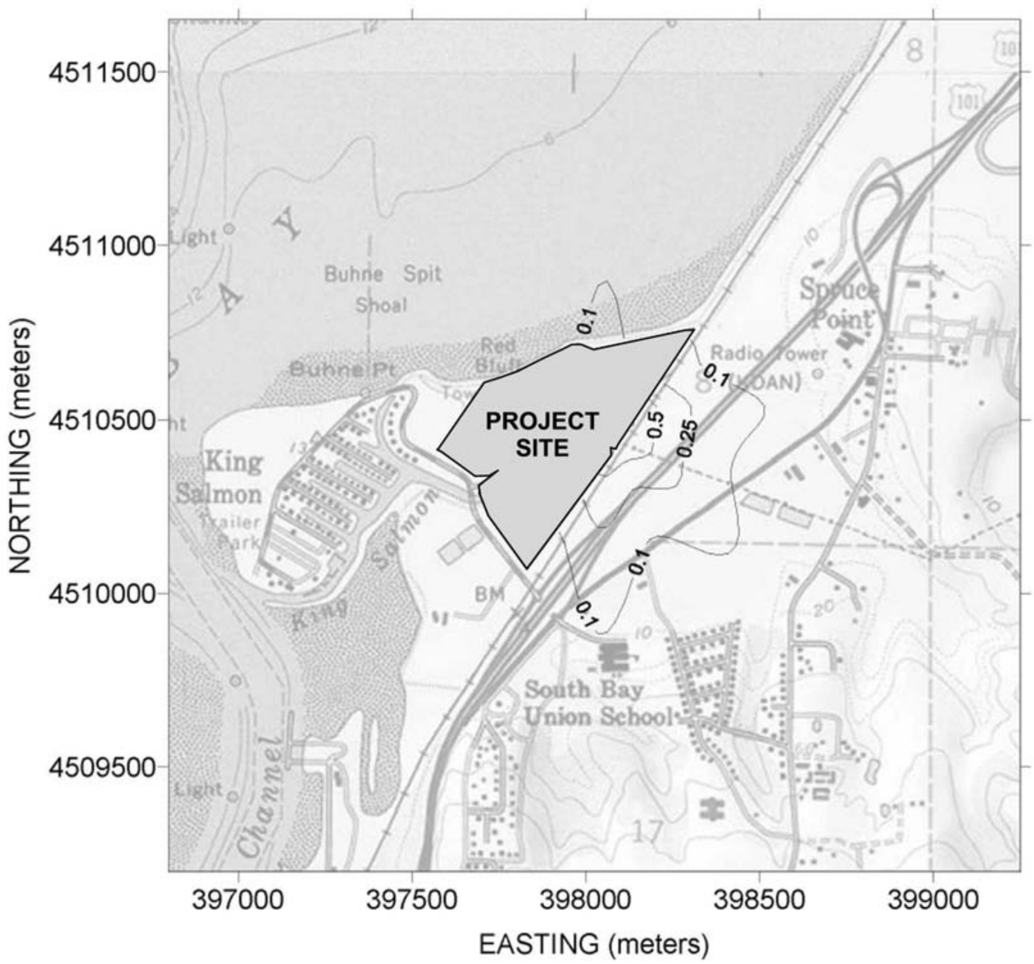
MAXIMUM ANNUAL AVERAGE PM_{10} IMPACTS DURING CONSTRUCTION ACTIVITIES, ALL SOURCES



Concentrations are shown in µg/m^3.

FIGURE 8.1D-5

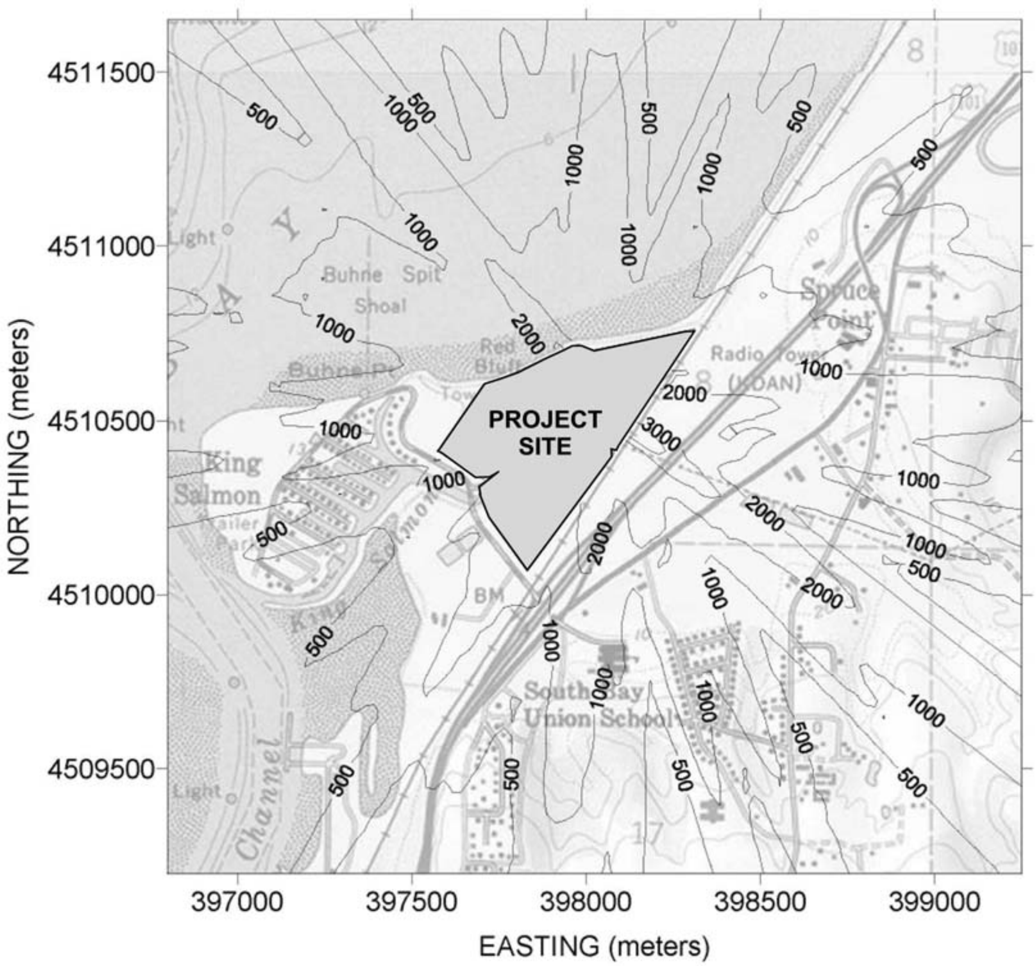
MAXIMUM ANNUAL AVERAGE $PM_{2.5}$ IMPACTS DURING CONSTRUCTION ACTIVITIES, ALL SOURCES



Concentrations are shown in µg/m^3.

FIGURE 8.1D-6

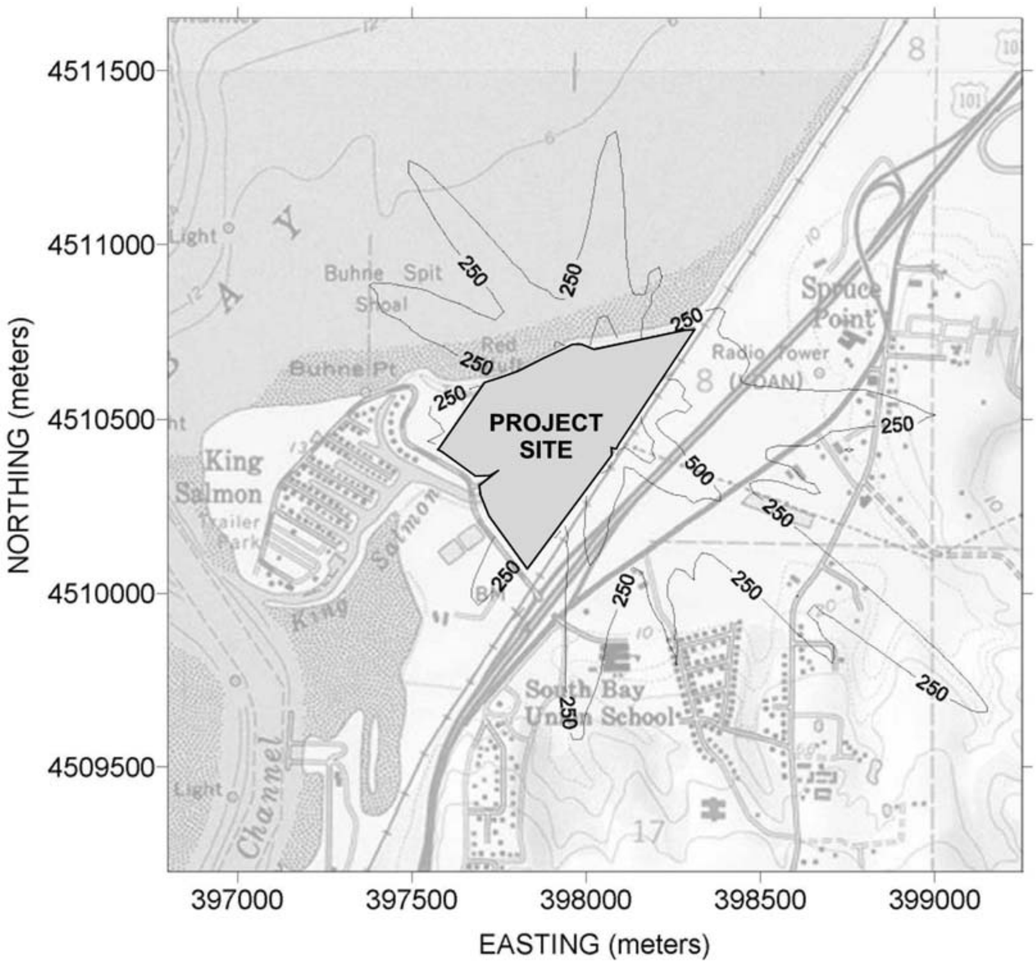
MAXIMUM 1-HOUR AVERAGE CO IMPACTS DURING CONSTRUCTION ACTIVITIES



Concentrations are shown in µg/m^3.

FIGURE 8.1D-7

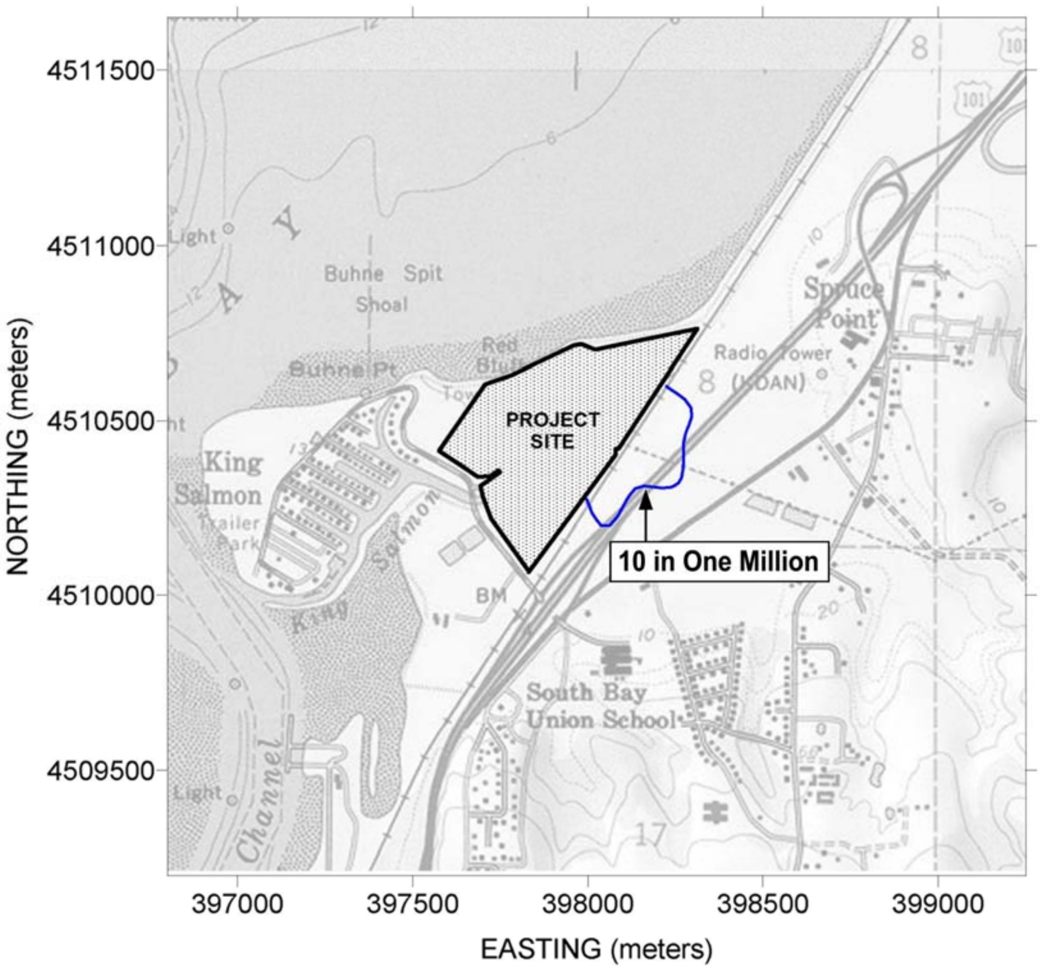
MAXIMUM 8-HOUR AVERAGE CO IMPACTS DURING CONSTRUCTION ACTIVITIES



Concentrations are shown in µg/m³.

FIGURE 8.1D-8

AREA WHERE CANCER RISK FROM DPM DURING PROJECT CONSTRUCTION EXCEEDS 10 IN ONE MILLION, 9-YEAR EXPOSURE PERIOD



ATTACHMENT 8.1D-1
DETAILED EMISSION CALCULATIONS

DETAILED CONSTRUCTION EMISSION CALCULATIONS

Onsite Combustion Emissions (Construction Phase

			Base Factors g/bhp, if Tier 1 >50 hp (1)						Appendix A Table A3 Adjustment (2)						Adjustment (3)	Adjusted Factors (g/bhp)					
Equipment	HP Cat.	Tier	BSFC lb/h	NOx	CO	VOC	SOx	PM10	Adj. Type	NOx	CO	VOC	SOx	PM10	PM10 Fuel S	BSFC	NOx	CO	VOC	SOx	PM10
Pilling machine (Driver), 640 HP	600-750	2	0.367	4.1000	1.3272	0.1669	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	2.03	0.18	0.0049	0.08
Trucks for pile delivery, 300 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Crane, pile lifting, 300 HP	300-600	2	0.367	4.3351	0.8425	0.1669	0.0050	0.1316	None	1.00	1.00	1.00	1.00	1.00	-0.086	0.367	4.34	0.84	0.17	0.0049	0.05
Truck, Soil moving, 325 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Excavator, 345 HP	300-600	2	0.367	4.3351	0.8425	0.1669	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	4.12	1.29	0.18	0.0049	0.08
Tractor, Track type, 185 HP	175-300	2	0.367	4.0000	0.7475	0.3085	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Wheel Loader, 318 HP	300-600	2	0.367	4.3351	0.8425	0.1669	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	4.12	1.29	0.18	0.0049	0.08
Compactor, 354 HP	300-600	2	0.367	4.3351	0.8425	0.1669	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	4.12	1.29	0.18	0.0049	0.08
Compactor plate, 4 HP	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Motor Grader, 165 HP	100-175	2	0.367	4.1000	0.8667	0.3384	0.0050	0.1800	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	1.33	0.36	0.0049	0.13
Concrete pump, 350 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Concrete trucks, 400 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Compactor, 83 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Troweling equipment, 4 HP	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Telehandler, 99 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Backhoe Loader, 88 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	LoLF	1.10	2.57	2.29	1.18	1.97	-0.113	0.481	5.17	6.08	0.84	0.0064	0.36
Air compressor, 49 HP	25-50	2	0.408	4.7279	1.5323	0.2789	0.0056	0.3389	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.49	2.34	0.29	0.0055	0.32
Manlift Scissors, JLG, 46 HP	25-50	2	0.408	4.7279	1.5323	0.2789	0.0056	0.3389	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.49	2.34	0.29	0.0055	0.32
Boom lift, JLG 65 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Trucks for gravel/pavement dlvr (200 HP)	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Paving equipment, 224 HP	175-300	2	0.367	4.0000	0.7475	0.3085	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Compactor, 22HP	16-25	2	0.408	4.4399	2.1610	0.4380	0.0056	0.2665	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.22	3.31	0.46	0.0055	0.23
Trucks Civil, 200 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Trucks Mechanical (includes insulators and sheet metal workers), 200 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Trucks Elect, 200 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Forklift, 10,000 lb capacity, 100 HP	100-175	2	0.367	4.1000	0.8667	0.3384	0.0050	0.1800	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	1.33	0.36	0.0049	0.13
Forklift, 8,000 lb capacity, 80 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Genie lift, 45ft, 50 HP	25-50	2	0.408	4.7279	1.5323	0.2789	0.0056	0.3389	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.49	2.34	0.29	0.0055	0.32
JLG (scissor lift), 45ft, 65 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Generator, 10kVA	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Truck (general cleanup, etc.), 200 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Welding Unit, 22 HP	16-25	2	0.408	4.4399	2.1610	0.4380	0.0056	0.2665	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.22	3.31	0.46	0.0055	0.23
Water Truck, 250 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad

