Appendix B
Air Quality Data

List of Attachments

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Attachment A
Windrose Figures

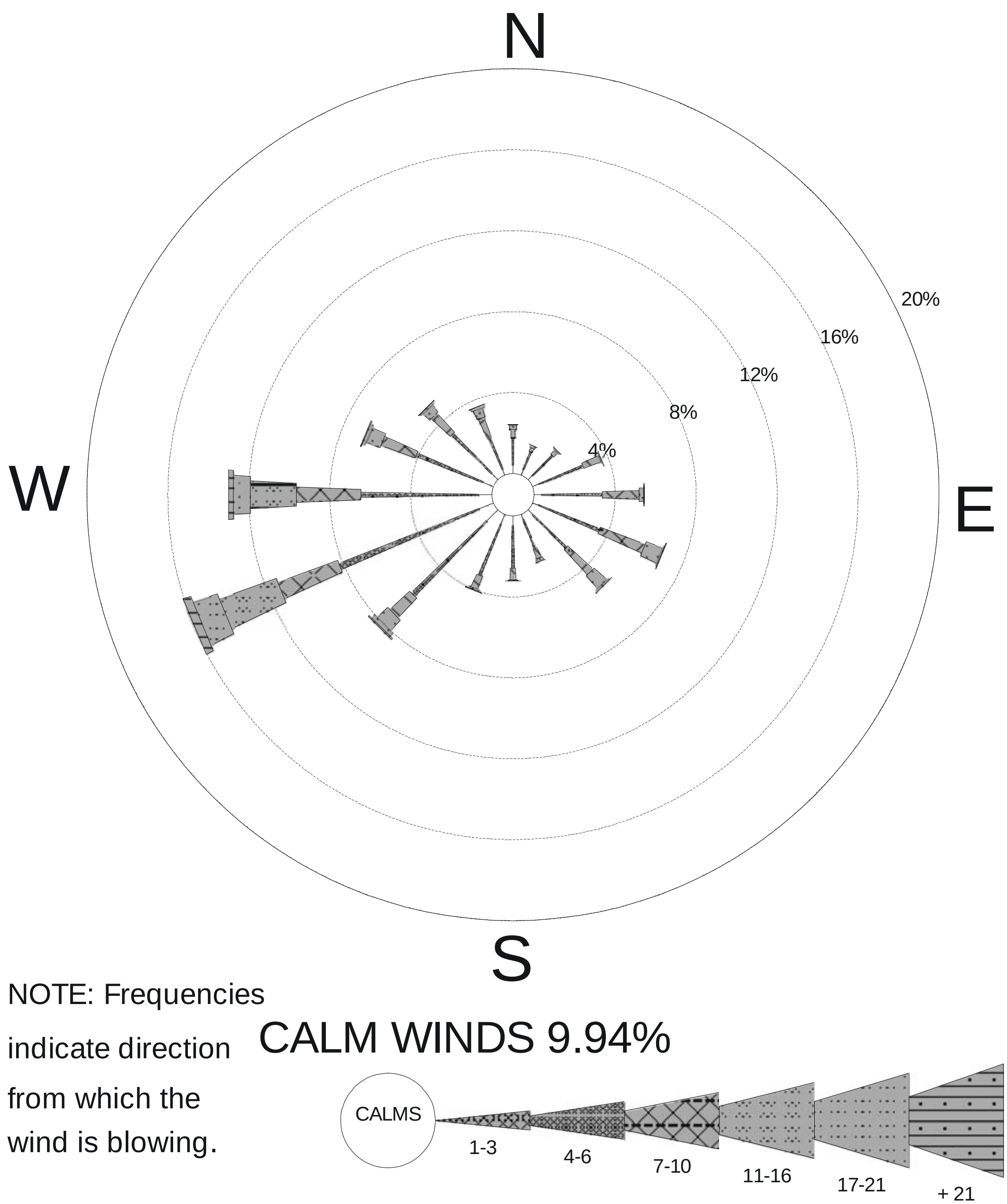

Figure A-1
Windrose for All Months 1991 – 1995
Imperial County Airport