		Adjusted factors lbs/1000 gallon (4)					Total Daily Fuel Use(5) (Gals/day)	Daily Emissions Lbs/day					Total Annual Peak Fuel Use(6) (Gals/yr)	Annual Emissions Lbs/yr					Total Annual Average Fuel Use(7) (Gals/yr)	Annual Emissions Lbs/yr				
Equipment	Tier	NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10
Pilling machine (Driver), 640 HP	2	164.48	85.75	7.40	0.21	3.17	0.00	0.00	0.00	0.00	0.00	0.00	4,875	801.83	418.02	36.08	1.01	15.47	3,250	534.55	278.68	24.05	0.68	10.31
Trucks for pile delivery, 300 HP	na	170.43	162.60	18.67	0.21	3.61	0.00	0.00	0.00	0.00	0.00	0.00	4,069	693.48	661.63	75.96	0.86	14.70	2,713	462.32	441.08	50.64	0.57	9.80
Crane, pile lifting, 300 HP	2	184.89	35.93	7.12	0.21	1.95	0.00	0.00	0.00	0.00	0.00	0.00	4,063	751.12	145.98	28.92	0.85	7.93	2,708	500.75	97.32	19.28	0.56	5.28
Truck, Soil moving, 325 HP	na	170.43	162.60	18.67	0.21	3.61	0.00	0.00	0.00	0.00	0.00	0.00	8,138	1386.96	1323.25	151.93	1.72	29.41	5,425	924.64	882.17	101.29	1.14	19.60
Excavator, 345 HP	2	173.91	54.43	7.40	0.21	3.17	50.00	8.70	2.72	0.37	0.01	0.16	7,583	1318.81	412.78	56.12	1.58	24.07	5,056	879.20	275.19	37.41	1.05	16.04
Tractor, Track type, 185 HP	2	160.47	48.29	13.68	0.21	3.17	0.00	0.00	0.00	0.00	0.00	0.00	1,625	260.76	78.48	22.23	0.34	5.16	1,806	289.73	87.20	24.70	0.38	5.73
Wheel Loader, 318 HP	2	173.91	54.43	7.40	0.21	3.17	35.00	6.09	1.91	0.26	0.01	0.11	4,550	791.28	247.67	33.67	0.95	14.44	4,044	703.36	220.15	29.93	0.84	12.84
Compactor, 354 HP	2	173.91	54.43	7.40	0.21	3.17	0.00	0.00	0.00	0.00	0.00	0.00	1,463	254.34	79.61	10.82	0.30	4.64	2,925	508.68	159.22	21.65	0.61	9.28
Compactor plate, 4 HP	na	195.25	7792.25	408.25	0.00	12.80	3.75	0.73	29.22	1.53	0.00	0.05	542	105.76	4220.80	221.14	0.00	6.93	397	77.56	3095.25	162.17	0.00	5.08
Motor Grader, 165 HP	2	164.48	56.00	15.00	0.21	5.69	0.00	0.00	0.00	0.00	0.00	0.00	433	71.27	24.26	6.50	0.09	2.46	867	142.55	48.53	13.00	0.18	4.93
Concrete pump, 350 HP	na	170.43	162.60	18.67	0.21	3.61	15.65	2.67	2.54	0.29	0.00	0.06	2,035	346.74	330.81	37.98	0.43	7.35	1,356	231.16	220.54	25.32	0.29	4.90
Concrete trucks, 400 HP	na	170.43	162.60	18.67	0.21	3.61	281.70	48.01	45.80	5.26	0.06	1.02	34,247	5836.81	5568.69	639.37	7.22	123.75	22,832	3891.21	3712.46	426.25	4.81	82.50
Compactor, 83 HP	2	169.60	137.47	14.65	0.21	7.55	0.00	0.00	0.00	0.00	0.00	0.00	650	110.24	89.36	9.52	0.14	4.91	433	73.49	59.57	6.35	0.09	3.27
Troweling equipment, 4 HP	na	195.25	7792.25	408.25	0.00	12.80	3.75	0.73	29.22	1.53	0.00	0.05	488	95.18	3798.72	199.02	0.00	6.24	325	63.46	2532.48	132.68	0.00	4.16
Telehandler, 99 HP	2	169.60	137.47	14.65	0.21	7.55	26.00	4.41	3.57	0.38	0.01	0.20	6,760	1146.49	929.32	99.00	1.40	51.05	6,009	1019.11	826.06	88.00	1.25	45.37
Backhoe Loader, 88 HP	2	168.09	197.65	27.34	0.21	11.71	12.50	2.10	2.47	0.34	0.00	0.15	1,625	273.14	321.18	44.43	0.34	19.03	1,444	242.79	285.50	39.49	0.30	16.91
Air compressor, 49 HP	2	170.61	89.05	11.12	0.21	12.17	6.35	1.08	0.57	0.07	0.00	0.08	826	140.84	73.51	9.18	0.17	10.05	550	93.89	49.01	6.12	0.11	6.70
Manlift Scissors, JLG, 46 HP	2	170.61	89.05	11.12	0.21	12.17	0.00	0.00	0.00	0.00	0.00	0.00	2,201	375.56	196.03	24.49	0.46	26.79	2,201	375.56	196.03	24.49	0.46	26.79
Boom lift, JLG 65 HP	2	169.60	137.47	14.65	0.21	7.55	0.00	0.00	0.00	0.00	0.00	0.00	2,201	373.35	302.62	32.24	0.46	16.62	2,201	373.35	302.62	32.24	0.46	16.62
Trucks for gravel/pavement dlvr (200 HP)	na	54.03	374.19	43.02	0.19	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	2,261	122.13	845.87	97.25	0.43	2.26
Paving equipment, 224 HP	2	160.47	48.29	13.68	0.21	3.17	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	650	104.30	31.39	8.89	0.14	2.06
Compactor, 22HP	2	160.21	125.59	17.47	0.21	8.79	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	183	29.39	23.04	3.20	0.04	1.61
Trucks Civil, 200 HP	na	54.03	374.19	43.02	0.19	1.00	78.25	4.23	29.28	3.37	0.01	0.08	14,581	787.75	5455.87	627.28	2.77	14.59	11,077	598.44	4144.77	476.54	2.11	11.08
Trucks Mechanical (includes insulators and sheet metal workers), 200 HP	na	54.03	374.19	43.02	0.19	1.00	78.25	4.23	29.28	3.37	0.01	0.08	11,868	641.19	4440.82	510.58	2.26	11.87	12,207	659.51	4567.70	525.16	2.32	12.21
Trucks Elect, 200 HP	na	54.03	374.19	43.02	0.19	1.00	46.95	2.54	17.57	2.02	0.01	0.05	6,104	329.75	2283.85	262.58	1.16	6.11	7,234	390.82	2706.79	311.21	1.38	7.24
Forklift, 10,000 lb capacity, 100 HP	2	164.48	56.00	15.00	0.21	5.69	18.50	3.04	1.04	0.28	0.00	0.11	2,405	395.57	134.67	36.09	0.50	13.68	2,806	461.50	157.12	42.10	0.58	15.96
Forklift, 8,000 lb capacity, 80 HP	2	169.60	137.47	14.65	0.21	7.55	20.00	3.39	2.75	0.29	0.00	0.15	2,600	440.96	357.43	38.08	0.54	19.63	2,889	489.95	397.14	42.31	0.60	21.81
Genie lift, 45ft, 50 HP	2	170.61	89.05	11.12	0.21	12.17	12.70	2.17	1.13	0.14	0.00	0.15	1,651	281.67	147.02	18.36	0.34	20.10	1,834	312.97	163.36	20.41	0.38	22.33
JLG (scissor lift), 45ft, 65 HP	2	169.60	137.47	14.65	0.21	7.55	12.70	2.15	1.75	0.19	0.00	0.10	2,477	420.01	340.45	36.27	0.51	18.70	3,027	513.35	416.11	44.33	0.63	22.86
Generator, 10kVA	na	195.25	7792.25	408.25	0.00	12.80	12.70	2.48	98.96	5.18	0.00	0.16	2,201	429.81	17153.34	898.69	0.00	28.17	1,468	286.54	11435.56	599.13	0.00	18.78
Truck (general cleanup, etc.), 200 HP	na	54.03	374.19	43.02	0.19	1.00	31.30	1.69	11.71	1.35	0.01	0.03	5,425	293.11	2030.09	233.41	1.03	5.43	5,877	317.54	2199.26	252.86	1.12	5.88
Welding Unit, 22 HP	2	160.21	125.59	17.47	0.21	8.79	38.10	6.10	4.78	0.67	0.01	0.33	8,117	1300.52	1019.45	141.80	1.69	71.35	6,145	984.58	771.79	107.35	1.28	54.01
Water Truck, 250 HP	na	170.43	162.60	18.67	0.21	3.61	31.30	5.33	5.09	0.58	0.01	0.11	7,460	1271.38	1212.98	139.27	1.57	26.96	6,104	1040.22	992.44	113.95	1.29	22.05
Total =							815.45	111.87	321.37	27.47	0.16	3.21	153,261.33	21,725.70	53,798.71	4,681.00	30.67	627.57	130,304.78	17,698.60	42,621.40	3,909.73	26.05	526.30
														10.86	26.90	2.34	0.02	0.31		8.85	21.31	1.95	0.01	0.26

Daily and Annual Dust Emissions (Construction Phase)

Daily Fugitive Dust Emissions (peak month)									
Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM2.5 Emission Factor(1) (lbs/unit)	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/day)
Excavator	1	1,260.0	1,260.0	tons	5.3E-05	0.0015	0%	0.07	1.90
Backhoe	1	787.5	787.5	tons	5.3E-05	0.0015	0%	0.04	1.19
Truck, Civil - Unpaved Road Travel	5	0.7	3.4	vmt	0.22	1.4328	94%	0.04	0.28
Truck, Cleanup - Unpaved Road Travel	2	0.7	1.4	vmt	0.22	1.4328	94%	0.02	0.11
Truck, Concrete - Unpaved Road Travel	18	0.7	12.3	vmt	0.46	2.9806	94%	0.32	2.07
Loader - Unloading	1	525.0	525.0	tons	1.98E-05	0.0001	0%	0.01	0.03
Loader - Unpaved Road Travel	1	0.9	0.9	vmt	0.50	3.2508	94%	0.03	0.17
Forklift - Unpaved Road Travel	4	2.0	7.8	vmt	0.26	1.7100	94%	0.12	0.76
Truck, Water - Unpaved Road Travel	2	4.1	8.2	vmt	0.44	2.8400	94%	0.20	1.31
Truck, Mechanical - Unpaved Road Travel	5	0.7	3.4	vmt	0.22	1.4328	94%	0.04	0.28
Truck, Electrical - Unpaved Road Travel	3	0.7	2.0	vmt	0.22	1.4328	94%	0.03	0.17
Windblown Dust (active construction area)	N/A	117,360.0	117,360.0	sq.ft.	6.73E-06	1.682E-05	94%	0.04	0.11
Delivery Truck Unpaved Road Travel	45	0.7	31.6	vmt	0.35	2.3088	94%	0.63	4.12
Total =								1.58	12.50

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

Peak Annual Fugitive Dust Emissions					
Activity	Average Daily PM2.5 Emissions(1) (lbs/day)	Average Daily PM10 Emissions(1) (lbs/day)	Days per Year	Annual PM2.5 Emissions (tons/yr)	Annual PM10 Emissions (tons/yr)
Construction Activities	0.98	7.89	260	0.13	1.03
Windblown Dust	0.04	0.11	365	0.01	0.02
Total =				0.14	1.05

Notes:
(1) Based on average of daily emissions during peak 12-month construction period.

Offsite Delivery Truck Emissions (Construction Phase)

Delivery Truck Daily Emissions (Maximum Monthly)													
Number of Deliveries Per Day(1)	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Day	Emission Factors (lbs/vmt)(1)					Daily Emissions (lbs/day)					
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
45	134	6030	0.0368	0.0351	0.0040	0.0000	0.0008	221.62	211.44	24.28	0.27	4.70
Idle exhaust (2)												0.189

Delivery Truck Peak Annual Emissions												
Number of Deliveries Per Year	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Year	Emission Factors (lbs/vmt)(1)					Annual Emissions (tons/yr)				
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
4680	134	627120.00	0.0368	0.0351	0.0040	0.0000	0.0008	11.52	10.99	1.26	0.01	0.24
Idle exhaust (2,3)												0.00983

Notes:
(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, Humboldt County, model years 1965 to 2008.
(2) Peak annual number of trucks per year times 1 hr idle time per visit times 0.0042 lb/hr
(3) Based on 1.91 g/hr idle emission rate for the composite HDD truck fleet in 2001 from EPA's PART5 model.

Offsite Worker Travel Emissions (Construction Phase)

Worker Travel Daily Emissions (Maximum Monthly)														
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)(1)					Daily Emissions (lbs/day)				
					NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
145	1	145	67	9,715	0.0019	0.0206	0.0023	0.0000	0.0001	18.94	199.93	22.67	0.08	0.76

Worker Travel Peak Annual Emissions															
Average Number of Workers Per Day	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)(1)					Annual Emissions (tons/yr)				
						NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
125	1	125	67	240	2,015,360	0.0019	0.0206	0.0023	0.0000	0.0001	1.96	20.74	2.35	0.01	0.08

Notes:
(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, Humboldt County, model years 1965 to 2008.

DETAILED SITE CLEARING EMISSION CALCULATIONS

Onsite Combustion Emissions (Site Clearing)

Equipment	HP Cat.	Tier	Base Factors g/bhp, if Tier 1 >50 hp (1) BSFC lb/hp	NOx	CO	VOC	SOx	PM10	Appendix A Table A3 Adjustment (2) Adj. Type	NOx	CO	VOC	SOx	PM10	Adjustment (3) PM10 Fuel S	Adjusted Factors (g/bhp) BSFC	NOx	CO	VOC	SOx	PM10
Backhoe, 75 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Crane, 200 HP	175-300	2	0.367	4.0000	0.7475	0.3085	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Excavator, 290 HP	175-300	2	0.367	4.0000	0.7475	0.3085	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Forklift, 100 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Loader, 190 HP	175-300	2	0.367	4.0000	0.7475	0.3085	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Excavator, 130 HP	300-600	2	0.367	4.3351	0.8425	0.1669	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	4.12	1.29	0.18	0.0049	0.08
Scraper, 200 HP	175-300	2	0.367	4.0000	0.7475	0.3085	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Motor Grader, 185 HP	100-175	2	0.367	4.1000	0.8667	0.3384	0.0050	0.1800	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	1.33	0.36	0.0049	0.13
Compactor, 110 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Truck (dump), 400 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Truck (general), 200 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Water Truck, 300 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad

Equipment	Tier	Adjusted factors lbs/1000 gallon (4) NOx	CO	VOC	SOx	PM10	Total Daily Fuel Use(5) (Gals/day)	Daily Emissions Lbs/day NOx	CO	VOC	SOx	PM10
Backhoe, 75 HP	2	169.60	137.47	14.65	0.21	7.55	15.00	2.54	2.06	0.22	0.00	0.11
Crane, 200 HP	2	160.47	48.29	13.68	0.21	3.17	31.25	5.01	1.51	0.43	0.01	0.10
Excavator, 290 HP	2	160.47	48.29	13.68	0.21	3.17	35.00	5.62	1.69	0.48	0.01	0.11
Forklift, 100 HP	2	169.60	137.47	14.65	0.21	7.55	9.25	1.57	1.27	0.14	0.00	0.07
Loader, 190 HP	2	160.47	48.29	13.68	0.21	3.17	25.00	4.01	1.21	0.34	0.01	0.08
Excavator, 130 HP	2	173.91	54.43	7.40	0.21	3.17	11.25	1.96	0.61	0.08	0.00	0.04
Scraper, 200 HP	2	160.47	48.29	13.68	0.21	3.17	27.50	4.41	1.33	0.38	0.01	0.09
Motor Grader, 185 HP	2	164.48	56.00	15.00	0.21	5.69	20.00	3.29	1.12	0.30	0.00	0.11
Compactor, 110 HP	2	169.60	137.47	14.65	0.21	7.55	15.00	2.54	2.06	0.22	0.00	0.11
Truck (dump), 400 HP	na	170.43	162.60	18.67	0.21	3.61	15.65	2.67	2.54	0.29	0.00	0.06
Truck (general), 200 HP	na	54.03	374.19	43.02	0.19	1.00	15.65	0.85	5.86	0.67	0.00	0.02
Water Truck, 300 HP	na	170.43	162.60	18.67	0.21	3.61	15.65	2.67	2.54	0.29	0.00	0.06
Total =							236.20	37.14	23.81	3.84	0.05	0.95

Daily Dust Emissions (Site Clearing)

Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM2.5 Emission Factor(1) (lbs/unit)	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/day)
Daily Fugitive Dust Emissions (peak month)									
Backhoe	1	787.5	787.5	tons	5.3E-05	0.0015081	0	0.04	1.19
Crane	1	na	na	na	0	0	0	0	0
Excavator	1	1260	1,260.0	tons	5.3E-05	0.0015081	0	0.07	1.90
Forklift	1	2.0	2.0	vmt	0.262197	1.7099803	94%	0.03	0.19
Loader	1	525	525.0	tons	1.98E-05	6.303E-05	0	0.01	0.03
Excavator	1	1,260.0	1,260.0	tons	5.3E-05	0.0015	0%	0.07	1.90
Grader	1	9.0	9.0	vmt	0.01933	0.2754	94%	0.01	0.14
Scraper	1	5.0	5.0	hrs	0.23	0.4194	0%	1.15	2.10
Truck, Dump - Unpaved Road Travel	1	1.9	1.9	vmt	0.44	2.84	94%	0.05	0.30
Truck, General - Unpaved Road Travel	1	1.9	1.9	vmt	0.22	1.4328	94%	0.02	0.15
Truck, Water - Unpaved Road Travel	1	4.1	4.1	vmt	0.44	2.8400	94%	0.10	0.66
Windblown Dust (active construction area)	N/A	117,360.0	117,360.0	sq.ft.	6.73E-06	1.682E-05	94%	0.04	0.11
Delivery Truck Unpaved Road Travel	9	0.7	6.3	vmt	0.35	2.3088	94%	0.13	0.82
Total =								1.72	9.50

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

Offsite Delivery Truck Emissions (Site Clearing)

Delivery Truck Daily Emissions (Maximum Monthly)													
Number of Deliveries Per Day(1)	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Day	Emission Factors (lbs/vmt)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10
7	134	938	0.0368	0.0351	0.0040	0.0000	0.0008	34.47	32.89	3.78	0.04	0.73
Idle exhaust (2)												0.0294

Notes:

(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, Humboldt County, model years 1965 to 2008.

(2) Peak annual number of trucks per year times 1 hr idle time per visit times 0.0042 lb/hr

(3) Based on 1.91 g/hr idle emission rate for the composite HDD truck fleet in 2001 from EPA's PART5 model.

Offsite Worker Travel Emissions (Site Clearing)

Worker Travel Daily Emissions (Maximum Monthly)														
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)(1)					Daily Emissions (lbs/day)				
					NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
25	1	25	67	1,675	0.0019	0.0206	0.0023	0.0000	0.0001	3.27	34.47	3.91	0.01	0.13

Notes:
(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, Humboldt County, model years 1965 to 2008.