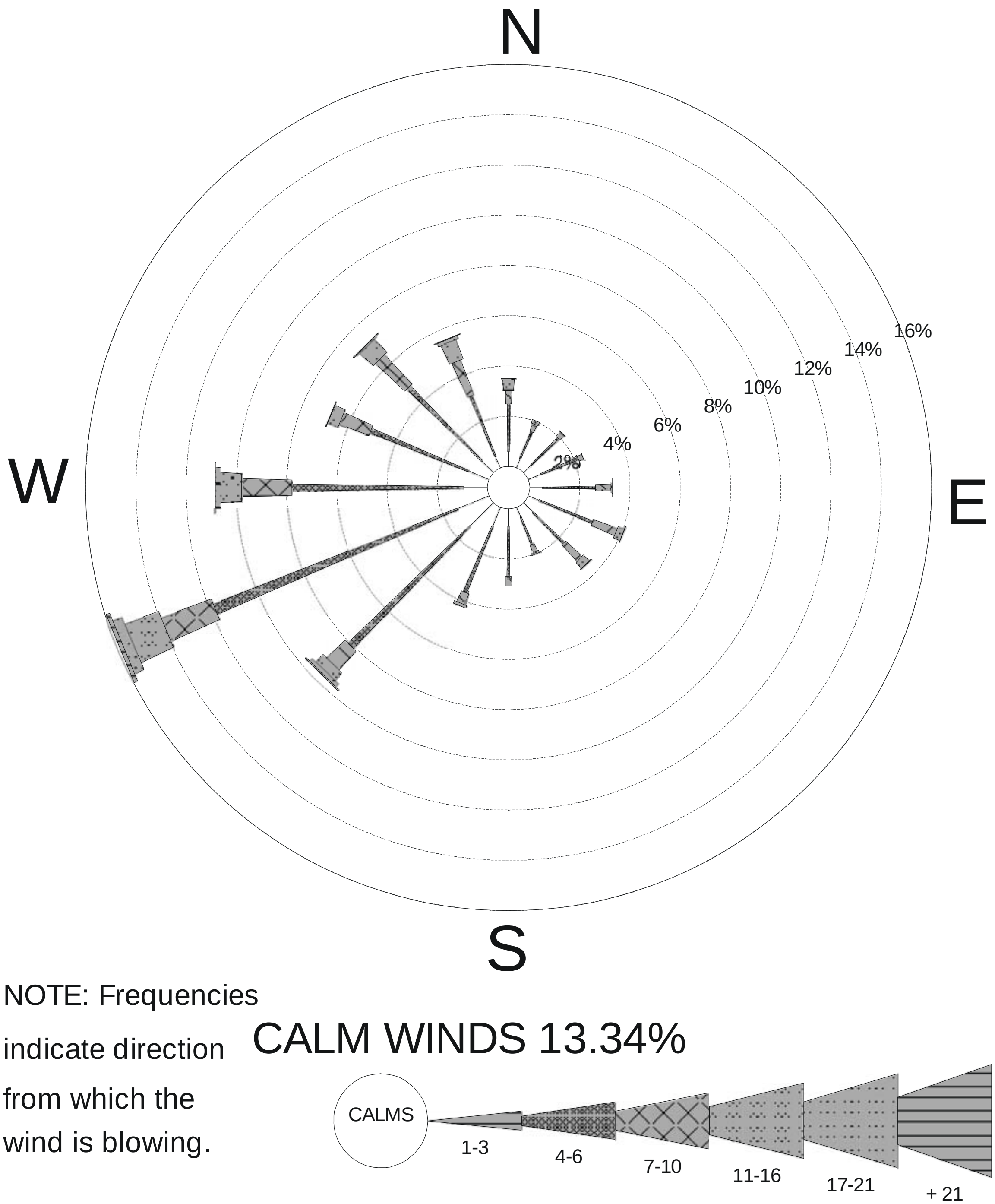

Figure A-2
Windrose for Winter Months (December – February) 1991 – 1995
Imperial County Airport

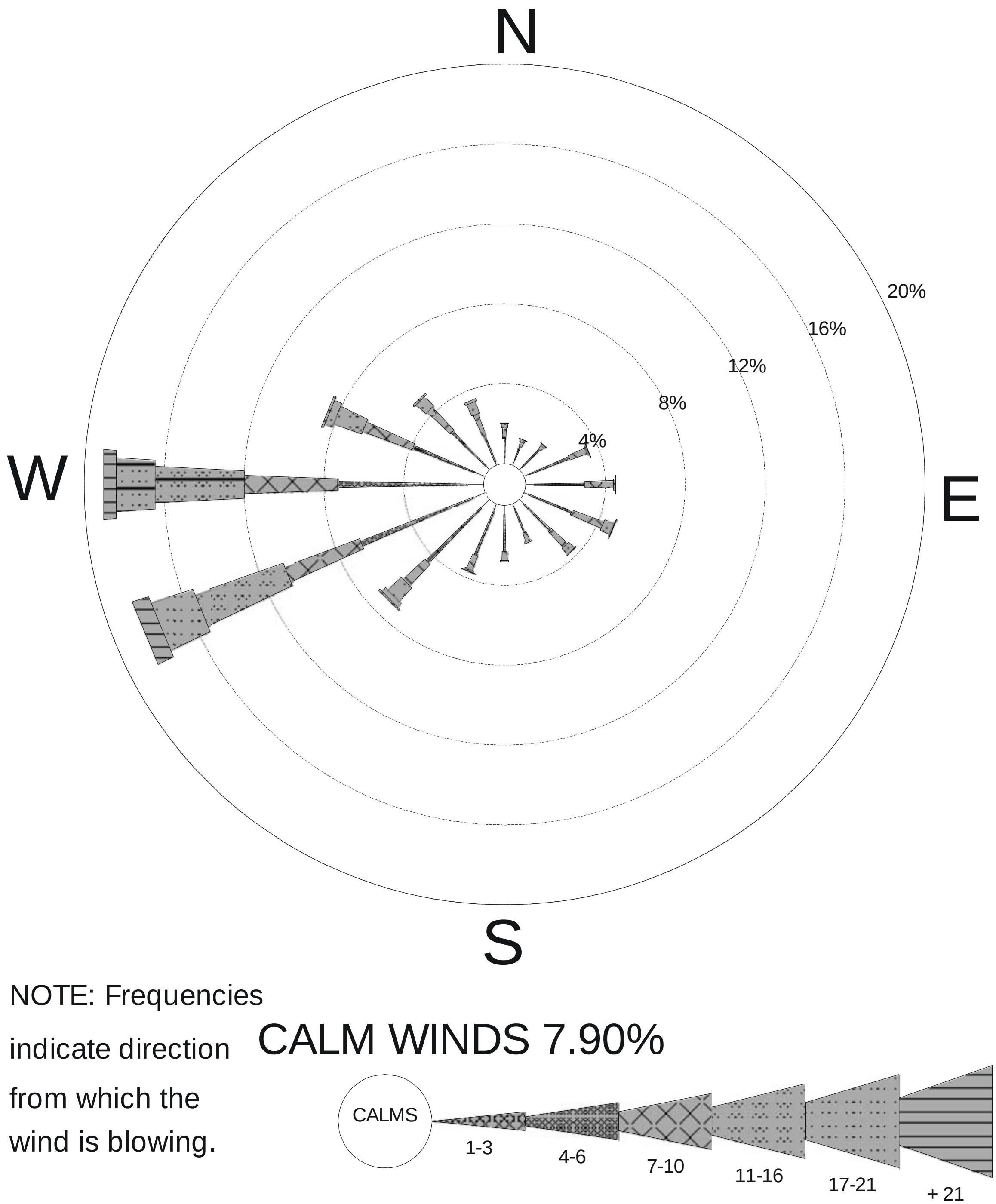

Figure A-3
Windrose for Spring Months (March – May) 1991 – 1995
Imperial County Airport

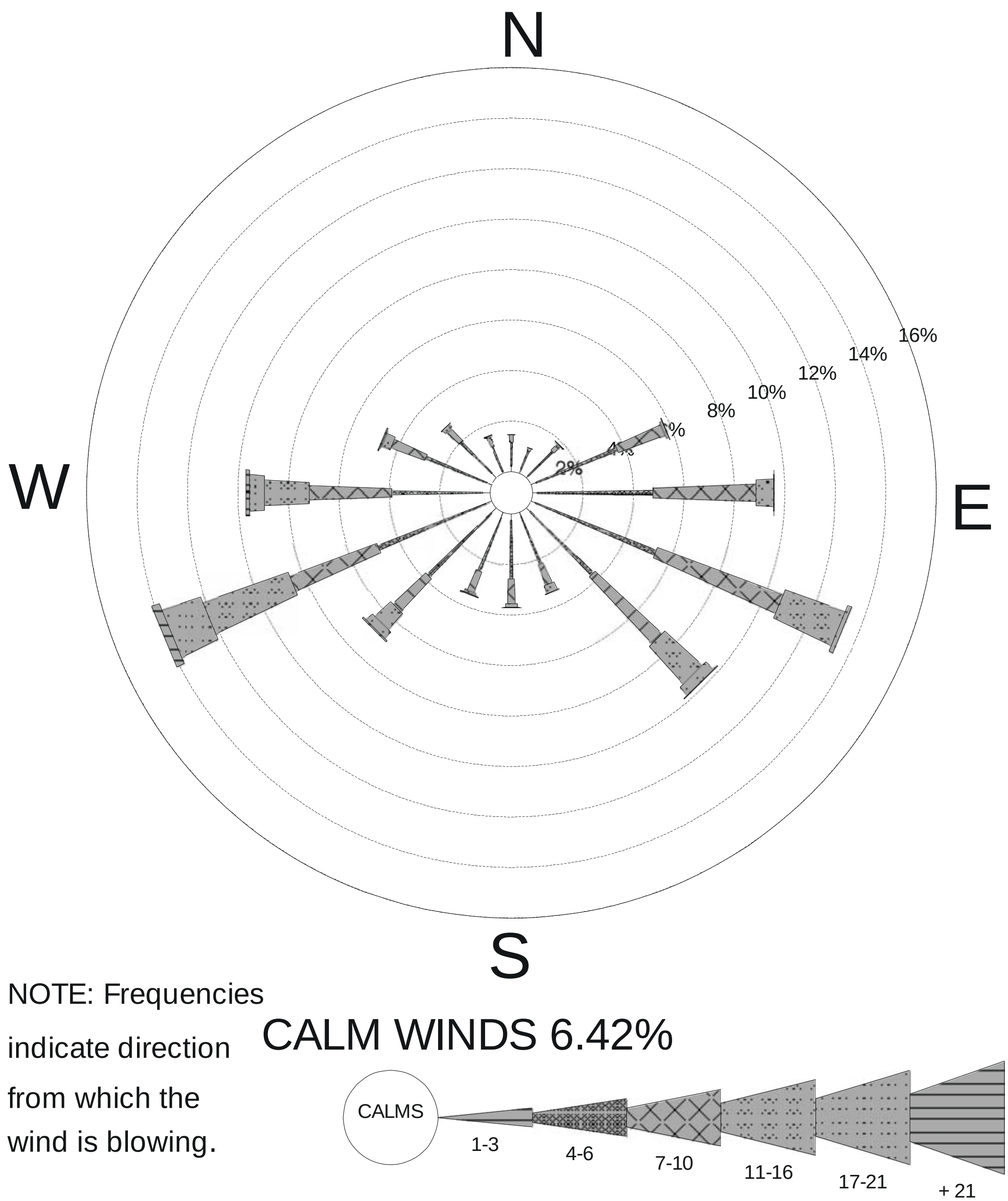

Figure A-4
Windrose for Summer Months (June – August) 1991 - 1995
Imperial County Airport

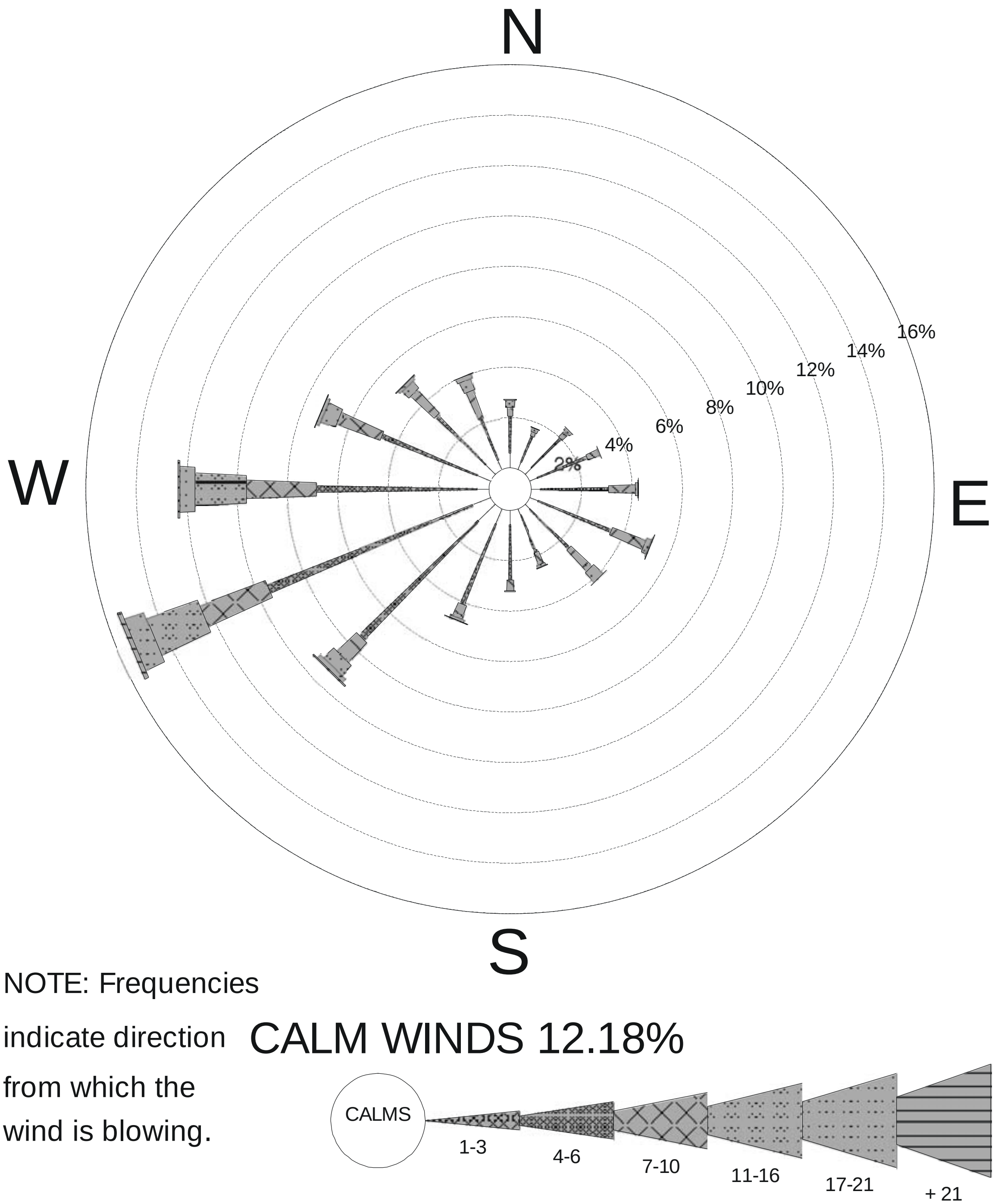

Figure A-5
Windrose for Autumn Months (September – November) 1991 - 1995
Imperial County Airport

Attachment B
Supporting Information on Estimation of Project Construction Emissions

EMISSION CALCULATIONS FOR CONSTRUCTION EQUIPMENT COMBUSTION

TABLE B-1 EMISSION FACTOR FOR DIESEL CONSTRUCTION EQUIPMENT COMBUSTION [1]