DETAILED ROAD CONSTRUCTION EMISSION CALCULATIONS

Onsite Combustion Emissions (Road Construction Phase)

			Base Factors g/bhp, if Tier 1 >50 hp (1)						Appendix A Table A3 Adjustment (2)						Adjustment (3)	Adjusted Factors (g/bhp)					
Equipment	HP Cat.	Tier	BSFC lb/h	NOx	CO	VOC	SOx	PM10	Adj. Type	NOx	CO	VOC	SOx	PM10	PM10 Fuel S	BSFC	NOx	CO	VOC	SOx	PM10
Excavator, 130 HP	300-600	2	0.367	4.3351	0.8425	0.1669	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	4.12	1.29	0.18	0.0049	0.08
Scraper, 200 HP	175-300	2	0.367	4.0000	0.7475	0.3085	0.0050	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Motor Grader, 185 HP	100-175	2	0.367	4.1000	0.8667	0.3384	0.0050	0.1800	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	1.33	0.36	0.0049	0.13
Compactor, 110 HP	50-100	2	0.408	4.7000	2.3655	0.3672	0.0056	0.2400	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.47	3.62	0.39	0.0055	0.20
Truck (general), 200 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Water Truck, 300 HP	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad

	Adjusted factors lbs/1000 gallon (4)						Total Daily Fuel Use(5) (Gals/day)	Daily Emissions Lbs/day				
Equipment	Tier	NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10
Excavator, 130 HP	2	173.91	54.43	7.40	0.21	3.17	4.50	0.78	0.24	0.03	0.00	0.01
Scraper, 200 HP	2	160.47	48.29	13.68	0.21	3.17	46.20	7.41	2.23	0.63	0.01	0.15
Motor Grader, 185 HP	2	164.48	56.00	15.00	0.21	5.69	33.60	5.53	1.88	0.50	0.01	0.19
Compactor, 110 HP	2	169.60	137.47	14.65	0.21	7.55	27.60	4.68	3.79	0.40	0.01	0.21
Truck (general), 200 HP	na	54.03	374.19	43.02	0.19	1.00	18.78	1.01	7.03	0.81	0.00	0.02
Water Truck, 300 HP	na	170.43	162.60	18.67	0.21	3.61	26.29	4.48	4.28	0.49	0.01	0.10
Total =							156.97	23.90	19.45	2.87	0.03	0.67

Daily Dust Emissions (Road Construction Phase)

Daily Fugitive Dust Emissions (peak month)										
Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM2.5 Emission Factor(1) (lbs/unit)	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/day)
Excavator	1	1,260.0	1,260.0	tons	5.3E-05	0.0015	0%	0.07	1.90
Grader	1	9.0	9.0	vmt	0.01933	0.2754	94%	0.01	0.14
Scraper	1	8.4	8.4	hrs	0.23	0.4194	0%	1.94	3.52
Truck, Cleanup - Unpaved Road Travel	1	1.9	1.9	vmt	0.22	1.4328	94%	0.02	0.15
Truck, Water - Unpaved Road Travel	1	19.1	19.1	vmt	0.44	2.8400	94%	0.47	3.07
Windblown Dust (active construction area)	N/A	20,000.0	20,000.0	sq.ft.	6.73E-06	1.682E-05	94%	0.01	0.02
Delivery Truck Unpaved Road Travel	9	0.2	1.7	vmt	0.35	2.3088	94%	0.03	0.22
Total =								2.55	9.03

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

Offsite Delivery Truck Emissions (Road Construction Phase)

Delivery Truck Daily Emissions (Maximum Monthly)													
Number of Deliveries Per Day(1)	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Day	Emission Factors (lbs/vmt)(1)					Daily Emissions (lbs/day)					
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10	
9	134	1206	0.0368	0.0351	0.0040	0.0000	0.0008	44.32	42.29	4.86	0.05	0.94	
Idle exhaust (2)												0.0378	

Notes:

(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, Humboldt County, model years 1965 to 2008.

(2) Peak annual number of trucks per year times 1 hr idle time per visit times 0.0042 lb/hr

(3) Based on 1.91 g/hr idle emission rate for the composite HDD truck fleet in 2001 from EPA's PART5 model.

Offsite Worker Travel Emissions (Road Construction Phase)

Worker Travel Daily Emissions (Maximum Monthly)														
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)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10
9	1	9	67	603	0.0019	0.0206	0.0023	0.0000	0.0001	1.18	12.41	1.41	0.01	0.05

Notes:
(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, Humboldt County, model years 1965 to 2008.

DETAILED HEAVY TRANSPORT EMISSION CALCULATIONS

On-Road Combustion Emissions (Heavy Haul)

				Base Factors g/bhp, if Tier 1 >50 hp (1)					Appendix A Table A3 Adjustment (2)						Adjustment (3)	Adjusted Factors (g/bhp)					
Equipment	HP Cat.	Tier	BSFC lb/hp	NOx	CO	VOC	SOx	PM10	Adj. Type	NOx	CO	VOC	SOx	PM10	PM10 Fuel S	BSFC	NOx	CO	VOC	SOx	PM10
Heavy Truck	600-750	1	0.367	5.8215	1.3272	0.1473	0.0050	0.2201	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	5.53	2.03	0.15	0.0049	0.18

	Adjusted factors lbs/1000 gallon (4)						Total Daily Fuel Use(5) (Gals/day)	Daily Emissions Lbs/day				
Equipment	Tier	NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10
Heavy Truck	1	233.54	85.75	6.53	0.21	7.77	54.00	12.61	4.63	0.35	0.01	0.42

Calculation of Tug/Barge Emissions During Transport of Engines to Plant Site

Activity	Distance, miles	Speed, mph	Time, hrs	Engine Load Mains	Engine Load Gens	Weighted Mains	Weighted Gens
Tow Loaded Barge: Simpson Samoa Dock to Fields Landing	6	1	6	40%	50%	26.1%	32.6%
Idle at dock during unloading	0	0	2	10%	50%	2.2%	10.9%
Return Empty Barge to Simpson Samoa Dock	6	5	1.2	50%	50%	6.5%	6.5%
Daily Total			9.2			34.8%	50.0%

	Pollutant NOx	SO2	CO	ROC	PM10
Emission Factor, g/bhp-hr	6.9	0.005	8.5	1	0.4
Full Load Em Rate, Mains, lb/hr	76.06	0.06	93.69	11.02	4.41
Full Load Em Rate, Gens lb/hr	2.28	0.00	2.81	0.33	0.13
Max. Hourly Operating Emissions, lb/hr	39.17	0.03	48.25	5.68	2.27
Max. Daily Operating Emissions, lb/day	253.9	0.2	312.8	36.8	14.7
Max. Total Barge Transport Emissions, lb	5,077.6	3.7	6,255.1	735.9	294.4

Emission Factor Source:
URBEMIS2002, Appendix H, 2000
Assumptions:

Tug Boat Main Generator Engine	5000	bhp
Tug Boat Aux Generator Engine	150	bhp
Round trips per day	1	
Total round trips	20	

NOTES - EMISSION CALCULATIONS

Notes - Fugitive Dust Emission Calculations

Wind erosion of active construction area - 'Source: "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996

Level 2 Emission Factor =	0.011	ton/acre-month
Construction Schedule =	30	days/month
=	0.7	lbs/acre-day
=	1.682E-05	PM10 lbs/scf-day
	6.7278E-06	PM2.5 lbs/scf-day

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
k = particle size constant =	0.11	for PM2.5
U = average wind speed =	2.14	m/sec (based on average of five years of wind data for Humboldt)
=	4.79	mph
M = moisture content =	15.0%	(SCAQMD CEQA Handbook, Table A9-9-G-1, moist soil)
E = PM10 emission factor =	0.0001	lb/ton
E = PM2.5 emission factor =	0.00002	lb/ton

Loader Unpaved Road Travel - Source: AP-42, Section 13.2.2, 12/03

E = (k)[(s/12)^0.9][(W/3)^0.45]

k = particle size constant =	1.5	for PM10
k = particle size constant =	0.23	for PM2.5
s = surface silt content =	8.50	(AP-42, Table 13.2.2-1, 12/03, construction haul route)
W = avg. vehicle weight =	33.35	tons (avg. of loaded and unloaded weights, 980H loader, Caterpillar Performance Handbook, 2006)
E = PM10 emission factor =	3.25	lb PM10/VMT
E = PM2.5 emission factor =	0.50	lb PM2.5/VMT
Soil Density =	1.05	ton/yd3 (Caterpillar Performance Handbook, 10/89)
Loader Bucket Capacity =	5	yd3 (980H loader, Caterpillar Performance Handbook, 2006)
=	5.25	ton/load
Daily Soil Transfer Rate =	525	ton/day (operating 5 hrs/day)
Daily Loader Trips =	100	loading trips/day
Loading Travel Distance =	50	ft/load (estimated)
Daily Loader Travel Distance =	5,000	ft/day
=	0.9	mi/day

Excavator Trenching - Source: AP-42, Table 11.9-1 (dragline operations), 7/98

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

d = drop height =	3	ft (estimated)
M = moisture content =	15.0%	(SCAQMD CEQA Handbook, Table A9-9-G-1, moist soil)
E = PM10 emission factor =	0.0015	PM10 lb/ton
E = PM2.5 emission factor =	0.0001	PM2.5 lb/ton
Excavating Rate =	240.0	yd3/hr (based on 2.0 yd3 bucket on a Cat. 345 excavator and a 30 sec. Cycle time)
=	1,200	yd3/day for 1 unit @ 5 hrs/day of operation
Soil Density =	1.0500	ton/yd3 (Caterpillar Performance Handbook, 10/89)
Daily Soil Transfer Rate =	1260.0000	ton/day (estimated)

Notes - Fugitive Dust Emission Calculations

Unpaved Road Travel - Source: AP-42, Section 13.2.2, 12/03.

E = (k)[(s/12)^0.9*(W/3)^0.45

k = particle size constant =	1.5	for PM10
k = particle size constant =	0.23	for PM2.5
s = silt fraction =	8.50	(AP-42, Table 13.2.2-1, 12/03, constructio
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 = 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 = 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 = 3 ton truck avg. veh. Wt =	5.4	tons (estimate)
W = scraper avg. veh. wt. =	28.2	tons empty (615 scraper, Caterpillar Performance Handbook, 10/89)
	48.6	tons loaded (615 scraper, Caterpillar Performance Handbook, 10/89)
	38.4	tons mean weight
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

E = water truck emission factor =	2.84	lb PM10/VMT
E = dump truck emission factor =	2.98	lb PM10/VMT
E = forklift emiss. factor =	1.71	lb PM10/VMT
E = auto/pickup emiss. factor =	0.99	lb PM10/VMT
E = delivery truck emiss. factor =	2.98	lb PM10/VMT
E = 3-ton truck emiss. factor =	1.43	lb PM10/VMT
E = scraper emiss. factor =	3.46	lb PM10/VMT
E = fuel truck emiss. factor =	2.13	lb PM10/VMT
E = water truck emission factor =	0.44	lb PM2.5/VMT
E = dump truck emission factor =	0.46	lb PM2.5/VMT
E = forklift emiss. factor =	0.26	lb PM2.5/VMT
E = auto/pickup emiss. factor =	0.15	lb PM2.5/VMT
E = delivery truck emiss. factor =	0.46	lb PM2.5/VMT
E = 3-ton truck emiss. factor =	0.22	lb PM2.5/VMT
E = scraper emiss. factor =	0.53	lb PM2.5/VMT
E = fuel truck emiss. factor =	0.33	lb PM2.5/VMT

Gravel Road Travel - Source: AP-42, Section 13.2.2, 12/03.

E = (k)[(s/12)^0.9*(W/3)^0.45

k = particle size constant =	1.5	for PM10
k = particle size constant =	0.23	for PM2.5
s = silt fraction =	6.40	(AP-42, Table 13.2.2
W = water truck avg. veh. weight =	10.0	tons empty (estimate
=	39.4	tons loaded (estimat water capacity)
=	24.7	tons average
W = dump truck avg. veh. weight =	15.0	tons (for heavy duty
=	40.0	tons (for heavy duty
=	27.5	tons (for heavy duty
W = forklift avg. veh. weight =	8.0	tons empty (estimate
W = auto/pickup avg. vehicle weight =	2.4	tons (CARB Area So
W = delivery truck avg. veh. wt. =	27.5	tons (for heavy duty

E = auto/pickup emiss. factor =	0.77	lb PM10/VMT
E = delivery truck emiss. factor =	2.31	lb PM10/VMT
E = auto/pickup emiss. factor =	0.12	lb PM2.5/VMT
E = delivery truck emiss. factor =	0.35	lb PM2.5/VMT

Notes - Fugitive Dust Emission Calculations
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 =	0.26	mm/hr (EPA document, Figure 3-2, summer)
evaporation rate =	0.196	mm/hr (EPA document, Figure 3-2, annual)
d = average hourly daytime traffic rate =	37.0	vehicles/hr (estimated)
t = time between watering applications =	1.00	hr/application (estimated)
i = application intensity =	1.4	L/m2 (typical level in EPA document, page 3-23)
C = average summer watering control efficienc	94.3%	
C = average annual watering control efficiency	95.7%	

Finish Grading - Source: AP-42, Table 11.9-1, 7/98

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

S = mean vehicle speed =	3.0	mph (estimate)
E = emission factor =	0.2754	PM10 lb/VMT
E = emission factor =	0.0193	PM2.5 lb/VMT

Bulldozer Operation and Scraper Excavation - Source: AP-42, Table 11.9.1, 7/98

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

s = silt content =	8.5%	(AP-42, Table 13.2.2-1, 12/03, construction haul route)
M = moisture content =	15.0%	(SCAQMD CEQA Handbook, Table A9-9-G-1)
E = emission factor =	0.42	PM10 lb/hr
E = emission factor =	0.23	PM2.5 lb/hr

Scraper Travel

W = mean vehicle weight =	28.2	tons empty (615E scraper, Caterpillar Performance Handbook, 10/89)
=	48.6	tons loaded (615E scraper, Caterpillar Performance Handbook, 10/89)
=	38.4	tons mean weight
Daily Scraper Haul Tonnage =	1,428	ton/day (estimated)
Scraper Load =	20.4	ton (615E scraper, Caterpillar Performance Handbook, 10/89)
Daily Scraper Loads =	70.00	loads/day
Daily Scraper Hauling Distance =	0.08	miles/load (estimated)
Daily Scraper Travel =	11.36	miles/day

Backhoe

Excavating Rate =	150.0	yd3/hr (based on 1.25 yd3 bucket on a Cat. 428D backhoe and a 30 sec. cycle time)
	750	yd3/day for 1 excavator @ 5 hrs/day of operation
Soil Density =	1.05	ton/yd3 (Caterpillar Performance Handbook, 10/89)
Daily Soil Transfer Rate =	788	ton/day (estimated)

Notes: Onsite Combustion Emissions

(1) - Steady State Emission Factors from Table A2 of EPA November 2002 NR-009b Publication.
(2) - In use adjustment factors per Table A3 EPA November 2002 NR-009b Publication.
(3) - PM10 and SO2 adjustments due to Equation 5 and Equation 7 on pages 18 and 19, Respectively of EPA Report No. NR-009b
(4) - Calculation uses adjusted BSFC and assumed 7.1 lbs/gallon. The onroad emission factors are not adjusted.
(5) - Daily fuel use based on peak combustion month equipment schedule.
(6) - Annual fuel use based on average level during peak 12-month period.
(7) - Annual fuel use based on average level during entire construction period.

APPENDIX 8.1E

Evaluation of Best Available Control Technology (BACT)

APPENDIX 8.1E

Evaluation of Best Available Control Technology (BACT)

BACT Requirements

Summary of BACT Determination

The emission rates determined to be BACT for this project are summarized below. The information considered in making these determinations is discussed in detail in the following sections.

Natural Gas Firing (except during startup and shutdown)

- NOx emission limit of 6.0 ppmv @ 15% O_2 constitutes BACT for lean-burn reciprocating engines fired on natural gas. This level, once demonstrated, will establish a new achieved-in-practice BACT level for lean-burn engines. Utilizing SCR with a design exhaust NOx concentration of 6.0 ppmv at 15% O_2, the proposed project will comply with the BACT NOx emission limit.

- ROC emission limit of 28 ppmv @ 15% O_2 constitutes BACT for lean-burn reciprocating engines capable of meeting 6 ppm NOx fired on natural gas. At a design exhaust ROC concentration of 28.0 ppmv at 15% O_2, the HBRP engines will meet an ROC limit that is comparable to the most stringent BACT limit achieved in practice by similar engines, while significantly reducing NOx emission levels to a new standard.

- CO emission limit of 13 ppmv @ 15% O_2 constitutes BACT for natural gas-fired lean-burn reciprocating engines. Utilizing a CO catalyst, with a design exhaust CO concentration of 13.0 ppmv at 15% O_2, the HBRP engines will meet a CO limit that is significantly below the most stringent BACT limit achieved in practice by similar engines, and is comparable to the most stringent level deemed to be technologically feasible.

- PM_{10} emission limit of 0.02 g/bhp-hr constitutes achieved-in-practice BACT for natural gas-fired lean-burn reciprocating engines. The use of natural gas for all discretionary firing constitutes BACT for PM_{10} for HBRP lean-burn engines fired on natural gas.

Emergency Backup Diesel Fuel Firing

- The BACT controls will achieve an exhaust NOx concentration of 35.0 ppmv at 15% O_2. This constitutes BACT for liquid fuel firing in a dual-fuel fired lean-burn engine capable of achieving 6ppm NOx on natural gas.

- The BACT controls will achieve an exhaust ROC concentration of 40.0 ppmv at 15% O_2 . This constitutes BACT for liquid fuel firing in a dual-fuel fired lean-burn engine capable of achieving 6ppm NOx on natural gas.

- The BACT controls will achieve an exhaust CO concentration of 20.0 ppmv at 15% O_2 . This constitutes BACT for liquid fuel firing in a dual-fuel fired lean-burn engine capable of achieving 6ppm NOx on natural gas.

- PM_{10} emission limit of 0.15 gm/hp-hr constitutes BACT for new compression ignition emergency engines fired on Diesel fuel.

Startup/Shutdown

BACT for all pollutants during startup/shutdown periods consists of minimization of the duration of the activity. The startup/shutdown period will be limited to 60 minutes per event or less. NOx, CO, and ROC emissions will be required to meet specified limits during startup activities.

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Rules and Applicability

Rule 110 Section 5.1 requires the application of BACT to any new or modified emissions unit if the new unit or modification results in an increase in permitted daily emissions greater than certain thresholds. BACT is defined in Rule 110 Section 4.5 as the more stringent of:

4.5.1 the most effective emission control device, emission limit, or technique which has been required or used for the type of equipment comprising such emissions unit unless the applicant demonstrates to the satisfaction of the APCO that such limitations are not achievable; or

4.5.2 any other emission control device or technique, alternative basic equipment, different fuel or process, determined to be technologically feasible and cost-effective by the APCO. The cost-effective analysis shall be performed in accordance with the methodology and criteria specified by the APCO.

The HBRP will have emissions in excess of the thresholds for NOx, ROC, CO, and PM_{10}, so BACT will be required for these pollutants. Because SO_2 emissions from the project will be below the regulatory threshold of 80 pounds per day, BACT will not be required for SO_2.