			Horsepower		BSFC	EFss (Zero Hour Steady State Emission Factor) - Tier 2 (g/hp-hr) (Table A-2)				TAF (Table A-3)					"A" Factor (For Deterioration Factor) - Tier 2 (Table A-4)				DF (= 1 + A x Fraction of Useful Life)				Adjusted EF (g/hp-hr) 2				Adjusted	Adjusted	Adjusted EF (lbs/gal) 6				
Equipment Type	Fuel Type	Unit Count	Range	Average	(lb/hp-hr) (Table A-2)	HC	CO	NOx	PM	HC (Base-T3)	CO (Base-T3)	NOx (Base-T2)	PM (Base-T2)	BSFC (Base-T2)	HC	CO	NOx	PM	HC	CO	NOx	PM	HC	CO	NOx	PM Adj. Factor 3	PM EF (g/hp-hr) 4	SO2 EF (g/hp-hr) 5	HC	CO	NOx	PM	SO2
Air Compressor 185 CFM	D	1	25-50	40	0.408	0.2789	1.5323	4.7279	0.3389	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3263	1.6097	4.7492	0.0578	0.3613	0.0054	0.0125	0.0618	0.1822	0.0139	0.0002
Air Compressor 750 CFM	D	1	25-50	40	0.408	0.2789	1.5323	4.7279	0.3389	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3263	1.6097	4.7492	0.0578	0.3613	0.0054	0.0125	0.0618	0.1822	0.0139	0.0002
Articulating Boom Platform	D	2	300-600	398	0.367	0.1669	0.8425	4.3351	0.1316	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.1953	0.8850	4.3546	0.0520	0.1107	0.0049	0.0083	0.0377	0.1857	0.0047	0.0002
Bulldozer D10R	D	1	500	500	0.367	0.1669	0.8425	4.3351	0.1316	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.2050	1.3541	4.1369	0.0525	0.1477	0.0049	0.0087	0.0572	0.1747	0.0062	0.0002
Bulldozer D4C	D	1	75-100	88	0.408	0.3672	2.3655	4.7	0.24	1.05	1.53	0.95	1.04	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.4511	3.8020	4.4851	0.0584	0.2503	0.0055	0.0171	0.1444	0.1704	0.0095	0.0002
Concrete Pumper Truck	D	1	300-600	398	0.408	0.1669	0.8425	4.3351	0.1316	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.1953	0.8850	4.3546	0.0578	0.1049	0.0054	0.0075	0.0340	0.1671	0.0040	0.0002
Concrete Trowel Machine	D	1	25-50	40	0.408	0.2789	1.5323	4.7279	0.3389	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3426	2.4628	4.5117	0.0584	0.4571	0.0055	0.0130	0.0935	0.1714	0.0174	0.0002
Concrete Vibrators	D	1	25-50	40	0.408	0.2789	1.5323	4.7279	0.3389	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3426	2.4628	4.5117	0.0584	0.4571	0.0055	0.0130	0.0935	0.1714	0.0174	0.0002
Crane - Mobile 65 ton	D	1	175-300	240	0.367	0.3085	0.7475	4	0.1316	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3609	0.7852	4.0180	0.0520	0.1107	0.0049	0.0154	0.0335	0.1714	0.0047	0.0002
Cranes - Mobile 35 ton	D	1	100-175	140	0.367	0.3384	0.8667	4.1	0.18	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3959	0.9105	4.1185	0.0520	0.1706	0.0049	0.0169	0.0388	0.1757	0.0073	0.0002
Cranes - Mobile 45 ton	D	1	100-175	140	0.367	0.3384	0.8667	4.1	0.18	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3959	0.9105	4.1185	0.0520	0.1706	0.0049	0.0169	0.0388	0.1757	0.0073	0.0002
Diesel Powered Welder	D	4	25-50	40	0.408	0.2789	1.5323	4.7279	0.3389	2.29	2.57	1.1	1.97	1.18	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.7473	4.1369	5.2241	0.0682	0.7573	0.0064	0.0243	0.1345	0.1698	0.0246	0.0002
Dump Truck	D	1	175-300	244	0.367	0.3085	0.7475	4	0.1316	1.05	1.53	0.95	1.04	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3790	1.2014	3.8171	0.0525	0.1167	0.0049	0.0160	0.0507	0.1612	0.0049	0.0002
Excavator - Backhoe/loader	D	2	50-100	75	0.408	0.3672	2.3655	4.7	0.24	2.29	2.57	1.1	1.97	1.18	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.9838	6.3863	5.1933	0.0682	0.5164	0.0064	0.0320	0.2076	0.1688	0.0168	0.0002
Excavator - Earth Scraper 623	D	2	175-300	240	0.367	0.3085	0.7475	4	0.1316	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3790	1.2014	3.8171	0.0525	0.1477	0.0049	0.0160	0.0507	0.1612	0.0062	0.0002
Excavator - loader	D	1	50-100	75	0.408	0.3672	2.3655	4.7	0.24	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.4511	3.8020	4.4851	0.0584	0.3067	0.0055	0.0171	0.1444	0.1704	0.0116	0.0002
Excavator - Motor Grader (CAT140H)	D	1	100-175	140	0.367	0.3384	0.8667	4.1	0.18	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.4157	1.3930	3.9125	0.0525	0.2213	0.0049	0.0176	0.0588	0.1652	0.0093	0.0002
Excavator - Trencher (CAT320)	D	1	50-100	75	0.408	0.3672	2.3655	4.7	0.24	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.4511	3.8020	4.4851	0.0584	0.3067	0.0055	0.0171	0.1444	0.1704	0.0116	0.0002
Forklift	D	2	50-100	75	0.408	0.3672	2.3655	4.7	0.24	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.4511	3.8020	4.4851	0.0584	0.3067	0.0055	0.0171	0.1444	0.1704	0.0116	0.0002
Pile Driver Truck	D	1	375	375	0.367	0.1669	0.8425	4.3351	0.1316	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.2050	1.3541	4.1369	0.0525	0.1477	0.0049	0.0087	0.0572	0.1747	0.0062	0.0002
Portable Compaction - Vibratory Plate	G	1	11-16	13	0.74	4.16	352.57	2.77	0.06	1	1	1	1	1	0.266	0.231	0	0.266	1.13	1.12	1.00	1.13	4.7133	393.2918	2.7700	0.1048	0.0368	0.0097	0.0997	8.3189	0.0586	0.0008	0.0002
Portable Compaction - Vibratory Ram	D	1	25-50	40	0.408	0.2789	1.5323	4.7279	0.3389	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3263	1.6097	4.7492	0.0578	0.3613	0.0054	0.0125	0.0618	0.1822	0.0139	0.0002
Portable Compaction Roller	D	1	175-300	240	0.367	0.3085	0.7475	4	0.1316	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3790	1.2014	3.8171	0.0525	0.1477	0.0049	0.0160	0.0507	0.1612	0.0062	0.0002
Portable Power Generators	D	2	25-50	40	0.408	0.2789	1.5323	4.7279	0.3389	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3263	1.6097	4.7492	0.0578	0.3613	0.0054	0.0125	0.0618	0.1822	0.0139	0.0002
Pumps	G	2	3-6	5	0.781	6.13	351.16	1.83	0.06	1	1	1	1	1	0.266	0.231	0	0.266	1.13	1.12	1.00	1.13	6.9453	391.7190	1.8300	0.1106	0.0426	0.0102	0.1392	7.8507	0.0367	0.0009	0.0002
Truck Crane - Greater than 200 ton	D	1	175-300	240	0.367	0.3085	0.7475	4	0.1316	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3609	0.7852	4.0180	0.0520	0.1107	0.0049	0.0154	0.0335	0.1714	0.0047	0.0002
Truck Crane - Greater than 300 ton	D	1	175-300	240	0.367	0.3085	0.7475	4	0.1316	1	1	1	1	1	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.3609	0.7852	4.0180	0.0520	0.1107	0.0049	0.0154	0.0335	0.1714	0.0047	0.0002
Vibratory Roller Ingersol-Rand 20 ton	D	1	100-175	140	0.367	0.3384	0.8667	4.1	0.18	1.05	1.53	0.95	1.23	1.01	0.34	0.101	0.009	0.473	1.17	1.05	1.00	1.24	0.4157	1.3930	3.9125	0.0525	0.2213	0.0049	0.0176	0.0588	0.1652	0.0093	0.0002

D - diesel

1. Emission factors are estimated following the methodology described in the U.S. EPA NONROAD model technical document NR-009c, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling -- Compression - Ignition", EPA420-P-04-009, April 2004.
   The following assumptions are used in the calculation:
   - Fraction of useful life expended: 0.5
   - Default Diesel Sulfur Content (wt%): 0.2 Tier 2 default (NR-009c)
   - Actual Diesel Sulfur Content (wt%): 0.0015 15 ppm
   - Diesel Density (lbs/gal): 7.1
2. Adjusted emission factor was calculated using the following equation: EF (HC, CO, NOx) = EFss x TAF x DF (NR-009c, Equation 1)
3. SPM (PM sulfur adjusting factor) = BSCF x 453.6 x 7.0 x soxcov x 0.01 x (soxbas - soxdsl); (NR-009c, Equation 5)
   Where: soncov = grams PM sulfur/grams fuel sulfur consumed, 0.02247 for Tier 2.
   soxbas = default certification fuel sulfur weight percent, 0.2% for Tier 2 fuel.
   soxdsl = episodic fuel sulfur weight percent, 0.01% for this project.
4. Adjusted PM emission factor = EFss x TAF x DF - SPM (NR-009c, Equation 2)
5. Adjusted SO2 emission factor = BSFC x 453.6 x (1 - soxcov) - HC) x 0.01 x soxdsl x 2 (NR-009c, Equation 7)
   Where: soncov = grams PM sulfur/grams fuel sulfur consumed, 0.02247 for Tier 2..
   HC = the in-use adjusted emission factor for hydrocarbons
   soxdsl = episodic fuel sulfur weight percent, 0.01 % for this project.
6. Adjusted EF (lbs/gal) = Adjusted EF (g/hp-hr) / Adjusted BSFC (lbs-fuel/hp-hr) x 7.1 (lbs/gal-fuel) / 453.6 (g/lb)

TABLE B-2 CONSTRUCTION EQUIPMENT USAGE

Equipment	Gasoline/ Diesel	Number of Units	Hrs/Day Per Unit	Gals/Hr Per Unit	Daily Fuel Use	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day
						1st month			2nd month			3rd month			4th month			5th month		
Air Compressor 185 CFM	D	1	8	1.27	10.16	5	51	10.16	5	51	10.16	5	51	10.16	5	51	10.16	5	51	10.16
Articulating Boom Platform	D	2	8	0.25	4.00		0			0			0			0			0	
Bulldozer D4C	D	1	8	3.00	24.00		0			0		5	120	24.00	10	240	24.00	10	240	24.00
Concrete Pumper Truck	D	1	4	3.13	12.52		0			0			0			0			0	
Concrete Trowel Machine	D	1	8	1.27	10.16		0			0			0			0			0	
Concrete Vibrators	D	1	8	0.25	2.00		0			0			0			0			0	
Cranes - Mobile 45 ton	D	1	4	4.00	16.00		0		5	80	16.00	5	80	16.00	5	80	16.00	5	80	16.00
Diesel Powered Welder	D	4	4	1.27	20.32	5	102	20.32	5	102	20.32	5	102	20.32	5	102	20.32	5	102	20.32
Dump Truck	D	1	8	3.13	25.04	5	125	25.04	10	250	25.04	20	501	25.04	20	501	25.04	20	501	25.04
Excavator - Backhoe/loader	D	2	8	2.50	40.00	5	200	40.00	5	200	40.00	10	400	40.00	10	400	40.00	10	400	40.00
Excavator - loader	D	1	8	5.00	40.00		0			0		10	400	40.00	20	800	40.00	20	800	40.00
Excavator - Motor Grader (CAT140H)	D	1	8	6.00	48.00		0			0		5	240	48.00	10	480	48.00	10	480	48.00
Excavator - Trencher (CAT320)	D	1	6	6.60	39.60	5	198	39.60	5	198	39.60	10	396	39.60	10	396	39.60	10	396	39.60
Forklift	D	2	8	2.50	40.00		0			0			0		5	200	40.00	10	400	40.00
Pile Driver Truck	D	1	8	7.50	60.00		0			0			0		10	600	60.00	15	900	60.00
Portable Compaction - Vibratory Plate	G	1	8	0.25	2.00		0			0			0			0		10	20	2.00
Portable Compaction - Vibratory Ram	D	1	8	0.25	2.00		0			0			0			0		10	20	2.00
Portable Compaction Roller	D	1	8	10.00	80.00		0			0		5	400	80.00	10	800	80.00	10	800	80.00
Portable Power Generators	D	2	8	1.27	20.32	5	102	20.32	5	102	20.32	5	102	20.32	5	102	20.32	5	102	20.32
Pumps	G	2	8	0.13	2.08		0			0			0		10	21	2.08	10	21	2.08
Tractor Truck 5th Wheel	D	1	4	3.13	12.52		0			0		5	63	12.52		0			0	
Truck - Fuel/Lube	D	1	4	3.13	12.52		0			0		5	63	12.52	5	63	12.52	5	63	12.52
Truck - Water	D	1	8	3.13	25.04		0			0		10	250	25.04	20	501	25.04	20	501	25.04
Truck Crane - Greater than 200 ton	D	1	4	5.00	20.00		0			0			0			0			0	
Truck Crane - Greater than 300 ton	D	1	4	7.50	30.00		0			0			0			0			0	
Trucks - 3 ton	D	2	2	1.56	6.24	10	62	6.24	10	62	6.24	10	62	6.24	10	62	6.24	10	62	6.24
Trucks - Pickup 3/4 ton	G	4	2	0.78	6.24	10	62	6.24	10	62	6.24	10	62	6.24	10	62	6.24	20	125	6.24
Total =							902	167.92		1107	183.92		3291	426.00		5460	515.56		6062	519.56