Federal Prevention of Significant Deterioration (PSD) requires the application of BACT to any regulated pollutant for which the modification results in a significant net emissions increase. BACT is defined in 40 CFR 52.21(b)(12) as:

> "an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator

determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

As shown in Table 8.1-34, HBRP will result in a significant net increase in emissions for ROC and PM_{10}, so the project is subject to PSD BACT requirements for those pollutants as well.

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Top-Down BACT Analysis—Definition

The following "top-down" BACT analyses for NO_x, ROC, CO, and PM_{10} have been prepared in accordance with EPA's 1990 Draft New Source Review Workshop Manual. A "top-down" BACT analysis takes into account energy, environmental, economic, and other costs associated with each alternative technology.

In a top-down analysis, all plausible control technologies are identified. Next, technically infeasible technologies are eliminated. The remaining candidate technologies are then ranked for effectiveness. In the "top-down" process, the most stringent, or "top" control alternative, is examined first. That alternative is established as BACT unless the applicant demonstrates, and the permitting authority in its informed judgment agrees, that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not feasible in that case. If the most stringent technology is eliminated in this fashion, then the next most stringent alternative is considered, and so on. BACT analysis is done on a case-by-case basis.

Typically, BACT is determined for the operating scenario that is responsible for the bulk of project emissions. Control technology is optimized for that scenario. The effectiveness of the selected controls during other operation is then determined.

For example, SCR is frequently selected as the NOx control technology for routine operations of combustion equipment. SCR requires, however, that the exhaust gases be at an appropriate temperature to function, and the variable conditions during startup and shutdown result in temperatures where SCR catalysts are not effective. As a result, BACT during startup and shutdown for a system controlled by SCR is usually "no control," and operating requirements are imposed to minimize the duration and emissions during startup and shutdown.

For the HBRP, BACT technology has been selected based on the combustion of natural gas. The BACT limits during fuel oil firing and startup/shutdown are then based on the appropriate operation of the selected technology under the alternate conditions.

Alternative Generating Technologies

A BACT review is limited to the technologies available to control emissions from "the type of equipment comprising such a source." The review does not extend to consideration of different types of equipment that might comprise such a source. On the other hand, it is reasonable to discuss available alternatives, especially when the type of equipment selected is inherently more polluting than some of those alternatives.

Several alternative generating technologies were reviewed in a process that resulted in the selection of clean, natural gas-fired compression ignition reciprocating internal combustion engines for the HBRP. The alternative technologies included conventional oil and natural gas-fired plants, combined-cycle combustion turbines, biomass-fired plants, waste-to-energy plants, solar plants, wind generation plants, and others. None of these technologies was considered better than or equal to the Wärtsilä 18V50DF internal combustion engine-generators selected for the HBRP to meet the specific needs for base and intermediate load power supply in this region. These needs include flexibility to dispatch power in small increments across the entire range of output (from 0-100%), and rapid startup and shutdown. These features meet the special load-following requirements necessary to provide power to the electricity users in northwestern California.

The multi-unit configuration of this power plant design allows for modular operation. PG&E can operate as many individual generating sets as required for optimal efficiency to follow existing loads. Because single units have a relatively flat heat rate at 50 percent load and above, the plant can be operated efficiently anywhere between 5 percent load (1 generator set operating at 50 percent load) to 100 percent (all ten units operating at 100 percent). No other technology can approach this kind of modularity and operational efficiency for load following economically. Standard combustion turbine technology, for example, would have to be run uneconomically and inefficiently at partial loads to meet the load following requirements necessary for this installation.

In addition, the Wärtsilä 18V50DF technology offers the most efficient conversion of fuel to electrical power of any technology considered for this application. The low heat rate (8,571 Btu/kWh higher heating value [HHV]) means more economical operation and lower fuel consumption.

The Wärtsilä 18V50DF technology will allow for a switch to emergency backup Diesel fuel under emergency conditions, which is another project requirement. If there were a disruption of the site's natural gas supply, these units could switch to Diesel fuel within one minute at any operational load lower than 80 percent. This design features offers a flexibility that meets the project's objectives and that is not matched with competing technologies. Project alternatives are discussed in more detail in Section 9.9.1, Generation Technology Alternatives.

BACT Analysis for NOx

Identify All Control Technologies

There are three basic means of controlling NOx emissions from reciprocating internal combustion engines: fuel limitations, combustion controls, and post-combustion controls. Fuel limitations reduce NOx formation by using the cleanest fuels available. Combustion controls act to reduce the formation of NOx during the combustion process, while post-combustion controls remove NOx from the exhaust stream. Potential NOx control technologies for reciprocating internal combustion engines include the following, either individually or in combination:

Fuel Specifications

Fuel specification (natural gas only)

Fuel specification (ultralow sulfur (CARB) Diesel fuel)

Water/fuel emulsions

Combustion Controls

Aftercooling

Electronic Fuel Injection Timing Retard (FITR)

Exhaust Gas Recirculation (EGR)

Lean burn combustion

Pre-Chamber Combustion Ignition (also described as Clean Burn Combustion or Pre-Stratified Charge)

Rich burn combustion

Turbocharging

Water/steam injection

Post-Combustion Controls

Diesel Particulate filters

Non-selective catalytic reduction (NSCR)

SCONOx

Selective catalytic reduction (SCR)

Selective non-catalytic reduction (SNCR)

Eliminate Technically Infeasible Options

The performance and technical feasibility of available NOx control technologies are discussed in more detail below.

Fuel Specifications

Fuel restrictions that lower NOx emissions include exclusive use of natural gas, the use of CARB ultralow sulfur Diesel fuel, and the use of water/fuel emulsions.

The proposed project will use natural gas except for periods of natural gas curtailment and periodic tests of liquid fuel firing capability. The HBRP reciprocating engines will be required to use California ultralow sulfur Diesel fuel when operating in emergency backup firing mode; no alternative Diesel fuels (including biodiesel fuels or water/fuel emulsions) have yet been approved by CARB for use in compression ignition engines. Therefore, the use of other liquid fuels was eliminated based on regulatory infeasibility.

Combustion Controls

Combustion modifications that lower NOx emissions include aftercooling, electronic fuel injection timing retard, exhaust gas recirculation (EGR), lean-burn combustion, intake air cooling, pre-chamber combustion, rich-burn combustion, turbocharging, and water/steam injection.

EGR, intake air cooling, rich burn combustion, and water/steam injection were all eliminated based on technical infeasibility. The remaining technologies are carried forward to the next step of the analysis.

EGR: EGR would result in increased fouling of the air intake systems, combustion chamber deposits, and engine wear rates due to the chemical and physical properties of the exhaust gas. In addition, this control technique is not commercially available from manufacturers of stationary internal combustion engines.

Pre-chamber combustion: This technology is applicable to IC engines fired with gaseous fuels. This includes both spark-ignited engines and compression ignition engines operating in pilot injection mode (as opposed to firing only Diesel fuel). Because the HBRP engines must be operated in liquid-fuel-only mode for emergency backup operation, this technique is technologically infeasible for this application.

Rich burn combustion: The ability to fire on gas or oil is a project requirement. There are no dual-fuel rich-burn engines available.

Water/steam injection: Steam injection techniques, applicable to boilers and turbines, reduce peak combustion temperatures, and for these applications realize a decrease in NOx emissions. However, water or steam would corrode the interior of internal combustion engines and downstream components, and increase engine wear; therefore these techniques are considered to be technically infeasible for this application.

Lean combustion uses excess air (greater than stoichiometric air-to-fuel ratio) in the combustion zone to cool the engine, thereby reducing the rate of thermal NOx formation. This combustion control technique is used by Wärtsilä to reduce NOx formation during both natural gas (with pilot injection) firing and backup Diesel fuel firing operating modes.

Post-Combustion Controls

Post-combustion controls that lower NOx emissions include NSCR, SCONOx, SCR, and SNCR.

NSCR, SCONOx, and SNCR were eliminated based on technical infeasibility. The remaining technology (SCR) is carried forward to the next step of the analysis.

Nonselective catalytic reduction (NSCR): NSCR uses a three-way CO and hydrocarbon catalyst without injected reagents to reduce NOx to nitrogen and water. NSCR is typically used in automobile exhaust and rich-burn stationary IC engines, and typically employs a platinum/rhodium catalyst. NSCR is effective only in a stoichiometric or fuel-rich environment where the combustion gas is nearly depleted of oxygen. Because the Wärtsilä 18V50DF is a lean-burn engine, NSCR is not a feasible control technology.

SCONOx is a proprietary catalytic oxidation and adsorption technology that uses a single catalyst for the control of NOx, CO, and ROC emissions. The catalyst is a monolithic design, made from a ceramic substrate with both a proprietary platinum-based oxidation catalyst and a potassium carbonate adsorption coating. The catalyst simultaneously oxidizes NO to NO_2, CO to CO_2, and ROCs to CO_2 and water, while NO_2 is adsorbed onto the catalyst surface where it is chemically converted to and stored as potassium nitrates and nitrites. SCONOx has not yet been demonstrated on a commercially operated natural-gas-fired internal combustion engine.

Selective Non-Catalytic Reduction (SNCR) involves injection of ammonia or urea with proprietary conditioners into the exhaust gas stream without a catalyst. SNCR technology requires gas temperatures in the range of 1200° to 2000° F and is most commonly used in boilers. The exhaust temperatures for the HBRP engines are in the 750 to 800° F range, which is well below the minimum SNCR operating temperature. Some method of exhaust gas reheat, such as additional fuel combustion, would be required to achieve exhaust temperatures compatible with SNCR operations, and this requirement makes SNCR technologically infeasible for this application. Even when technically feasible, SNCR is unlikely to achieve NOx reductions in excess of 80%-85%.

Selective Catalytic Reduction (SCR) is a post-combustion technique that controls both thermal and fuel NOx emissions by reducing NOx with a reagent (generally ammonia or urea) in the presence of a catalyst to form water and nitrogen. NOx conversion is sensitive to exhaust gas temperature, and performance can be limited by contaminants in the exhaust gas that may mask the catalyst (sulfur compounds, particulates, heavy metals, and silica). SCR is used in numerous reciprocating engine and gas turbine installations throughout the United States, almost exclusively in conjunction with other wet or dry NOx combustion controls. SCR requires the consumption of a reagent (ammonia or urea) and requires periodic catalyst replacement. Estimated levels of NOx control are in excess of 90%.

Based on the discussions above, the technologically feasible NOx control technologies for the proposed project are listed in Table 8.1E-1.

Rank Remaining Control Technologies by Control Effectiveness

The remaining technically feasible control technologies are ranked by NOx control effectiveness in Table 8.1E-1. All of these technologies will be used by the project.

TABLE 8.1E-1
NOx Control Alternatives

NOx Control Alternative	Available?	Technically Feasible?	NOx Emissions (@ 15% O_2)	Environmental Impact	Energy Impacts
Fuel Restrictions	Yes	Yes			
Turbocharging	Yes	Yes			
FITR	Yes	Yes		Increased CO/ROC	Decreased Efficiency
Lean Burn Combustion	Yes	Yes	160-240 ppm		
Selective Catalytic Reduction	Yes	Yes	>90% reduction 6 ppm	Ammonia slip	Decreased Efficiency

Determination of BACT Emission Rates

A literature search was conducted to identify the current regulatory environment for control of lean burn internal combustion engines:

- Reviewed published BACT guidelines for natural gas-fired lean burn internal combustion engines;
- Reviewed recent BACT determinations for natural gas-fired lean burn internal combustion engines; and
- Reviewed published prohibitory rules for natural gas-fired lean burn internal combustion engines.

All of the published BACT guidelines pertain to spark-ignition engines. Since the HBRP reciprocating engines are compression-ignited and not spark ignited, the BACT determinations cited here are not for the same type of source and therefore are not directly applicable to the proposed project. However, the BACT determinations can be used as guidance in determining what should be considered to be BACT for this particular class and category of source.

Published BACT Guidelines

Published BACT guidelines from the following agencies were reviewed to identify relevant previously established BACT emission rates:

- Bay Area Air Quality Management District (BAAQMD);
- San Joaquin Valley Air Pollution Control District (SJVAPCD); and
- South Coast Air Quality Management District (SCAQMD).

The BAAQMD's BACT guidelines specify that, for natural gas-fired lean-burn reciprocating internal combustion engines, a NOx limit of 12 ppmv @ 15% O_2 has been "achieved in practice." Other permits have been issued with limits as low as 6ppm, based upon a demonstration of cost effectiveness.

The SJVAPCD's BACT guidelines specify that, for natural gas-fired lean-burn reciprocating internal combustion engines, a NOx limit of 9 ppmv @ 15% O_2 has been achieved in practice and 5 ppmv @ 15% O_2 is technologically feasible.

The SCAQMD's BACT guidelines specify that, for natural gas-fired lean-burn reciprocating internal combustion engines, a NOx limit of 9 ppmv @ 15% O_2 has been achieved in practice. SCAQMD's guidelines do not suggest a "technologically feasible" level.

Table 8.1E-2 summarizes published BACT guidelines for spark-ignited lean burn reciprocating natural gas-fired reciprocating internal combustion engines for the three agencies.

Table 8.1E-3 summarizes published BACT guidelines for liquid fuel fired compression ignition internal combustion engines. This table is included because BACT must be determined for the periods when liquid fuels are being fired (during engine testing and for emergency backup operation during emergencies, including natural gas curtailment).

Table 8.1E-2

Published BACT Guidelines for Spark-Ignited Lean Burn Reciprocating Internal Combustion Engines (Natural Gas)

District	BACT Guideline			
	NOx	ROC	CO	PM_{10}
BAAQMD—Achieved in Practice	12 ppmc [a]	32 ppmc	74 ppmc	n/a
BAAQMD—Technologically Feasible	6 ppmc	n/a	12 ppmc	n/a
SJVAPCD—Achieved in Practice	9 ppmc	25 ppmc	56 ppmc	0.02 g/bhp-hr
SJVAPCD—Technologically Feasible	5 ppmc	n/a	12 ppmc	n/a
SCAQMD—Achieved in Practice	9 ppmc	25 ppmc	33 ppmc	n/a

Note:

a. ppmc: ppmvd, corrected to 15% O_2

Table 8.1E-3

Published BACT Determinations for Compression Ignition Lean Burn Internal Combustion Engines (Liquid Fuels)

District	BACT Guideline			
	NOx	ROC	CO	PM_{10}
BAAQMD—Achieved in Practice	490 ppmc	309 ppmc	319 ppmc	0.1 g/bhp-hr
BAAQMD -- Technologically Feasible	107 ppmc	62 ppmc	n/a	n/a
SJVAPCD—Achieved in Practice	9 ppmc	25 ppmc	56 ppmc	0.02 g/bhp-hr
SCAQMD—Achieved in Practice	50 ppmc	39 ppmc	89 ppmc	0.045 g/bhp-hr

Recent BACT Determinations

CARB's BACT Clearinghouse contains six determinations in the spark-ignited reciprocating natural gas internal combustion engine category: two of these were for small engines (<200 bhp); two were for rich burn engines; and one burns field gas, not clean natural gas. The remaining determination was the following:

- NEO California Power LLC in Tehama County (San Joaquin Valley AQMD). The facility utilizes 16 Wärtsilä 18V220SG engines (3870 hp each) to power a 44 MW peaking power plant. The limits imposed were 9 ppmc NOx, 56 ppmc CO, 25 ppmc ROC, 0.02 g/hp-hr PM_{10}. Compliance was demonstrated in 2001 and 2003.

EPA's BACT Clearinghouse has a number of determinations in the spark-ignited natural gas internal combustion category. The NEO California Power project (described above) had the second lowest emission rate listed. The facility with the lowest emission rate was for an engine using Clear Burn Engine Technology, which does not allow for liquid fuel firing.

Published Prohibitory Rules

Published prohibitory rules from USEPA, BAAQMD, SMAQMD, San Diego County Air Pollution Control District (SDCAPCD), SJVAPCD, and SCAQMD were reviewed to identify the NOx standards that govern existing natural gas-fired compression ignition reciprocating engines.

Federal New Source Performance Standard (NSPS)

On July 11, 2006, USEPA adopted a NSPS for stationary compression ignition internal combustion engines (NSPS Subpart IIII). When fired on natural gas, the Wärtsilä engines are pilot ignition engines, not compression ignition engines, and are therefore not subject to the NSPS. Nevertheless, the NSPS requirements provide a yardstick against which the performance of the Wärtsilä engines may be measured.

The NSPS specifies a NOx limit of 1.2 gm/hp-hr. This is equivalent to an outlet concentration of 120 ppm NOx. The proposed NOx BACT limits of 6.0 ppm during natural gas firing and 35 ppm during emergency backup Diesel fuel firing are much lower than the new NSPS.

USEPA has adopted a NESHAPS standard for reciprocating internal combustion engines (NESHAPS subpart ZZZZ). This standard requires use of an oxidizing catalyst or NSCR to reduce emissions of formaldehyde, and is therefore not relevant to a discussion of NOx control requirements.

District Prohibitory Rules

Table 8.1E-4 summarizes published prohibitory rules for existing spark-ignited natural gas-fired lean burn internal combustion engines from the following agencies:

- BAAQMD;
- Sacramento Metropolitan Air Quality Management District (SMAQMD);
- San Diego County Air Pollution Control District (SDCAPCD);
- SJVAPCD; and
- SCAQMD.

The BACT limits proposed for this project are well below the limits shown in Table 8.1E-4.

Table 8.1E-4

Published Prohibitory Rules for Spark-Ignited Natural Gas-Fired Lean Burn Internal Combustion Engines

District/Rule	Emission Limit		
	NOx	ROC	CO
BAAQMD – Rule 9-8	140 ppmc	None	2000 ppmcc
SMAQMD – Rule 412	65 ppmc	250 ppmc	4000 ppmc
SDAPCD – 69.4.1	65 ppmc	250 ppmc	4500 ppmc
SJVAPCD – Rule 4701 (dual fired)	80 ppmc	750 ppmc	2000 ppmc
SCAQMD – Rule 1110.2	36 ppmc	250 ppmc	2000 ppmc

Conclusion—BACT for NOx

BACT must be at least as stringent as the most stringent level achieved in practice, federal rule, or district prohibitory rule. The most stringent NOx level achieved in practice for a lean-burn spark-ignition engine fired on natural gas is 9ppm, as listed in SCAQMD and SJVAPCD BACT guidelines.

However, the SJVAPCD guidelines indicate that 5.0 ppm @ 15% O_2 on a 3-hour average is technically feasible. It should be noted that, if SJVAPCD has issued a permit with a 5 ppm limit, it has not submitted that information to either the EPA or the CARB BACT clearinghouse. In addition, the HBRP reciprocating engines are pilot ignition and not spark ignition engines; therefore, the BACT determinations for spark ignited engines are not directly applicable.