Equipment	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day
	6th month			7th month			8th month			9th month			10th month		
Air Compressor 185 CFM	5	51	10.16	10	102	10.16	10	102	10.16	10	102	10.16	10	102	10.16
Articulating Boom Platform		0			0		10	40	4.00	10	40	4.00	20	80	4.00
Bulldozer D4C	5	120	24.00		0			0			0			0	
Concrete Pumper Truck		0		5	63	12.52	10	125	12.52	10	125	12.52	5	63	12.52
Concrete Trowel Machine		0		5	51	10.16	10	102	10.16	10	102	10.16	5	51	10.16
Concrete Vibrators		0		5	10	2.00	10	20	2.00	10	20	2.00	5	10	2.00
Cranes - Mobile 45 ton	5	80	16.00	5	80	16.00	10	160	16.00	20	320	16.00	20	320	16.00
Diesel Powered Welder	5	102	20.32		0			0			0			0	
Dump Truck	20	501	25.04	10	250	25.04	5	125	25.04		0			0	
Excavator - Backhoe/loader	10	400	40.00	5	200	40.00	5	200	40.00	5	200	40.00	5	200	40.00
Excavator - loader	10	400	40.00		0			0			0			0	
Excavator - Motor Grader (CAT140H)	5	240	48.00		0			0			0			0	
Excavator - Trencher (CAT320)	10	396	39.60	5	198	39.60	5	198	39.60		0			0	
Forklift	20	800	40.00	20	800	40.00	20	800	40.00	20	800	40.00	20	800	40.00
Pile Driver Truck		0			0			0			0			0	
Portable Compaction - Vibratory Plate	10	20	2.00	10	20	2.00	10	20	2.00		0			0	
Portable Compaction - Vibratory Ram	10	20	2.00	10	20	2.00	10	20	2.00		0			0	
Portable Compaction Roller	5	400	80.00	5	400	80.00		0			0			0	
Portable Power Generators	5	102	20.32		0			0			0			0	
Pumps	10	21	2.08	10	21	2.08		0			0			0	
Tractor Truck 5th Wheel	5	63	12.52		0			0			0			0	
Truck - Fuel/Lube	5	63	12.52	2	25	12.52	2	25	12.52	2	25	12.52	2	25	12.52
Truck - Water	10	250	25.04	10	250	25.04	10	250	25.04	10	250	25.04	10	250	25.04
Truck Crane - Greater than 200 ton		0			0		5	100	20.00	5	100	20.00	10	200	20.00
Truck Crane - Greater than 300 ton		0			0		5	150	30.00	5	150	30.00	10	300	30.00
Trucks - 3 ton	10	62	6.24	10	62	6.24	10	62	6.24	10	62	6.24	10	62	6.24
Trucks - Pickup 3/4 ton	20	125	6.24	20	125	6.24	20	125	6.24	20	125	6.24	20	125	6.24
Total =		4214	472.08		2677	331.60		2624	303.52		2421	234.88		2588	234.88

Equipment	Gasoline/ Diesel	Number of Units	Hrs/Day Per Unit	Gals/Hr Per Unit	Daily Fuel Use	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day
						11th month			12th month			13th month			14th month			h month		
Air Compressor 185 CFM	D	1	8	1.27	10.16	10	102	10.16	10	102	10.16	10	102	10.16	10	102	10.16	10	102	10.16
Air Compressor 750 CFM	D	1	8	1.27	10.16		0			0			0			0			0	
Articulating Boom Platform	D	2	8	0.25	4.00	20	80	4.00	20	80	4.00	20	80	4.00	20	80	4.00	20	80	4.00
Bulldozer D10R	D	1	8	22.25	178.00		0			0			0			0			0	
Bulldozer D4C	D	1	8	3.00	24.00		0			0			0			0			0	
Concrete Pumper Truck	D	1	4	3.13	12.52		0			0			0			0			0	
Concrete Trowel Machine	D	1	8	1.27	10.16		0			0			0			0			0	
Concrete Vibrators	D	1	8	0.25	2.00		0			0			0			0			0	
Crane - Mobile 65 ton	D	1	4	4.00	16.00		0			0			0			0			0	
Cranes - Mobile 35 ton	D	1	4	4.00	16.00		0			0			0			0			0	
Cranes - Mobile 45 ton	D	1	4	4.00	16.00	20	320	16.00	20	320	16.00	10	160	16.00	5	80	16.00	5	80	16.00
Diesel Powered Welder	D	4	4	1.27	20.32		0			0			0			0			0	
Dump Truck	D	1	8	3.13	25.04		0			0			0			0			0	
Excavator - Backhoe/loader	D	2	8	2.50	40.00	5	200	40.00	5	200	40.00	5	200	40.00	5	200	40.00	5	200	40.00
Excavator - Earth Scraper 623	D	2	8	9.00	144.00		0			0			0			0			0	
Excavator - loader	D	1	8	5.00	40.00		0			0			0			0			0	
Excavator - Motor Grader (CAT140H)	D	1	8	6.00	48.00		0			0			0			0			0	
Excavator - Trencher (CAT320)	D	1	6	6.60	39.60		0			0			0			0			0	
Forklift	D	2	8	2.50	40.00	20	800	40.00	20	800	40.00	10	400	40.00	10	400	40.00	10	400	40.00
Fusion Welder	D	1	8	1.27	10.16		0			0			0			0			0	
Light Plants	D	1	8	1.27	10.16		0			0			0			0			0	
Pile Driver Truck	D	1	8	7.50	60.00		0			0			0			0			0	
Portable Compaction - Vibratory Plate	G	1	8	0.25	2.00		0			0			0			0			0	
Portable Compaction - Vibratory Ram	D	1	8	0.25	2.00		0			0			0			0			0	
Portable Compaction Roller	D	1	8	10.00	80.00		0			0			0			0			0	
Portable Power Generators	D	2	8	1.27	20.32		0			0			0			0			0	
Pumps	G	2	8	0.13	2.08		0			0			0			0			0	
Service Truck - 1 ton	D	1	4	1.56	6.24		0			0			0			0			0	
Tractor Truck 5th Wheel	D	1	4	3.13	12.52		0			0			0			0			0	
Truck - Fuel/Lube	D	1	4	3.13	12.52	2	25	12.52	2	25	12.52	2	25	12.52	2	25	12.52	2	25	12.52
Truck - Water	D	1	8	3.13	25.04	10	250	25.04	10	250	25.04	10	250	25.04	10	250	25.04	10	250	25.04
Truck Crane - Greater than 200 ton	D	1	4	5.00	20.00	10	200	20.00	5	100	20.00		0			0			0	
Truck Crane - Greater than 300 ton	D	1	4	7.50	30.00	10	300	30.00	5	150	30.00		0			0			0	
Trucks - 3 ton	D	2	2	1.56	6.24		0			0			0			0			0	
Trucks - Pickup 3/4 ton	G	4	2	0.78	6.24	20	125	6.24	20	125	6.24	20	125	6.24	20	125	6.24	20	125	6.24
Vibratory Roller Ingersol-Rand 20 ton	D	1	8	10.00	80.00		0			0			0			0			0	
Total =							2402	203.96		2152	203.96		1342	153.96		1262	153.96		1262	153.96