The 50DF engines proposed for Humboldt have uncontrolled NOx levels of 160-240 ppm, depending on engine load (down to 50% load). There are lean burn engine designs that have uncontrolled NOx levels closer to 125 ppm. The difference may be attributable to the higher compression ratio of the HBRP engines. The higher compression ratio, in turn, results in higher pressures and temperatures, which lead to higher NOx concentrations. The HBRP engines would be expected to have higher efficiencies as well, another side effect of the higher compression ratio. Higher efficiencies, in turn, mean lower emission rates when expressed in lbs/MW-hr.

The HBRP facility will be designed to meet a NOx level of 6.0 ppmv @ 15% O_2 on a 3-hour average basis. Considering the higher compression ratio that is inherent in the compression ignition design, the higher energy efficiency, and uncertainty associated with establishing a new BACT level so far below that achieved in practice, it is infeasible to require these engines to meet a NOx level of 5.0 ppmv.

BACT for NOx for these engines while firing on CARB Diesel fuel is the rate achievable by the engines utilizing the proposed controls for natural gas. Because the uncontrolled NOx emissions are approximately six times higher when firing on fuel oil, the controlled NOx emissions are approximately six times higher when firing on fuel oil. The HBRP facility will be designed to meet a NOx level of 35 ppmv @ 15% O_2 on a 3-hour average basis while firing fuel oil.

BACT for NOx on startup and shutdown is the minimization of duration of startup and shutdown. Startup and shutdown will be limited to 30 minutes per event, and emissions will be limited to 55 lb/event during natural gas firing and 176 lb/event during emergency backup Diesel firing.

BACT Analysis for CO

Identify All Control Technologies

There are two basic means of controlling CO emissions from internal combustion engines: combustion controls and post-combustion controls. Combustion controls act to minimize CO by ensuring complete combustion, while post-combustion controls oxidize CO to CO2 in the exhaust stream.

Combustion Controls

Aftercooling

Electronic Fuel Injection Timing Retard (FITR)

Exhaust Gas Recirculation (EGR)

Intake air cooling

Lean burn combustion

Pre-Chamber Combustion Ignition (also described as Clean Burn Combustion or Pre-Stratified Charge)

Rich burn combustion

Timing adjustments

Turbocharging

Water/steam injection

Post-combustion controls

Oxidation catalyst

Eliminate Technically Infeasible Options

The performance and technical feasibility of available CO control technologies are discussed in more detail below.

Combustion Controls

To an extent, better combustion control of CO comes at the expense of better NOx control. Complete CO combustion is easier to achieve at higher combustion temperatures, but higher combustion temperatures can lead to increased NOx formation.

In practice, combustion controls are selected for NOx control and then tuned to minimize NOx formation until CO emissions begin to increase sharply.

See Section 8.1E1.2.2 for a discussion of the feasibility of combustion controls. All feasible NOx combustion controls have been incorporated into the project design.

Post-Combustion Controls

The only post-combustion control that lowers CO emissions is an oxidation catalyst.

Oxidation catalyst modules and pre-engineered packages are generally a cost-effective way to reduce carbon monoxide levels and have a side benefit of also reducing emissions of unburned hydrocarbon and toxic organic compounds. Oxidation catalysts are manufactured with precious metal–based formulations. Typical catalysts are made with a metal and ceramic honeycomb substrate coupled with application-specific wash coats and catalyst coatings. The precious metal–based formulations provide high destruction levels at lower operating temperatures.

Environmental Impacts

In addition to the positive reduction in CO emissions, the oxidation catalyst will lower ROC emissions, including emissions of toxic ROCs.

Energy Impacts

The use of an oxidation catalyst will create an additional pressure drop, resulting in a slight increase in energy consumption.

Based on the discussions above, the technologically feasible CO control technologies for the proposed project are listed in Table 8.1E-4.

Rank Remaining Control Technologies by Control Effectiveness

The remaining technically feasible control technologies are ranked by CO control effectiveness in Table 8.1E-5.

TABLE 8.1E-5
CO Control Alternatives

NOx Control Alternative	Available?	Technically Feasible?	CO Emissions (@ 15% O_2)	Environmental Impact	Energy Impacts
Combustion controls	Yes	Yes		Optimized for NOx controls	Decreased Efficiency
Oxidation Catalyst	Yes	Yes	12-13 ppmv	Reduce ROC emissions	Decreased Efficiency

Determination of BACT Emission Rates

A literature search was conducted to identify the current regulatory environment for control of lean burn internal combustion engines:

- Reviewed published BACT guidelines for natural gas-fired lean burn internal combustion engines;

- Reviewed recent BACT determinations for natural gas-fired lean burn internal combustion engines; and
- Reviewed published prohibitory rules for natural gas-fired lean burn internal combustion engines.

Published BACT Guidelines

Published BACT guidelines from the following agencies were reviewed to identify relevant previously established BACT emission rates:

- Bay Area Air Quality Management District (BAAQMD);
- San Joaquin Valley Air Pollution Control District (SJVAPCD); and
- South Coast Air Quality Management District (SCAQMD).

The BAAQMD's BACT guidelines specify that, for natural gas-fired lean-burn internal combustion engines, a CO limit of 74 ppmv @ 15% O_2 has been "achieved in practice." Other permits have been issued with limits as low as 12 ppm, based upon a demonstration of cost effectiveness.

The SJVAPCD's BACT guidelines contained a determination for natural gas-fired lean-burn internal combustion engines. The SJVAPCD concluded that a CO exhaust concentration of 56 ppmv @ 15% O_2 constituted BACT that had been achieved in practice and 12 ppmv @ 15% O_2 constituted BACT that is technologically feasible.

The SCAQMD BACT guidelines contained a determination for natural gas-fired lean-burn internal combustion engines. The SCAQMD concluded that a CO exhaust concentration of 33 ppmv @ 15% O_2 constituted BACT that had been achieved in practice.

Table 8.1E-1 summarizes published BACT guidelines for natural gas-fired reciprocating engines for the three agencies. Table 8.1E-2 summarizes published BACT guidelines for liquid fuel fired internal combustion engines. This table is included because BACT must be determined for the periods when liquid fuels are being fired (during engine testing and during natural gas curtailment).

Recent BACT Determinations

CARB's BACT Clearinghouse contains six determinations in the spark-ignited natural gas internal combustion engine category: two of these were for small engines (<200 bhp); two were for rich burn engines; and one burns field gas, not clean natural gas. The remaining determination was the following:

- NEO California Power LLC in Tehama County (San Joaquin Valley AQMD). The facility utilizes 16 Wärtsilä 18V220SG engines (3870 hp) to power a 44 MW peaking power plant. The limits imposed were 9 ppm NOx, 56 ppm CO, 25 ppm ROC, .02 gm/hp-hr PM_{10}. Compliance was demonstrated in 2001 and 2003.

EPA's BACT Clearinghouse has a number of determinations in the natural gas internal combustion category. The NEO California Power project (described above) had the second lowest emission rate listed. The facility with the lowest emission rate was for an engine using Clear Burn Engine Technology, which does not allow for liquid fuel firing.

Published Prohibitory Rules

Published prohibitory rules from USEPA, BAAQMD, SMAQMD, San Diego County Air Pollution Control District (SDCAPCD), SJVAPCD, and SCAQMD were reviewed to identify the CO standards that govern existing natural gas-fired lean burn engines.

Federal New Source Performance Standard (NSPS)

On July 11, 2006, USEPA adopted a NSPS for stationary compression ignition internal combustion engines (NSPS Subpart IIII). The NSPS does not address CO emissions.

USEPA has adopted a NESHAPS standard for reciprocating internal combustion engines (NESHAPS subpart ZZZZ). This standard limits emissions of formaldehyde. When an oxidizing catalyst is utilized to comply with the requirements of the NESHAP, CO emissions from pilot-ignition engines (which are classified as compression ignition engines under the NESHAP) must be reduced by 70%.

District Prohibitory Rules

Table 8.1E-4 summarizes published prohibitory rules for existing natural gas-fired lean burn internal combustion engines from the following agencies:

- BAAQMD;
- Sacramento Metropolitan Air Quality Management District (SMAQMD);
- San Diego County Air Pollution Control District (SDCAPCD);
- SJVAPCD; and
- SCAQMD.

Conclusion—BACT for CO

BACT must be at least as stringent as the most stringent level achieved in practice, federal rule, or district prohibitory rule. The most stringent CO level achieved in practice for a lean-burn spark-ignition engine fired on natural gas is 56 ppm, as listed in SJVAPCD BACT guidelines.

However, the Bay Area and SJVAPCD guidelines indicate that 12.0 ppm @ 15% O2 on a 3-hour average is technically feasible. While this level may be achievable for spark-ignited engines, the Wärtsilä engines use a pilot-ignition technology. According to the engine manufacturer, the lowest level that can be guaranteed for this engine is 13 ppm. Because 12 ppm is not technically feasible, but 13 ppm is, BACT for this project is 13 ppm. The HBRP facility will be designed to meet a CO level of 13.0 ppmv @ 15% O2 on a 3-hour average basis.

BACT for CO for these engines while firing on fuel oil is the rate achievable by the engines utilizing the proposed controls for natural gas. The HBRP facility will be designed to meet a CO level of 20 ppmv @ 15% O_2 on a 3-hour average basis while firing fuel oil.

BACT for CO on startup and shutdown is the minimization of duration of startup and shutdown. Startup and shutdown will be limited to 30 minutes per event, and emissions will be limited to 22 lb/event.

BACT Analysis for ROC

Identify All Control Technologies

The techniques for controlling CO will also control ROC: combustion controls and post-combustion controls. Combustion controls act to minimize ROC by ensuring complete combustion, while post-combustion controls oxidize hydrocarbons to CO_2 in the exhaust stream. Once BACT controls for CO are installed, ROC emissions are reduced as well.

See the section for CO controls for a discussion of the feasibility and effectiveness of these controls.

Rank Remaining Control Technologies by Control Effectiveness

The technically feasible control technologies are ranked by ROC control effectiveness in Table 8.1E-6.

TABLE 8.1E-6
ROC Control Alternatives

NOx Control Alternative	Available?	Technically Feasible?	ROC Emissions (@ 15% O_2)	Environmental Impact	Energy Impacts
Combustion controls	Yes	Yes		Optimized for NOx controls	Decreased Efficiency
Oxidation Catalyst	Yes	Yes	25-28 ppmv	Reduce CO emissions	Decreased Efficiency

Determination of BACT Emission Rates

A literature search was conducted to identify the current regulatory environment for control of lean burn internal combustion engines:

- Reviewed published BACT guidelines for natural gas-fired lean burn internal combustion engines;
- Reviewed recent BACT determinations for natural gas-fired lean burn internal combustion engines; and
- Reviewed published prohibitory rules for natural gas-fired lean burn internal combustion engines.

Published BACT Guidelines

Published BACT guidelines from the following agencies were reviewed to identify relevant previously established BACT emission rates:

- Bay Area Air Quality Management District (BAAQMD);
- San Joaquin Valley Air Pollution Control District (SJVAPCD); and
- South Coast Air Quality Management District (SCAQMD).

The BAAQMD's BACT guidelines specify that, for natural gas-fired lean-burn internal combustion engines, a ROC limit of 32 ppmv @ 15% O_2 has been "achieved in practice."

The SJVAPCD's BACT guidelines contained a determination for natural gas-fired lean-burn internal combustion engines. The SJVAPCD concluded that a ROC exhaust concentration of 25 ppmv @ 15% O_2 constituted BACT that had been achieved in practice.

The SCAQMD BACT guidelines contained a determination for natural gas-fired lean-burn internal combustion engines. The SCAQMD concluded that a ROC exhaust concentration of 26 ppmv @ 15% O_2 constituted BACT that had been achieved in practice.

Table 8.1E-2 summarizes published BACT guidelines for natural gas-fired reciprocating engines for the three agencies.

Table 8.1E-3 summarizes published BACT guidelines for liquid fuel fired internal combustion engines. This table is included because BACT must be determined for the periods when liquid fuels are being fired (during engine testing and during natural gas curtailment). The technically feasible CO emission limit during emergency backup Diesel firing is 20 ppmc.

Recent BACT Determinations

CARB's BACT Clearinghouse contains six determinations in the spark-ignited natural gas internal combustion engine category: two of these were for small engines (<200 bhp); two were for rich burn engines; and one burns field gas, not clean natural gas. The remaining determination was the following:

- NEO California Power LLC in Tehama County (San Joaquin Valley AQMD). The facility utilizes 16 Wärtsilä 18V220SG engines (3870 hp) to power a 44 MW peaking power plant. The limits imposed were 9 ppm NOx, 56 ppm CO, 25 ppm ROC, .02 gm/hp-hr PM_{10}. Compliance was demonstrated in 2001 and 2003.

EPA's BACT Clearinghouse has a number of determinations in the natural gas internal combustion category. The NEO California Power project (described above) had the second lowest emission rate listed. The facility with the lowest emission rate was for an engine using Clear Burn Engine Technology, which does not allow for liquid fuel firing.

Published Prohibitory Rules

Published prohibitory rules from USEPA, BAAQMD, SMAQMD, San Diego County Air Pollution Control District (SDCAPCD), SJVAPCD, and SCAQMD were reviewed to identify the ROC standards that govern existing natural gas-fired lean burn internal combustion engines.

Federal New Source Performance Standard (NSPS)

On July 11, 2006, USEPA adopted a NSPS for stationary compression ignition internal combustion engines (NSPS Subpart IIII). The NSPS does not address ROC emissions.

USEPA has adopted a NESHAPS standard for reciprocating internal combustion engines (NESHAPS subpart ZZZZ). This standard is intended to limit emissions of formaldehyde. When an oxidizing catalyst is utilized to meet the requirements of the NESHAP, CO control is used as a surrogate for formaldehyde emissions control, and CO emissions must be reduced by 70%. The NESHAPS does not address ROC emissions.

District Prohibitory Rules

Table 8.1E-4 summarizes published prohibitory rules for existing natural gas-fired lean burn internal combustion engines from the following agencies:

- BAAQMD;
- Sacramento Metropolitan Air Quality Management District (SMAQMD);
- San Diego County Air Pollution Control District (SDCAPCD);
- SJVAPCD; and
- SCAQMD.

Conclusion—BACT for ROC

BACT must be at least as stringent as the most stringent level achieved in practice, federal rule, or district prohibitory rule for a comparable class or category of source. The most stringent ROC level achieved in practice for a lean-burn spark-ignition engine fired on natural gas is 25 ppm, as listed in SJVAPCD BACT guidelines. While this level may be achievable for spark-ignited engines, the Wärtsilä engines use a pilot-ignition technology. According to the engine manufacturer, the lowest level that can be guaranteed for this engine is 28 ppm. Because 25 ppm is not technically feasible, but 28 ppm is, BACT for this project is 28 ppm. The HBRP facility will be designed to meet a ROC level of 28.0 ppmv @ 15% O_2 on a 3-hour average basis.

BACT for ROC for these engines while firing on fuel oil is the rate achievable by the engines utilizing the proposed controls for natural gas. The HBRP facility will be designed to meet a ROC level of 40 ppmv @ 15% O_2 on a 3-hour average basis while firing fuel oil.

BACT for ROC on startup and shutdown is the minimization of duration of startup and shutdown. Startup and shutdown will be limited to 30 minutes per event, and emissions will be limited to less than 10 lb/event.

BACT Analysis for PM_{10}

Identify All Control Technologies

There are three basic means of controlling PM_{10} emissions from internal combustion engines: fuel limitations, combustion controls, and post-combustion controls.

Combustion Controls

Minimization of non-gaseous fuels reduces particulate emissions. Reducing the sulfur content of fuels (liquid and gaseous) reduces particulate emissions.

Post-combustion controls

Diesel oxidation catalysts

Diesel particulate filters

Diesel particulate traps

Deleted: P

Electrostatic precipitators (ESPs)

Eliminate Technically Infeasible Options

The performance and technical feasibility of available PM_{10} control technologies are discussed in more detail below.

Post-Combustion Controls

Filters and ESPs can be used to remove fine soot from engine exhaust. Some filters work by physically filtering the particulate from the exhaust. Others work by trapping the particulate on a catalyst surface which causes the particulate to be fully oxidized.

Rank Remaining Control Technologies by Control Effectiveness

The remaining technically feasible control technologies are ranked by PM_{10} control effectiveness in Table 8.1E-7.

TABLE 8.1E-7
PM_{10} Control Alternatives

NOx Control Alternative	Available?	Technically Feasible?	PM_{10} reductions (@ 15% O_2)	Environmental Impact	Energy Impacts
Combustion controls	Yes	Yes		Optimized for NOx controls	Decreased Efficiency
Diesel oxidation catalysts	Yes	Yes	>30%	Highly effective in controlling CO and organic HAP emissions	Decreased Efficiency
Particulate traps/filters	No	No	50-90%		Decreased Efficiency

Oxidation Catalysts

Oxidation catalysts can be used to control emissions of diesel particulate matter (DPM) and other toxic compounds in diesel exhaust. Oxidation catalysts are most effective in reducing emissions of gaseous organics and organic aerosols, and are less effective in reducing emissions of solid (filterable) particulate matter.[4] Oxidation catalysts are sensitive to the sulfur level of the fuel; however, the use of CARB ultra-low sulfur diesel fuel (15 ppmw) results in an exhaust gas sulfur concentration comparable to the use of natural gas.[5] Oxidation catalysts typically reduce particulate matter emissions by approximately 20[6] to 35[7] percent. The HBRP engines will be equipped with oxidation

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[4] The definition of DPM in the Air Toxic Control Measure for Stationary Compression Ignition Engines is based on filterable particulate matter.
[5] See SO_2 emissions calculations for natural gas firing and emergency diesel firing in Tables 8.1A-2 and 8.1A-3 of the HBRP AFC.
[6] USEPA, OTAQ, "Technical Highlights: Questions and Answers on Using a Diesel Oxidation Catalyst in Heavy-Duty Trucks and Buses," EPA420-F-03-016, June 2003.
[7] Slide presentation on DOC performance presented by Engelhard to CARB in 2001.

Deleted: Manufacturers of Emission Control Technology (MECA) website, http://www.meca.org/page.ww?section=Emission+Control+Technology&name=Off-Road+Diesel +Equipment.

catalysts; however, no credit has been taken for the reductions in particulate emissions associated with these devices because of the uncertainty in the control efficiency for both filterable particulate matter and organic aerosols. This uncertainty is related to two factors: (1) variability in source test results, and (2) the low uncontrolled emission factors associated with the HBRP engines.

Diesel Particulate Filters

Diesel particulate filters collect particulate matter, trap the material on the filter surface, and oxidize the particulates at high temperatures. The high temperatures may be achieved using just the exhaust heat from the engine, or from a supplemental heating source, depending on the characteristics of the engine, the particulate loading, and the engine's duty cycle. Diesel particulate filters typically reduce DPM emissions by 85 percent or more.[8] There are no diesel particulate filters that have been used on engines as large as those proposed for HBRP.[9] In developing the Compression Ignition Engine New Source Performance Standard (CI NSPS), EPA concluded that DPFs were not feasible for engines with a displacement of greater than 30 liters per cylinder.[10] This conclusion is discussed in correspondence between EPA and its consultant for development of the NSPS:

> During the development of the proposed NSPS, EPA met with the Engine Manufacturers Association (EMA) and the European Association of Internal Combustion Engine Manufacturers (Euromot) to obtain information about stationary CI engines and discuss draft concepts for the NSPS. Both groups had concerns about potentially requiring larger size stationary CI engines to meet the standards for nonroad diesel engines. One concern raised by Euromot during the meeting was the inability of very large stationary CI engines to meet the EPA emission standards for nonroad diesel engines. According to Euromot, these engines cannot use the same emission control technologies as nonroad engines, for example diesel particulate filter and exhaust gas recirculation, due to their large size. These large engines tend to operate several thousands of hours per year and at constant speed and load as opposed to nonroad engines that normally operate for a few hundred hours per year and often at transient conditions. These large engines are not produced in mass quantities, and only a few may be installed in the U.S. per year. No engines of this size were found to be located in the continental U.S. For these reasons, EPA feels it is more appropriate to regulate the owners and operators of these engines and is not requiring manufacturers to certify these engines… The requirement of 60 percent PM control or more is based on the capabilities of an electrostatic precipitator (ESP).[11]

Comments submitted on the proposed NSPS by a consultant in Alaska suggested that DPMs were feasible for these largest engines. However, this commenter added:

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[8] Clean Air Fleets website, http://www.cleanairfleets.org/ect.html.

9 USEPA, OTAQ: "Summary and Analysis of Comments: Control of Emissions from Nonroad Diesel Engines, Comments by the Engine Manufacturers Association (EMA)." EPA420-R-04-008, May 2004.

[10] The HBRP engines have cylinders that displace 114 liters each.

[11] Memo from Bradley Nelson, Alpha-Gamma Technologies, Inc., to Jaime Pagán, EPA Energy Strategies Group, dated May 22, 2006.

> A currently available technology, particulate filter traps, is suited to these large units, although the particulate removal efficiency is less than 60 percent. However, it must be noted that particulate emissions will already be reduced considerably by the use of low and ultra-low sulfur diesel fuel.[12]

A literature search was performed to determine whether particulate filters were available for this type of application. The largest engine found using a diesel particulate filter was about 4,000 hp, while the HBRP engines are rated at nearly 21,500 hp.

Electrostatic Precipitators

CARB does not identify ESPs as a potential control technology for particulate emissions from diesel engines. However, as discussed above, this technology was considered and evaluated by EPA in development of the CI NSPS. EPA concluded that ESPs were feasible and cost-effective when applied to diesel engines using heavy fuel oils.[13] EPA did not reach the same conclusion with respect to light fuel oils, such as CARB ultra-low sulfur diesel. When applied to diesel engines using heavy fuel oils, ESPs have the potential to reduce particulate emissions by approximately 60 percent. There are no data available to estimate the control efficiency for ESPs for diesel engines using CARB ultra-low sulfur diesel or similar light fuel oils.

ESPs remove particulate matter that is in particle form at the exhaust gas temperature. As a result, the ESP has the potential to remove only the filterable fraction (in-stack) of the particles. In the case of the HBRP engines, the filterable fraction will be less than 0.11 grams per brake-horsepower hour (gm/bhp-hr), and less than 5.56 lbs/hr.[14]

ESPs work by using an electric charge to ionize particulate matter and attract the particles to a plate that is periodically cleaned. Thus, the efficiency of an ESP is directly related to the resistivity of the target particles.[15] For engines similar in size to those proposed for HBRP, dry ESPs have been demonstrated only for engines using high sulfur and ash fuels such as heavy fuel oil (HFO) and Orimulsion,[16] which generate particles having good resistivity characteristics.

The particles collected using an ESP are released to a hopper by physically rapping the ESP collection plates to loosen the particles so that they will fall due to gravity. This is done while the ESP is in the gas stream and the combustion source is operating. Without an ability to ensure particle agglomeration on the plates, it is likely that a substantial fraction of the collected fine particulate matter from diesel combustion in the HBRP engines would be reentrained during the rapping process, thus returning the collected particulate matter to the exhaust gas stream.

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[12] Comments by Alfred K. Bohn, PE Proposed Rulemaking - Docket Number OAR-2005-0029: New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines, September 7, 2005.

[13] US EPA "Summary and Analysis of Comments", May 2004. Op.cit.

[14] Wärtsilä performance data, personal communication.

[15] USEPA, OAQPS, "Lesson 3: ESP Design Parameters and Their Effects on Collection Efficiency," http://yosemite.epa.gov/oaqps/EOGtrain.nsf/fabbfcfe2fc93dac85256afe00483cc4/6a234c29e34af9fa85256b66004ebeae/$FILE/12bles3.pdf.

[16] Orimulsion is a fossil fuel produced from bitumen. It typically has a sulfur content of over 2.5% (wt). See http://www.sovereign-publications.com/bitumene.htm.

When used in the exhaust stream of gas-fired engines, an ESP could present a potential safety hazard by providing a source of ignition in situations where abnormally high concentrations of unburned gas are present in the exhaust system.[17]

Comments provided to EPA during the development of Subpart ZZZZ suggest that wet ESP technology would be effective in removing particulate matter from oil-fired combustion devices. Wet ESPs operate similarly to dry ESPs, except that instead of rapping the collector plates to remove the particles, the particles are washed from the collector walls by a spray of liquid.[18] Data presented by Hamon[19] suggests that for an oil-fired boiler, collection efficiencies of 79 to 95 percent may be achieved. However, the particulate emission rates for the oil-fired boiler are equivalent to inlet grain loadings of between 0.5 and 0.9 gr/scf, approximately twice as high as the exhaust particulate grain loadings for the HBRP engines.

Information provided by EPA on wet ESPs[20] lists the following considerations for their use:

- Temperature: Wet wire-plate ESPs are limited to operating at temperatures below the dew point of the exhaust gas (approximately 60°C or 140°F). Since the exhaust temperature of the Wärtsilä engines is expected to be on the order of 600 to 700°F, the engine exhaust would have to be cooled by 460 to 560°F before the exhaust gas could be passed through a wet ESP. This, in turn, would require the injection of approximately 53,000 scfm of ambient air (approximately 88 percent of the exhaust gas flow) into the exhaust of each engine, downstream of all of the catalyst systems. The electric load associated with this cooling would be significant, and would be in addition to the electric load required to ionize the particulate matter and charge the plates (discussed further below). The cooling air would also further dilute the particulate concentrations below the already-low levels expected, thus further reducing the expected control efficiency. The extremely low exhaust gas temperatures would reduce plume rise and decrease dispersion, thus reducing any potential benefits associated with reduced particulate emission rates.

- Water Use: Wet ESPs require a source of wash water to be injected or sprayed near the top of the collector plates. The wash system replaces the rapping mechanism used by dry ESPs. The water flows with the collected particles into a sump from which the fluid is pumped or drained. Although a portion of the fluid may be recycled to reduce the total amount of water required, this technology would create a new water use and wastewater disposal requirement for the project.

- Operating Conditions: ESPs in general are not well suited for use in processes which are highly variable because they are very sensitive to fluctuations in gas stream conditions (flow rates, temperatures, particulate and gas composition, and particulate loading). The Wärtsilä engines were selected for this project in part because of their ability to operate at any load and on either natural gas or diesel fuel, but these engine

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17 Wärtsilä, personal communication.

18 EPA-CICA Fact Sheet, Wet Electrostatic Preciptator, Wire-Plate Type, downloaded from http://www.epa.gov/ttn/catc/dir1/fwespwpi.pdf.

19 Mastropietro, Robert A. Hamon Research-Cottrell, Inc. "The Use of Treatment Time and Emissions Instead of SCA and Efficiency for Sizing Electrostatic Precipitators," August 29, 1997.

20 EPA-CICA Fact Sheet, Wet Electrostatic Precipitator, op. cit.

characteristics would produce the variable load conditions for which ESPs are not well suited. Consequently, to ensure that exhaust gas stream variability does not interfere with ESP performance, it would also be necessary to install 10 separate ESPs. The space required for these installations would likely preclude the ability to group the stacks to enhance dispersion, thus adding to the poorer dispersion already expected as a result of the cooler plumes.

Finally, comments provided to EPA during the NSPS rulemaking proceeding indicated that an ESP would require approximately 10 percent of the power generated by the engine being controlled to ionize the particulate matter and charge the plates.[21] This could result in a situation where one of the 10 engines proposed for the HBRP project was operating on diesel fuel solely to power the ESPs when the other engines are operated on diesel fuel.

At the March 12 CEC workshop, reference was made to a description of an ESP used on a Wärtsilä diesel engine. The website reference is to the use of an ESP on a diesel engine fueled with a high ash fuel oil.[22] Wärtsilä estimates the post-treatment particulate emission rate at 50 mg/Nm^3 (dry, 15% O_2) or lower, using an ESP under these circumstances. This is equivalent to 0.03 gr/dscf at the nominal exhaust oxygen concentration of 13 percent for the HBRP engines during diesel firing. This is comparable to the level achieved by the HBRP engines using ultra-low sulfur diesel fuel without an ESP. This is also consistent with EPA's finding in the NSPS rulemaking for compression ignition engines, where the use of ultra-low sulfur fuel and engine modifications are presented as an alternative to the use of an ESP for particulate control.

> The final rule has been written considering the comments received and requires 60 percent PM reduction or an emission limit of 0.15 g/KW-hr (0.11 g/HP-hr). EPA believes the PM standard will be achievable through the use of lower sulfur fuel, on-engine controls, and aftertreatment. EPA believes that the PM percent reduction requirement is feasible through application of ESP.[23]

There is no evidence to suggest that the use of an ESP on the HBRP engines would achieve any significant reduction in particulates.

Fabric Filter Baghouses

Traditional fabric filter types are not designed to operate at the high flue gas temperatures of a reciprocating engine; maximum acceptable gas stream temperatures for fabric filter systems are on the order of 500°F.[24] Thus, the exhaust gas from the HBRP engines would need to be reduced by approximately 100°F to 200°F to enable the use of a fabric filter baghouse. This, in turn, would require the injection of approximately 19,000 scfm of ambient air (approximately 30 percent of the exhaust gas flow) into the exhaust of each engine, downstream of all of the catalyst systems. In addition to the electric load associated with this cooling, such a system would increase the size of the baghouse

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[21] Comments by Alfred K. Bohn, op. cit.

[22] http://www.wartsila.com/,en,solutions,0,generalcontent,E2B96D7E-8B0F-4B77-814E-173EBE0978DE,5D037227-09A5-4C00-93E3-06FF36D75F6F,,.htm.

[23] USEPA, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, Final Rule, 70FR39869.

[24] http://www.epa.gov/ttn/catc/dir1/cs6ch1.pdf.

required because of the larger gas flow requiring treatment, and would require the use of larger-diameter stacks (approximately 10 percent) to accommodate the higher flow rates. The cooling air would also further dilute the particulate concentrations below the already-low levels expected, thus further reducing the expected control efficiency. The lower exhaust gas temperatures and larger diameter stacks would reduce plume rise and decrease dispersion, thus reducing any potential benefits associated with reduced particulate emission rates.

Fabric filter systems generally result in an increased backpressure of 5" to 20" w.c.[25] Wärtsilä has indicated that any increase in backpressure will result in a derate to the engines' performance.[26] Consequently, an additional engine may be required to meet the project objective of providing 163 MW of capacity for HBRP. Fabric filter systems are most effective in high-dust environments; the filter cake that deposits on the filters enhances the collection efficiency. In contrast to many other types of emission control systems, the collection efficiency of fabric filters is at its lowest when the filters are new and clean, and collection efficiency is enhanced over time.[27]

Fabric filter baghouses remove particles that are in solid form at the exhaust gas temperature. As a result, particle fabric filters have the potential to remove only the filterable fraction (in-stack) of the particles.

Fabric filter systems are typically constant-output devices. Thus, once designed and installed, the outlet grain loading does not vary with changes in the inlet grain loading.[28] Typical inlet grain loadings in applications that use fabric filter systems are in the range of 0.5 to 10 grains per actual cubic foot. By comparison, the filterable particulate levels in the HBRP exhaust will be no higher than approximately 0.06 gr/acf, or more than 10 times lower than the typical inlet grain loadings for these systems.

There are no fabric filter control systems installed on any diesel engines of this size using light fuel oil.

Deleted: Particulate filters and traps are used only on reciprocating engines burning Diesel or heavy oil fuels. The expense of the controls is justified by the relatively high particulate loading in the exhaust and by the high toxicity of Diesel particulates. For engines firing other fuels, however, particulate filters and traps are not justified. The particulates that are formed are not nearly as toxic as Diesel particulate, and the quantity of particulate emitted by combustion of clean natural gas is much lower (0.02 gm/hp-hr) than the levels emitted by combustion of Diesel fuel (uncontrolled emissions of 0.7 gm/hp-hr and up). ¶
A literature search was performed to determine whether particulate filters or traps were available for this type of application. The largest engine found using a Diesel particulate filter was about 4,000 hp, while these engines are rated at nearly 21,500 hp. While electrostatic precipitator (ESP) particulate controls are in use on a Wärtsilä reciprocating engine power plant in Korea, this installation is fueled with heavy oil and thus has much higher exhaust particulate grain loadings that are more susceptible to control using ESP technology. Therefore particulate traps, filters, and ESPs are not considered to be available or technologically feasible for these reciprocating engines using limited quantities of ultra low sulfur CARB Diesel fuel and having extremely low exhaust particulate grain loadings.¶

Determination of BACT Emission Rates

A literature search was conducted to identify the current regulatory environment for control of lean burn internal combustion engines:

- Reviewed published BACT guidelines for natural gas-fired lean burn internal combustion engines;
- Reviewed recent BACT determinations for natural gas-fired lean burn internal combustion engines; and
- Reviewed published prohibitory rules for natural gas-fired lean burn internal combustion engines.

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[25] Ibid.

[26] Wärtsilä , personal communication.

[27] http://www.epa.gov/ttn/catc/dir1/ff-revar.pdf.

[28] Ibid.

Published BACT Guidelines

Published BACT guidelines from the following agencies were reviewed to identify relevant previously established BACT emission rates:

- Bay Area Air Quality Management District (BAAQMD);
- San Joaquin Valley Air Pollution Control District (SJVAPCD); and
- South Coast Air Quality Management District (SCAQMD).

The SJVAPCD's BACT guidelines contained a determination for natural gas-fired lean-burn internal combustion engines. The SJVAPCD concluded that a PM_{10} exhaust concentration of 0.02 g/bhp-hr constituted BACT that had been achieved in practice. Table 8.1E-2 summarizes published BACT guidelines for the three agencies.

Table 8.1E-3 summarizes published BACT guidelines for liquid fuel fired internal combustion engines. This table is included because BACT must be determined for the periods when liquid fuels are being fired (during engine testing and during natural gas curtailment).

Recent BACT Determinations

CARB's BACT Clearinghouse contains six determinations in the spark-ignited natural gas internal combustion engine category: two of these were for small engines (<200 bhp); two were for rich burn engines; and one burns field gas, not clean natural gas. The remaining determination is as follows:

- NEO California Power LLC in Tehama County (San Joaquin Valley AQMD). The facility utilizes 16 Wärtsilä 18V220SG engines (3870 hp) to power a 44 MW peaking power plant. The limits imposed were 9 ppm NOx, 56 ppm CO, 25 ppm ROC, 0.02 g/hp-hr PM_{10}. Compliance was demonstrated in 2001 and 2003.

EPA's BACT Clearinghouse has a number of determinations in the natural gas internal combustion category. The NEO California Power project (described above) had the second lowest emission rate listed. The facility with the lowest emission rate was for an engine using Clear Burn Engine Technology, which does not allow for liquid fuel firing.

Published Prohibitory Rules

Published prohibitory rules from USEPA, BAAQMD, SMAQMD, San Diego County Air Pollution Control District (SDCAPCD), SJVAPCD, and SCAQMD were reviewed to identify the PM_{10} standards that govern existing natural gas-fired lean burn engines.

Federal New Source Performance Standard (NSPS)

On July 11, 2006, USEPA adopted a NSPS for stationary compression ignition internal combustion engines (NSPS Subpart IIII). The Wärtsilä engines are subject to the NSPS if their annual Diesel fuel use exceeds 2% of their total fuel use on a heat input basis. The NSPS requires compression ignition engines in this size range (displacement in excess of 30 liters per cylinder) to reduce particulate emissions by 60% or to meet an exhaust emission level of 0.11 gm/bhp-hr. This limit applies only to filterable particulate, not total particulate (filterable plus condensable), so is not comparable to the total PM_{10} emission limit for which a BACT determination is being made. However, the HBRP engines will meet the NSPS limit when operated on Diesel fuel.

USEPA has adopted a NESHAPS standard for reciprocating internal combustion engines (NESHAPS subpart ZZZZ). The NESHAPS does not address the emissions of PM_{10}.

District Prohibitory Rules

Table 8.1E-4 summarizes published prohibitory rules for existing natural gas-fired lean burn internal combustion engines from the following agencies:

- BAAQMD;
- Sacramento Metropolitan Air Quality Management District (SMAQMD);
- San Diego County Air Pollution Control District (SDCAPCD);
- SJVAPCD; and
- SCAQMD.

CARB Air Toxics Control Measure (ATCM) for Diesel Engines

In 2003, the CARB adopted an ATCM to reduce diesel PM emissions from stationary diesel-fueled compression ignition engines.

The HBRP engines are compression ignited. As discussed in Section 8.1.5.2.2.2, however, the engines are exempt from the ATCM while firing natural gas fuel with pilot injection. They are subject to the ATCM during emergency backup Diesel firing, however. The ATCM standard for new emergency backup Diesel engines is 0.15 g/bhp-hr. This limit applies to the filterable portion of the PM_{10} emissions only, and therefore is not directly comparable to the proposed total (filterable plus condensable) PM_{10} limit of 10.8 lb/hr during emergency backup Diesel fuel firing. The HBRP engines will comply with the ATCM requirements during Diesel fuel firing.

Conclusion—BACT for PM_{10}

BACT must be at least as stringent as the most stringent level achieved in practice, federal rule, or district prohibitory rule. The most stringent PM_{10} level achieved in practice for a lean-burn spark-ignition engine fired on natural gas is 0.02 gram per bhp-hr (g/bhp), as listed in SJVAPCD BACT guidelines. The HBRP reciprocating engines use pilot ignition, not spark ignition, so the achieved in practice level is not for the same class of source and thus is not directly applicable. The HBRP engines will meet a PM_{10} limit that ranges from 0.07 g/bhp-hr at full load to 0.14 g/bhp-hr at minimum load while operating in natural gas mode.