Equipment	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Days	Gal/Month	Gal/Day	Total Fuel Usage	Total Operating Hours
	16th month			17th month			18th month			19th month			20th month				
Air Compressor 185 CFM	10	102	10.16	10	102	10.16	10	102	10.16	10	102	10.16	10	102	10.16	609.6	480
Air Compressor 750 CFM		0			0			0			0			0		0	0
Articulating Boom Platform	20	80	4.00	20	80	4.00	20	80	4.00	10	40	4.00	10	40	4.00	80	320
Bulldozer D10R		0			0			0			0			0		0	0
Bulldozer D4C		0			0			0			0			0		720	240
Concrete Pumper Truck		0			0			0			0			0		313	100
Concrete Trowel Machine		0			0			0			0			0		254	200
Concrete Vibrators		0			0			0			0			0		50	200
Crane - Mobile 65 ton		0			0			0			0			0		0	0
Cranes - Mobile 35 ton		0			0			0			0			0		0	0
Cranes - Mobile 45 ton	5	80	16.00		0			0			0			0		960	240
Diesel Powered Welder		0			0			0			0			0		609.6	480
Dump Truck		0			0			0			0			0		2754.4	880
Excavator - Backhoe/loader	5	200	40.00	5	200	40.00	5	200	40.00	5	200	40.00	5	200	40.00	2600	1040
Excavator - Earth Scraper 623		0			0			0			0			0		0	0
Excavator - loader		0			0			0			0			0		2400	480
Excavator - Motor Grader (CAT140H)		0			0			0			0			0		1440	240
Excavator - Trencher (CAT320)		0			0			0			0			0		2376	360
Forklift	5	200	40.00	5	200	40.00	5	200	40.00	5	200	40.00	5	200	40.00	3800	1520
Fusion Welder		0			0			0			0			0		0	0
Light Plants		0			0			0			0			0		0	0
Pile Driver Truck		0			0			0			0			0		1500	200
Portable Compaction - Vibratory Plate		0			0			0			0			0		80	320
Portable Compaction - Vibratory Ram		0			0			0			0			0		80	320
Portable Compaction Roller		0			0			0			0			0		2800	280
Portable Power Generators		0			0			0			0			0		609.6	480
Pumps		0			0			0			0			0		83.2	640
Service Truck - 1 ton		0			0			0			0			0		0	0
Tractor Truck 5th Wheel		0			0			0			0			0		125.2	40
Truck - Fuel/Lube	1	13	12.52	1	13	12.52	1	13	12.52	1	13	12.52	1	13	12.52	325.52	104
Truck - Water	5	125	25.04	5	125	25.04	5	125	25.04	5	125	25.04	5	125	25.04	2253.6	720
Truck Crane - Greater than 200 ton		0			0			0			0			0		200	40
Truck Crane - Greater than 300 ton		0			0			0			0			0		300	40
Trucks - 3 ton		0			0			0			0			0		561.6	360
Trucks - Pickup 3/4 ton	20	125	6.24	20	125	6.24	20	125	6.24	10	62	6.24	10	62	6.24	873.6	1120
Vibratory Roller Ingersol-Rand 20 ton		0			0			0			0			0		0	0
Total =		924	153.96		844	137.96		844	137.96		742	137.96		742	137.96	28759	11444