BACT for PM_{10} for these engines while operating in diesel mode is the rate achievable by the engines utilizing the proposed controls for natural gas. The HBRP facility will be designed to meet a total PM_{10} level of 10.8 lb/hr across all engine loads and the filterable PM_{10} limit of 0.15 g/hp-hr level required by the ATCM. The applicant expects that the PM_{10} emissions during diesel mode operation will be lower than the levels guaranteed by the manufacturer, and has proposed to comply with a daily emission limit for all 10 engines that is 30% lower than the guaranteed emission rate.

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APPENDIX 8.1F

Cumulative Impacts Analysis for the HBRP

APPENDIX 8.1F

Cumulative Impacts Analysis for the HBRP

Cumulative air quality impacts from the HBRP and other reasonably foreseeable projects will be both regional and localized in nature. Regional air quality impacts are possible for pollutants such as ozone, which is formed through a photochemical process that can take hours to occur. Carbon monoxide, NOx, and SOx impacts are generally localized in the area in which they are emitted. PM_{10} can create a local air quality problem in the vicinity of its emission source, but can also be a regional issue when it is formed in the atmosphere from ROC, SOx, and NOx.

The cumulative impacts analysis considered the potential for both regional and localized impacts due to emissions from proposed operation of HBRP. Regional impacts were evaluated by comparing maximum daily and annual emissions from HBRP with emissions of ozone and PM_{10} precursors in both Humboldt County and the entire North Coast Unified AQMD. Localized impacts were evaluated by looking at other local sources of pollutants that are not included in the background air quality data to determine whether these sources in combination with HBRP would be expected to cause significant cumulative air quality impacts.

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Regional Impacts

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Regional impacts are evaluated by assessing HBRP's contribution to regional emissions. Although the relative importance of ROC and NOx emissions in ozone formation differs from region to region and from day to day, state law requires reductions in emissions of both precursors to reduce overall ozone levels. The change in the sum of emissions of these pollutants, equally weighted, provides a rough estimate of the impact of HBRP on regional ozone levels. Similarly, a comparison of the emissions of PM_{10} precursor emissions from HBRP with regional PM_{10} precursor emissions provides an estimate of the impact of HBRP on regional PM_{10} levels.

Under NCUAQMD regulations, HBRP will be required to provide offsets for increases in NOx, ROC, and PM_{10} emissions from the project at a 1.0 to 1 ratio. Therefore, emissions of ozone and PM_{10} precursors from the project will be fully mitigated. Regulatory offset requirements are calculated based on quarterly emissions, but the regional inventories are expressed in tons per day of emissions. Comparisons are shown on both a daily and annual basis.

The following tables summarize these comparisons; detailed calculations are shown in the attached tables. HBRP emissions are compared with regional emissions in 2008, as the project is expected to begin operation in 2008. Humboldt County and NCUAQMD emissions projections for 2008 were taken from the Air Resources Board's web-based emission inventory projection software, available at *www.arb.ca.gov/app/emsinv/emssumcat.php.*

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These comparisons show that the total ozone and PM_{10} precursor emissions reductions from the shutdown of the existing Humboldt Bay Power Plant generating equipment will be larger than the reasonably foreseeable potential emissions from HBRP. Therefore, HBRP will have an overall positive impact on regional ozone and PM_{10} formation.

Table 8.1F-1
Comparison of HBRP Emissions to Regional Precursor Emissions in 2008: Daily Basis

	Humboldt County		NCUAQMD
Ozone Precursors – Daily Basis			
Total Ozone Precursors, tons/day	49.9		67.9
Total HBRP Ozone Precursor Emissions, tons/day		5.66	
HBRP Ozone Precursor Emissions as Percent of Regional Total	11.3%		8.3%
Reductions from Shutdown of HBPP, tons/day		13.2	
HBRP Ozone Precursor Emissions after offsets, tons/day		(7.5)	
HBRP Ozone Precursor Emissions as Percent of Regional Total, after offsets	0.0%		0.0%
PM_{10} Precursors – Daily Basis			
Total PM_{10} Precursors, tons/day	80.9		129.8
Total HBRP PM_{10} Precursors, tons/day		7.0	
HBRP PM_{10} Precursors as Percent of Regional Total	8.6%		5.4%
Reductions from Shutdown of HBPP, tons/day		36.7	
HBRP PM_{10} Precursors after offsets, tons/day	0.0%		0.0%

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Table 8.1F-2
Comparison of HBRP Emissions to Regional Precursor Emissions in 2008: Annual Basis*

	Humboldt County		NCUAQMD
Ozone Precursors – Annual Basis			
Total Ozone Precursors, tons/year	18,227		24,773
Total HBRP Ozone Precursor Emissions, tons/year		363.2	
HBRP Ozone Precursor Emissions as Percent of Regional Total	2.0%		1.5%
Reductions from Shutdown of HBPP, tons/year		961.3	
HBRP Ozone Precursor Emissions after offsets, tons/year		-598.1	
PM_{10} Precursors – Annual Basis			
Total PM_{10} Precursors, tons/year	29,538		47,388
Total HBRP PM_{10} Precursor Emissions, tons/year		486.3	
HBRP PM_{10} Precursor Emissions as Percent of Regional Total	1.6%		1.0%
Reductions from Shutdown of HBPP, tons/year		1,018.7	
HBRP PM_{10} Precursor Emissions after offsets, tons/year		-532.3	

Note: * County and AQMD emissions calculated as 365 times daily emissions.

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Localized Impacts

To evaluate potential cumulative impacts of HBRP in combination with other projects in the area, projects within a radius of 6 miles (10 km) of the project were used for the cumulative impacts analysis.

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Within this search area, three categories of projects with combustion sources were used as criteria for identification:

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- Existing projects that have been in operation since at least 2005.
- Projects for which air pollution permits to construct have been issued and that began operation after 2005.
- Projects for which air pollution permits to construct have not been issued, but that are reasonably foreseeable.

Existing projects that have been in operation since at least 2005 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 in 2005 were identified through a request of permit records from the North Coast Unified AQMD. Projects that had a permit to construct issued after January 1, 2004, were included in the cumulative air quality impacts analysis. The January 1, 2004 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 2005 ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 10 pounds per day were assumed to be *de minimis*, and were included in the dispersion modeling analysis.

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A list of projects within the area for which air pollution permits to construct have not yet been issued, but that are reasonably foreseeable, was also requested from the NCUAPCD staff.

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The District responded that there were no projects that met these criteria within 6 miles of the project site. Therefore, the actual emissions reductions from the shutdown of the Humboldt Bay Power Plant generating units and the potential to emit from the proposed new HBRP equipment were modeled to assess localized cumulative project impacts.

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Short-term cumulative impacts from temporary simultaneous activities at HBRP were previously evaluated. These temporary simultaneous activities include the following:

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- Construction of the new HBRP units while the existing Humboldt Bay Power Plant generating units are in use. The construction of the new units will occur while the existing plant is in operation. The assessment of localized cumulative impacts included ISCST3 and CTSCREEN modeling analyses of the combined impacts of the two activities (see Data Response 12).

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- Commissioning of the new HBRP units while the existing Humboldt Bay Power Plant generating units are in use. Because the Humboldt Bay Power Plant generating units must continue to operate until the new units have been brought online, commissioning of the new units will occur simultaneously with operation of the existing facility. The ambient air quality impacts of commissioning in combination with Humboldt Bay Power Plant operation was evaluated as part of the assessment of localized cumulative impacts (see Data Response 13).

- Although it is extremely speculative, the demolition of Units 1 and 2 at Humboldt Bay Power Plant could occur while the HBRP generating units are in operation. While there is no requirement that Units 1 and 2 be demolished as a condition of HBRP operation, there is a reasonably likelihood that demolition will take place sometime during the operational life of HBRP. As discussed in Data Response 77, planning the demolition of Units 1 and 2 has not reached the point at which it is possible to project average and maximum construction workforce levels or to schedule the time frame for demolition. This is because, as described in Data Response 77(a), Units 1 and 2 are classified as Class II areas, and therefore, their demolition will take place under the NRC's jurisdiction and in accordance with the MARSSIM. Therefore it is not possible to provide a detailed analysis of potential air quality impacts from the demolition of Units 1 and 2. However, in general, it is expected that air quality impacts during demolition of Units 1 and 2 would be similar to the air quality impacts from construction of the HBRP. A detailed analysis of cumulative impacts of construction of HBRP and operation of Humboldt Bay Power Plant (Data Response 12) showed that there was expected to be little or no overlap between the impacts of the two projects because of the nature of the activities. Based on the available information, we conclude that there would be little or no overlap between the impacts of the demolition project and the operation of the HBRP.

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APPENDIX 8.1G

Offsets and Interpollutant Offset Ratio Analysis

APPENDIX 8.1G

Offsets and Interpollutant Offset Ratio Analysis

Under District Rule 110 §5.2, HBRP must provide offsets that are at least equal to that portion of the potential to emit that exceeds 25 tons per year for PM_{10} and PM_{10} precursors. Most of the required offsets will be provided through the shutdown of the existing generating units at Humboldt Bay Power Plant. Table 8.1G-1 shows quarterly and annual proposed potential to emit from the new HBRP units and quarterly actual historical reductions from the existing Humboldt Bay Power Plant units that will be shut down following successful commissioning, startup testing, and commercial operation of HBRP.

TABLE 8.1G-1

Offsets Provided by the Shutdown of Existing Units at Humboldt Bay Power Plant[a]

Pollutant	Q1, tons	Q2, tons	Q3, tons	Q4, tons	Annual, tons
NOx					
Emissions Increase, New Units	42.7	43.1	44.2	44.2	174.3
Actual Historical Reduction, Shutdown of Existing Units	234.3	204.6	230.4	267.6	936.8
Net Increase (Reduction)	**(191.6)**	**(161.5)**	**(186.2)**	**(223.4)**	**(762.5)**
ROC					
Emissions Increase, New Units	46.6	47.1	47.6	47.6	188.9
Actual Historical Reduction, Shutdown of Existing Units	6.4	5.3	6.2	6.6	24.5
Net Increase (Reduction)	**40.2**	**41.8**	**41.4**	**41.0**	**164.4**
PM_{10}					
Emissions Increase, New Units	29.3	29.6	30.0	30.0	118.7
Actual Historical Reduction, Shutdown of Existing Units	5.9	6.6	8.1	6.7	27.4
Net Increase (Reduction)	**23.4**	**23.0**	**21.8**	**23.3**	**91.3**

Note:

a. HBRP SO_2 PTE is less than 25 tpy, so no offsets are required.

District Rule 110 §5.4 allows the APCO to approve interpollutant offsets on a case-by-case basis. HBRP proposes to use the excess NOx reductions from the shutdown of the Humboldt Bay Power Plant as offsets for ROC and PM_{10}. The ARB has determined that interpolllutant offset ratios of 1 ton of NOx for 1 ton of ROC and 3.58 tons of NOx for 1 ton of PM_{10} will provide equivalent air quality benefits as required under the NSR rules. HBRP has also purchased ERCs from a nearby source, Eel River Sawmill, that was recently shut down.

The required quarterly calculation of offsets is provided in Table 8.1G-2. This calculation demonstrates that more than sufficient offsets are being provided to achieve

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the no net increase and net air quality benefit provisions of the District NSR rule. The excess NOx reductions beyond those required to offset the HBRP emissions will be banked by PG&E to assist in creating a functional ERC transaction system in the District.

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Table 8.1G-2
HBRP
Calculation of Emission Reduction Credits
Rev March 07 to reflect 10/04 -- 9/06 baseline and higher NOx:PM10 ratic
Rev 08/08 to reflect new NG PM em limit

	Q1 (tons)	Q2 (tons)	Q3 (tons)	Q4 (tons)	Annual, tons	Exclusion, tons
NOx	90	91	92	92	365	
Project Emissions	42.7	43.1	44.2	44.2	174.3	25
Project Emissions Subject to Offset	36.8	37.2	37.6	37.6	149.3	
Onsite Reductions (Note 1)	*234.3*	*204.6*	*230.4*	*267.6*	*936.8*	
Offsite NOx ERCs (Note 2)	0.93	0.89	0.90	0.89	3.6	
Surplus NOx ERCs	*198.4*	*168.2*	*193.6*	*230.8*	*791.1*	
NOx ERCs for ROC	*-33.6*	*-35.2*	*-34.7*	*-34.3*	*-137.8*	
Net Surplus NOx ERCs	*164.8*	*133.1*	*158.9*	*196.5*	*653.3*	
NOx ERCs for PM10	*-55.6*	*-54.3*	*-49.8*	*-55.1*	*-214.9*	
Net Surplus NOx ERCs	***109.1***	***78.7***	***109.1***	***141.5***	***438.4***	
ROC						
Project Emissions	46.6	47.1	47.6	47.6	188.9	25
Project Emissions Subject to Offset	40.4	40.9	41.3	41.3	163.9	
Onsite Reductions (Note 1)	*6.4*	*5.3*	*6.2*	*6.6*	*24.5*	
Offsite ROC ERCs (Note 2)	0.41	0.39	0.39	0.39	1.6	
ROC Deficit	*-33.6*	*-35.2*	*-34.7*	*-34.3*	*-137.8*	
NOx for ROC at 1:1 (Note 3)	*33.6*	*35.2*	*34.7*	*34.3*	*137.8*	
Net ROC Deficit	0	0	0	0	0.0	
SOx						
Project Emissions	3.2	3.3	3.3	3.3	4.4	25
Project Emissions Subject to Offset	0.0	0.0	0.0	0.0	0.0	
Onsite Reductions (Note 1)	*0.5*	*0.9*	*27.7*	*0.8*	*30.0*	
Net Surplus SOx ERCs	***0.5***	***0.9***	***27.7***	***0.8***	***30.0***	
PM10						
Project Emissions	***29.3***	***29.6***	***30.0***	***30.0***	***118.7***	25
Project Emissions Subject to Offset	23.1	23.4	23.6	23.6	93.7	
Onsite Reductions (Note 1)	*5.9*	*6.6*	*8.1*	*6.7*	*27.4*	
Offsite PM10 ERCs (Note 2)	1.6	1.6	1.6	1.6	6.3	
PM10 Deficit	*-15.5*	*-15.2*	*-13.9*	*-15.4*	*-60.0*	
Surplus NOx ERCs Used for PM10 (Note 4)	*15.5*	*15.2*	*13.9*	*15.4*	*60.0*	
Net PM10 ERC Deficit	0.0	0.0	0.0	0.0	0.0	

Notes:

1. Distance ratio of 1:1 applies to onsite reductions from shutdown of Humboldt Bay Power Plant
2. Offsite ERCs purchased from Eel River Sawmills March 26, 2007; adjusted for distance ratio of 1.5:1.
3. See Attachment 8.1G-1.
4. NOx:PM10 offset ratio of 3.58 to 1 provided by ARB March 22, 2007.

Table 8.1G-3
HBRP
Calculation of Emission Reductions for CEQA
Rev 08/07

	Annual Emissions, tons
NOx	
Project Emissions	*174.3*
Onsite Reductions (Note 1)	*936.8*
Offsite NOx ERCs (Note 2)	5.4
Surplus NOx Reductions	*767.9*
NOx Reductions for ROC	*-162.0*
Net Surplus NOx Reductions	*605.9*
NOx Reductions for PM10	*293.0*
Net Surplus NOx Reductions	312.9
ROC	
Project Emissions	*188.9*
Onsite Reductions (Note 1)	*24.5*
Offsite ROC ERCs (Note 2)	2.4
ROC Deficit	*-162.0*
NOx for ROC at 1:1 (Note 3)	*162.0*
Net ROC Deficit	0.0
SOx	
Project Emissions	*4.4*
Onsite Reductions (Note 1)	*30.0*
Net Surplus SOx Reductions	*25.6*
PM10	
Project Emissions	***118.7***
Onsite Reductions (Note 1)	*27.4*
Offsite PM10 ERCs (Note 2)	9.5
PM10 Deficit	*-81.8*
NOx for PM10 at 3.58:1 (Note 4)	*81.8*
Net PM10 Deficit	0.0

Notes:
1. Onsite reductions from shutdown of Humboldt Bay Power Plant.
2. Offsite ERCs purchased from Eel River Sawmills March 26, 2007.
3. See offset ratio calculations in Attachment 8.1G-1.
4. Revised NOx for PM10 ratio provided by ARB March 22, 2007.

Attachment 8.1G-1

Interpollutant Offset Analysis

The objective of an emission offset requirement is to ensure that new projects will have a net air quality benefit in the region. The offset program seeks to achieve this by reducing emissions at one location to balance, or offset, an emission increase elsewhere.

The simplest case involves the generation of emission offsets by reductions from an existing source at, or near, the new source. When the pollutants are the same and the location is the same, the presence or absence of a net air quality benefit is relatively easy to determine: if the new emissions are less than the old emissions, a regional net air quality benefit is achieved.

When the location of the source of offsets is different from the source of new emissions, the areas impacted by the two sources differ. It is often impossible to demonstrate that the area impacted by the new source is benefited everywhere by the reductions from the existing source. Agencies usually address this by setting an offset ratio that takes distance into account. The amount of reductions required is higher than the emission increase, resulting in a net benefit to the region as a whole and to most locations in the impacted area as well. This approach is usually coupled with a requirement to conduct an impact analysis to ensure that no significant increases occur in those areas where the effect of the increase is greater than the benefit from the decrease.

The analysis becomes much more complicated when the proposed reduction is of a different pollutant than that emitted by the proposed new source. The principle is the same: a net air quality benefit must be demonstrated. However, when the offsetting pollutant is different than the new pollutant, the demonstration is not straightforward.

Although the statutory requirement is to show an overall net air quality benefit, the practice has been to apply this test on a pollutant-specific basis. The agencies have allowed the reduction of one pollutant to offset the increase of another pollutant only where the two pollutants can be related, generally because one pollutant is a precursor for the other, or both are precursors for a third pollutant.

The NCUAQMD is not in attainment with the state 24-hour standard for PM_{10}. The District's new source review rule requires offsets for most increases in emissions of PM_{10} and its precursors, which include NOx, SO_2, and ROC. PG&E will be required to provide offsets for the PM_{10}, NOx, and ROC emissions from HBRP. PG&E has ample NOx reductions from the shutdown of the Humboldt Bay Power Plant to use as offsets. However, it does not have sufficient ROC and PM_{10} offsets available to fully offset these pollutants with ROC and PM_{10} reductions.

NCUAQMD allows the use of interpollutant offsets, provided the project demonstrates a net air quality benefit and the impact analysis demonstrates that the project does not worsen or cause non-compliance with any ambient air quality standard.

HBRP proposes to meet the NOx offset requirements through provision of NOx reductions; the PM_{10} offset requirements mostly through interpollutant offsets of NOx reductions; and the ROC offset requirements mostly through interpollutant offsets of NOx reductions. The impact analysis requirement was addressed in Section 8.1.2.5.

This analysis provides a technical basis for determining that the proposed offset ratios for NOx to PM_{10} and NOx to ROC are sufficient to demonstrate a net air quality benefit.

Determining an Offset Ratio

Reductions of precursor pollutants as offsets for the pollutant being formed have been approved by other California air districts for other major projects. See Attachment 8.1G-1.1 for two examples of approved offset ratio calculations (SO_2 for PM_{10} and NOx for PM_{10}).

All examples of projects for which PM_{10} precursors have been accepted as offsets for PM_{10} emissions have based the offset ratio on the relative effect that the precursor emissions have on ambient PM_{10} levels versus directly-emitted PM_{10}. The health benefits due to reductions of ambient concentrations of NOx, SO_2, or ozone have not been considered.

The determination of an appropriate interpollutant offset ratio begins by determining the air quality impact (i.e., ground level concentration) due to directly emitted PM_{10} from sources similar to the new source in units of microgram/cubic meter per ton per year (tpy) emitted. The general methodology is to identify the portion of measured average PM_{10} levels that is attributed to direct PM_{10} emissions from combustion sources, and divide that concentration by the portion of the emission inventory that contributes to it. The result is the theoretical amount that the regional average PM_{10} concentrations would go up for every new ton of PM_{10} directly emitted by the source category.

Next, the same calculation is performed for the portion of ambient PM_{10} that is the result of secondary particulate formation from emissions of the pollutant providing the offsets. If the proposal is to provide NOx reductions to offset PM_{10} increases, the nitrate portion of the ambient PM_{10} levels is divided by the NOx inventory contributing to formation of those nitrates.

NOx for PM_{10}

The NOx to PM_{10} interpollutant offset ratio is the amount of NOx that would result in 1 $\mu g/m^3$ of ground-level PM_{10} divided by the amount of directly emitted PM_{10} that would result in 1 $\mu g/m^3$ of ground-level PM_{10}.

Ambient PM_{10} Measurements

The NCUAQMD and other jurisdictions recognize that ambient concentrations vary seasonally and require offsets to be provided on a quarterly basis. Recognizing that ambient particulate levels are higher in the winter than other seasons, some districts allow emission reductions from the winter season to be used to offset increases in other seasons, but not vice versa.

All of the criteria pollutants subject to offsets for this project are, or are precursors for, PM_{10} - a pollutant for which offsets are required because, on certain days, ambient levels exceed short-term ambient standards. The agency's goal is to reduce the pollutant levels on the worst days to below the ambient standards.

In determining whether interpollutant offsets provide a net air quality benefit, therefore, it is reasonable to give greatest consideration to the season of most concern, and set a single ratio based on the days when pollutant levels exceed the standards. This approach has been taken by the SJVAPCD in setting PM_{10} interpollutant offset ratios.

In Humboldt County, PM_{10} and $PM_{2.5}$ levels are highest during the late fall and winter. Colder, more stagnant conditions during this time of the year are conducive to the buildup of PM, including the formation of secondary ammonium nitrate. In addition, increased emissions from residential wood burning during this time of year contribute to higher direct particulate emissions.

Source Categories Included in the Inventory

The goal of the offset ratio analysis is to determine what the impact of directly emitted PM_{10} from the new source is, and to compare that with the impact of indirect PM_{10} from the source providing the offsets. Ideally, each source category would be defined as narrowly as possible—for example, individual types of combustion sources, such as power plants and automobiles, would be treated separately—so that the direct and indirect PM_{10} impacts would be related as closely as possible.

However, studies[29] that have quantified the contribution of source categories to measured ambient PM have not been able to make distinctions between similar sources. At present, the best that they can do is determine that a fraction comes directly from wood burning, another fraction comes directly from other combustion sources (automobiles, power plants, etc.), fractions form indirectly from nitrates and sulfates, a fraction comes from marine air, and the rest from various other sources.

Calculations

In order to determine the appropriate NOx to PM_{10} offset ratio for HBRP, the information listed in Table 1 was used.

The North Coast Air Basin is in attainment of the federal PM_{10} 24-hour standards, but exceeds the state standard. Annual average PM_{10} concentrations are well below the federal standard, but remain very close to the new state standard of 20 µg/m3.

Offsets are required for PM_{10} because the region has not attained the state 24-hour PM_{10} standard. As a result, this analysis uses the PM_{10} and nitrate data for the day with the highest monitored 24-hour average PM_{10} concentration. Ambient monitoring data from 2005 were used to coincide with the most current emissions inventory, which is the 2005 planning inventory. Because nitrate data are not available for the NCUAQMD, chemical mass balance data from the BAAQMD were used to characterize relative fractions of measured ambient PM_{10} and $PM_{2.5}$ coming from directly emitted PM_{10} and from nitrate on the days with the highest monitored concentrations. The ARB has indicated that, based on similarities between the North Coast Air Basin, the Bay Area, and San Joaquin regions, the percentage of PM_{10} that comes from secondary pollutants should be about

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[29] Chemical Mass Balance (CMB) modeling is a way of estimating how much various sources contribute to ambient PM_{10} concentrations. The CMB model uses a computer program whose inputs are source profiles and an ambient PM_{10} sample or samples which have been analyzed for a variety of chemical components. The CMB model finds the mix of sources whose combined amounts of chemical components best approximates those in the ambient sample. In other words, the output of the CMB model is estimates of the relative contributions from the various emissions sources that would result in the specific profile of chemical components that make up the PM_{10} in the ambient sample.

the same, at least on an annual basis.[30] This analysis assumes that this is also true on the worst-case day.

The CMB modeling for the Bay Area is based on $PM_{2.5}$, not PM_{10}. Because almost all PM emitted from combustion sources is $PM_{2.5}$, and because all secondary PM is $PM_{2.5}$, the CMB data can be used to estimate combustion and nitrate levels as a fractions of total $PM_{2.5}$. The worst-case $PM_{2.5}$ concentration for 2005 is listed in Table 1. Assuming that the $PM_{2.5}$ speciation is the same as for the Bay Area, 32% of the worst-case $PM_{2.5}$ comes from direct combustion sources (other than wood combustion), while 42% is secondary nitrate.

Emissions come from the North Coast Air Basin Planning Inventory for calendar year 2005. Directly emitted non-wood combustion PM comes from the following source categories: stationary source combustion, managed burning and disposal, cooking, and mobile direct emissions. The entire regional NOx emissions are used because nitrate forms without regard to the category from which NOx is emitted.

[30] CARB Technical Report, "Characterization of Ambient PM_{10} and $PM_{2.5}$ in California," June 2005

Table 1
DATA USED IN CALCULATING THE NOX TO PM_{10} OFFSET RATIO

Data	**Value**
Ambient PM_{10} concentration (max daily)[31]	71 μg/m^3
Ambient $PM_{2.5}$ concentration (max daily)	31.8 μg/m^3
Portion of PM_{10} concentration attributed to direct emission from stationary combustion sources[32]	10.2 μg/m^3
Directly emitted organic PM_{10} from combustion (North Coast Air Basin)[33]	17.4 tpd
PM_{10} impact from stationary combustion sources[34]	0.586 μg/m^3 per tpd
Nitrate portion of PM_{10} concentration [35]	13.4 μg/m^3
NOx emission inventory (North Coast Air Basin)[36]	58.04 tpd
Secondary PM_{10} impact from NOx emissions[37]	0.231 μg/m^3 per tpd
Tons of NOx to equal effect of 1 ton PM_{10}[38]	2.54

A more detailed description of the calculation procedure is provided in Appendix 8.1G-1.2. Based on this analysis, a reduction of 2.54 tons of NOx would provide the same impact on ambient PM_{10} levels as a reduction of 1.0 ton of PM_{10}, so an offset ratio of 2.54:1.0 will be proposed.

Based on a subsequent analysis performed by ARB staff, a NOx:PM_{10} ratio of 3.58 to 1 has been used in the final offset and mitigation calculations.

NOx for ROC

Another approach to mitigating project impacts through offsets is by reducing emissions of one precursor pollutant to offset increases of another precursor pollutant. Most of the examples have been NOx for ROC and vice versa, where both pollutants are precursors

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31 CARB Air Quality Data (Top 4 Summary for Eureka-I Street Station). Data from 2005.

32 Assumed stationary source combustion direct contribution to $PM_{2.5}$ same as BAAQMD (32%); assumed all combustion PM_{10} emitted as $PM_{2.5}$

33 CARB website 2006 Almanac Data, PM_{10}, Projected Emission Inventory
North Coast Air Basin, 2005 inventory (winter); sum of stationary source combustion, managed burning and disposal, cooking, and mobile direct emissions

34 Portion of PM_{10} attributed to direct emissions from stationary source combustion divided by stationary source PM_{10} emissions

35 CARB summary of PM_{10} and $PM_{2.5}$ data for the North Coast Air Basin states that no nitrate or sulfate data are available. Based on similarities with Bay Area and San Joaquin, CARB estimates 30% of the annual $PM_{2.5}$ to be secondary sulfate and nitrate (on an annual basis). On the winter days when PM10 concentrations are highest, nitrate levels are much higher. Studies in the Bay Area, for example, reported nitrate portion of $PM_{2.5}$ on peak particulate days at 42%. Sulfate levels, on the other hand, do not appear to vary seasonally. The ultimate fate of NOx in the atmosphere is very complex and is greatly affected by sunlight and temperature.

36 CARB website 2006 Almanac Data, Oxides of Nitrogen, Projected Emission Inventory North Coast Air Basin, 2005 inventory (winter)

37 Nitrate concentration divided by NOx emissions

38 Impact of directly emitted PM_{10} divided by impact of secondary PM_{10} from NOx: 0.586/0.231 = 2.54

for ozone formation. Note that in the present proposal, the same precursor pollutants are involved. However, they are considered here in their roles as precursors for PM_{10} formation.

Two approaches have been used to develop interpollutant offset ratios for NOx and ROC in their role as ozone precursors. The more rigorous approach considers the relative contribution that each pollutant makes to the formation of the secondary pollutant. This involves complex photochemical modeling. The offset ratio is the relative strength of the two pollutants as ozone precursors. In practice, the offset ratio is never less than 1 to 1.

The second approach is a simplified version of the first. In some regions the agencies have determined that the formation of ozone is limited by one or the other precursor. Under these conditions, offset of one precursor by the other can only go one way. The agency can determine, with certainty, that a reduction of one pollutant is always more beneficial than a reduction of the other pollutant. The agencies that allow interpollutant offsets will usually allow use of the more harmful pollutant as a source of offsets, again at a 1 to 1 ratio.

Neither approach is applicable here. The requirement for offsets for ROC is based on its being a precursor for PM_{10}, not ozone. The mechanism for formation of secondary PM_{10} from ROC does not involve reaction with NOx.

The proposed methodology for determining an offset ratio for NOx to ROC is, however, conceptually similar. Each pollutant will be evaluated for its impact on ambient PM_{10} levels, and the proposed offset ratio will be based on the relative strength of the pollutant as a PM_{10} precursor. Because of uncertainties in the calculations, an offset ratio of less than 1:1 will not be proposed.

The approach begins by determining the ambient PM_{10} impact due to directly emitted NOx from sources in the county (on average) in units of microgram/cubic meter per tpy. That calculation was laid out in the previous section.

Next, the same calculation is performed for the portion of ambient PM_{10} that is the result of secondary particulate formation from emission of ROC. The organic portion of the ambient PM_{10} levels attributable to secondary formation from ROC is divided by the ROC inventory contributing to formation of those particulates.

In order to determine the appropriate ROC to PM_{10} offset ratio, the following information is needed:

Table 2
NOX TO ROC OFFSET RATIO

Data	Value
Secondary PM_{10} impact from NOx emissions[39]	0.231 μg/m^3 per tpd
Secondary organic portion of PM_{10} concentration [40]	Less than 5.09 μg/m^3
ROC emission inventory (North Coast Air Basin)[41]	59.315 tpd
Secondary PM_{10} impact from ROC emissions[42]	Less than 0.086 μg/m^3 per tpd
Tons of NOx to equal effect of one ton ROC on PM_{10}43	Less than 0.37: 1

A detailed description of the calculation process is provided in Attachment 8.1G-1.3. Based on these calculations, a reduction of 0.37 tons of NOx would provide the same impact on ambient PM_{10} levels as a reduction of 1.0 ton of PM_{10}. However, because of the uncertainty inherent in these calculations an offset ratio of 1.0 to 1.0 is proposed.

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[39] See the calculations for NOx:PM_{10} offsets

[40] Secondary organic aerosols may constitute up to 16% of $PM_{2.5}$ (Characterization of Ambient PM_{10} and $PM_{2.5}$ in California, CARB). PM2.5 concentration = 31.8 μg/m^3

[41] CARB website 2005 inventory

[42] Divide secondary organic PM_{10} by ROC emissions

[43] Divide impact of impact of secondary PM_{10} from ROC by impact of secondary PM_{10} from NOx: 0.086/0.231 = 0.37

Attachment 8.1G-1.1

Examples of Interpollutant Offset Ratio Calculations Accepted by SJVAPCD, EPA, and CEC

Example 1: Modesto Irrigation District (SJVACPD, 2003)

SOx for PM_{10}

Ratio proposed: 1.0:1.0

Rationale:

1. Annual average nitrate, sulfate, chloride, and total PM_{10} ambient air measurements used to partially speciate the PM_{10}

2. Unspeciated PM_{10} split between direct-combustion-related PM_{10} (fuel combustion and mobile sources) and other direct PM_{10} sources

    a. Direct-combustion-related PM_{10} based on Chemical Mass Balance modeling performed for the District's PM_{10} attainment demonstration plan (24-hour models)

3. Annual average direct-combustion PM_{10} concentration is divided by total annual direct-combustion PM_{10} emissions from district-wide inventory

4. Annual average sulfate concentration is divided by total annual SO_2 emissions from district-wide inventory

5. Ratio of (3) to (4) represents the amount of SO_2 reductions needed to have equivalent impact on PM_{10} concentrations as reducing 1 TPY of directly emitted combustion PM_{10}.

Example 2: Pastoria Energy Facility (SJVAPCD, 2005)

NOx for PM_{10}

Ratio proposed: 2.16:1

1. Direct-combustion-related PM_{10} based on Chemical Mass Balance modeling performed for the District's PM_{10} attainment demonstration plan (24-hour models)

2. Annual average direct-combustion PM_{10} concentration (attributed to industry) is divided by total annual direct-combustion PM_{10} emissions (from industry) from district-wide inventory

3. Annual average nitrate concentration (attributed to local [county] sources) is divided by total annual NOx emissions from countywide inventory

4. Ratio of (2) to (3) represents the amount of NO_2 reductions needed to have an equivalent impact on PM_{10} concentrations as reducing 1 TPY of directly emitted combustion PM_{10}

Attachment 8.1G-1.2

Detailed Description of NOx to PM_{10} Offset Ratio Methodology

Step 1: Actual worst day average nitrate, sulfate, chloride, and PM_{10} ambient air measurements are used to partially speciate the PM_{10}. Missing data is filled in by appropriate gap-filling. In this case, the highest PM_{10} day in 2005 was used.

Step 2: The unspeciated balance of PM_{10} (after subtracting the ammonium sulfate, ammonium nitrate, and ammonium chloride from the total PM_{10}) is split between direct-combustion-related PM_{10} (fuel combustion and mobile sources) and other direct PM_{10} sources. The contribution from direct-combustion can be based on Chemical Mass Balance (CMB) modeling performed for a District's PM_{10} Attainment Demonstration Plan, if available.

Step 3: The region's direct-combustion emissions are obtained from the regional emission inventory. In this case, the winter inventory for planning year 2005 was used.

Step 4: The peak daily average PM_{10} concentration due to direct-combustion sources and the peak daily average nitrate concentration for calendar year 2005 are adjusted (downward) to account for the contribution due to pollution transport. Because the goal is to determine what effect local sources have on regional PM_{10} concentrations, the impact from outside sources must be excluded. In this case, the region is assumed to be upwind of the other districts. No adjustments were made for transport of NOx or PM_{10} for this analysis.

Step 5: The direct PM_{10} impact (in units of $\mu g/m^3$ per ton/day) from local combustion sources is calculated by dividing the adjusted direct-combustion-related PM_{10} concentration by the direct-combustion regional PM_{10} emissions. The secondary impact from NOx emissions is calculated by dividing the adjusted nitrate concentration by all regional NOx emissions.

Step 6: The NOx to PM_{10} ratio is determined by dividing the NOx impact by the direct PM_{10} impact.

Appendix 8.1G-1.3

Detailed Description of NOx to ROG Offset Ratio Methodology

Step 1: Actual worst day average nitrate, sulfate, chloride, and PM_{10} ambient air measurements are used to partially speciate the PM_{10}. Missing data is filled in by appropriate gap-filling. The portion of organic PM_{10} that is due to secondary particulate formation is estimated. In this case, the highest PM_{10} day in 2005 was used.

Step 2: The unspeciated balance of PM_{10} (after subtracting the ammonium sulfate, ammonium nitrate, and ammonium chloride from the total PM_{10}) is split between direct-combustion-related PM_{10} (fuel combustion and mobile sources) and other direct PM_{10} sources. The contribution from direct-combustion can be based on Chemical Mass Balance (CMB) modeling performed for a district's PM_{10} Attainment Demonstration Plan, if available.

Step 3: The region's direct-combustion emissions are obtained from the regional emission inventory. In this case, the winter inventory for planning year 2005 was used.

Step 4: The peak daily average PM_{10} concentration due to direct-combustion sources and the peak daily average secondary organic PM_{10} concentration for calendar year 2005 are adjusted (downward) to account for the contribution due to pollution transport. Because the goal is to determine what effect local sources have on regional PM_{10} concentrations, the impact from outside sources must be excluded. In this case, the region is assumed to be upwind of the other districts. No adjustments were made for transport of NOx or PM_{10} for this analysis.

Step 5: The direct PM_{10} impact (in units of $\mu g/m^3$ per ton/day) from local combustion sources is calculated by dividing the adjusted direct-combustion-related PM_{10} concentration by the direct-combustion regional PM_{10} emissions. The secondary impact from ROG emissions is calculated by dividing the adjusted nitrate concentration by all regional ROG emissions.

Step 6: The ROG:PM_{10} ratio is determined by dividing the ROG impact by the direct PM_{10} impact.

Step 7: The NOx:ROG ratio is determined by dividing the ROG impact by the NOx impact.