EMISSION CALCULATIONS FOR CONSTRUCTION EQUIPMENT COMBUSTION

TABLE B-3 MAXIMUM DAILY EMISSION CALCULATIONS FOR CONSTRUCTION EQUIPMENT COMBUSTION

Equipment	NR-009c Load Factor [2]	SCAQMD CEQA Typical Load Factor [3]	Fuel Type	Number of Units	Hrs/Day Per Unit	Gals/Hr Per Unit	Daily Fuel Usage (gal)	LF Adjusted EF (lbs/gal fuel) [4]					Emission Rate for 1-HR Standards (lbs/hr) [5]				
								HC	CO	NOx	PM	SO2	HC	CO	NOx	PM	SO2
Air Compressor 185 CFM	none	0.43	D	1	8	1.27	10.16	0.0125	0.0618	0.1822	0.0139	0.0002	0.02	0.08	0.23	0.02	0.00
Air Compressor 750 CFM	none	0.43	D		8	1.27	0.00	0.0125	0.0618	0.1822	0.0139	0.0002	0.00	0.00	0.00	0.00	0.00
Articulating Boom Platform		0.46	D		8	0.25	0.00	0.0083	0.0377	0.1857	0.0047	0.0002	0.00	0.00	0.00	0.00	0.00
Bulldozer D10R	High	0.59	D		8	22.25	0.00	0.0051	0.0572	0.1747	0.0062	0.0002	0.00	0.00	0.00	0.00	0.00
Bulldozer D4C		0.59	D	1	8	3.00	24.00	0.0101	0.1444	0.1704	0.0095	0.0002	0.03	0.43	0.51	0.03	0.00
Concrete Pumper Truck			D		4	3.13	0.00	0.0000	0.0340	0.1671	0.0040	0.0002	0.00	0.00	0.00	0.00	0.00
Concrete Trowel Machine	High	0.59	D		8	1.27	0.00	0.0130	0.0935	0.1714	0.0174	0.0002	0.00	0.00	0.00	0.00	0.00
Concrete Vibrators	High		D		8	0.25	0.00	0.0130	0.0935	0.1714	0.0174	0.0002	0.00	0.00	0.00	0.00	0.00
Crane - Mobile 65 ton	none	0.43	D		4	4.00	0.00	0.0154	0.0335	0.1714	0.0047	0.0002	0.00	0.00	0.00	0.00	0.00
Cranes - Mobile 35 ton	none	0.43	D		4	4.00	0.00	0.0169	0.0388	0.1757	0.0073	0.0002	0.00	0.00	0.00	0.00	0.00
Cranes - Mobile 45 ton	none	0.43	D	1	4	4.00	16.00	0.0169	0.0388	0.1757	0.0073	0.0002	0.07	0.16	0.70	0.03	0.00
Diesel Powered Welder	Low	0.21	D	4	4	1.27	20.32	0.0243	0.1345	0.1698	0.0246	0.0002	0.12	0.68	0.86	0.13	0.00
Dump Truck			D	1	8	3.13	25.04	0.0160	0.0507	0.1612	0.0049	0.0002	0.05	0.16	0.50	0.02	0.00
Excavator - Backhoe/loader	Low	0.21	D	2	8	2.50	40.00	0.0320	0.2076	0.1688	0.0168	0.0002	0.16	1.04	0.84	0.08	0.00
Excavator - Earth Scraper 623	High	0.59	D		8	9.00	0.00	0.0094	0.0299	0.0951	0.0037	0.0001	0.00	0.00	0.00	0.00	0.00
Excavator - loader	High	0.59	D	1	8	5.00	40.00	0.0101	0.0852	0.1005	0.0069	0.0001	0.05	0.43	0.50	0.03	0.00
Excavator - Motor Grader (CAT140H)	High	0.59	D	1	8	6.00	48.00	0.0104	0.0347	0.0975	0.0055	0.0001	0.06	0.21	0.58	0.03	0.00
Excavator - Trencher (CAT320)	High	0.59	D	1	6	6.60	39.60	0.0101	0.0852	0.1005	0.0069	0.0001	0.07	0.56	0.66	0.05	0.00
Forklift	High	0.59	D	2	8	2.50	40.00	0.0171	0.1444	0.1704	0.0116	0.0002	0.09	0.72	0.85	0.06	0.00
Pile Driver Truck	High	0.59	D	1	8	7.50	60.00	0.0087	0.0572	0.1747	0.0062	0.0002	0.06	0.43	1.31	0.05	0.00
Portable Compaction - Vibratory Ram	none		D	1	8	0.25	2.00	0.0125	0.0618	0.1822	0.0139	0.0002	0.00	0.02	0.05	0.00	0.00
Portable Compaction Roller	none		D	1	8	10.00	80.00	0.0160	0.0507	0.1612	0.0062	0.0002	0.16	0.51	1.61	0.06	0.00
Portable Power Generators	none		D	2	8	1.27	20.32	0.0125	0.0618	0.1822	0.0139	0.0002	0.03	0.16	0.46	0.04	0.00
Truck Crane - Greater than 200 ton	none		D		4	5.00	0.00	0.0154	0.0335	0.1714	0.0047	0.0002	0.00	0.00	0.00	0.00	0.00
Truck Crane - Greater than 300 ton	none		D		4	7.50	0.00	0.0154	0.0335	0.1714	0.0047	0.0002	0.00	0.00	0.00	0.00	0.00
Vibratory Roller Ingersol-Rand 20 ton	none		D		8	10.00	0.00	0.0176	0.0588	0.1652	0.0093	0.0002	0.00	0.00	0.00	0.00	0.00
Total																	

TABLE B-3 CONTINUED MAXIMUM DAILY EMISSION CALCULATIONS FOR CONSTRUCTION EQUIPMENT COMBUSTION

	Daily Emissions (lbs) [6]					Emission Rate for 24-HR Standards (lbs/hr) [7]					Modeled Emission Rates for 1-HR Standards (g/s)					Modeled Emission Rates for 24-HR Standards (g/s)				
Equipment	HC	CO	NOx	PM	SO2	HC	CO	NOx	PM	SO2	HC	CO	NOx	PM	SO2	HC	CO	NOx	PM	SO2
Air Compressor 185 CFM	0.13	0.63	1.85	0.14	0.00	0.005	0.026	0.077	0.006	0.000	0.0020	0.0099	0.0292	0.0022	0.0000	0.0007	0.0033	0.0097	0.0007	0.0000
Air Compressor 750 CFM	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Articulating Boom Platform	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bulldozer D10R	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bulldozer D4C	0.24	3.47	4.09	0.23	0.00	0.010	0.144	0.170	0.010	0.000	0.0038	0.0546	0.0644	0.0036	0.0001	0.0013	0.0182	0.0215	0.0012	0.0000
Concrete Pumper Truck	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Concrete Trowel Machine	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Concrete Vibrators	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Crane - Mobile 65 ton	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cranes - Mobile 35 ton	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cranes - Mobile 45 ton	0.27	0.62	2.81	0.12	0.00	0.011	0.026	0.117	0.005	0.000	0.0085	0.0196	0.0885	0.0037	0.0001	0.0014	0.0033	0.0148	0.0006	0.0000
Diesel Powered Welder	0.49	2.73	3.45	0.50	0.00	0.021	0.114	0.144	0.021	0.000	0.0156	0.0861	0.1087	0.0158	0.0001	0.0026	0.0143	0.0181	0.0026	0.0000
Dump Truck	0.40	1.27	4.04	0.12	0.01	0.017	0.053	0.168	0.005	0.000	0.0063	0.0200	0.0636	0.0019	0.0001	0.0021	0.0067	0.0212	0.0006	0.0000
Excavator - Backhoe/loader	1.28	8.31	6.75	0.67	0.01	0.053	0.346	0.281	0.028	0.000	0.0202	0.1308	0.1064	0.0106	0.0001	0.0067	0.0436	0.0355	0.0035	0.0000
Excavator - Earth Scraper 623	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Excavator - loader	0.40	3.41	4.02	0.27	0.00	0.017	0.142	0.168	0.011	0.000	0.0064	0.0537	0.0633	0.0043	0.0001	0.0021	0.0179	0.0211	0.0014	0.0000
Excavator - Motor Grader (CAT140H)	0.50	1.67	4.68	0.26	0.01	0.021	0.069	0.195	0.011	0.000	0.0078	0.0262	0.0737	0.0042	0.0001	0.0026	0.0087	0.0246	0.0014	0.0000
Excavator - Trencher (CAT320)	0.40	3.37	3.98	0.27	0.00	0.017	0.141	0.166	0.011	0.000	0.0084	0.0709	0.0836	0.0057	0.0001	0.0021	0.0177	0.0209	0.0014	0.0000
Forklift	0.69	5.78	6.81	0.47	0.01	0.029	0.241	0.284	0.019	0.000	0.0108	0.0910	0.1073	0.0073	0.0001	0.0036	0.0303	0.0358	0.0024	0.0000
Pile Driver Truck	0.52	3.43	10.48	0.37	0.01	0.022	0.143	0.437	0.016	0.001	0.0082	0.0540	0.1651	0.0059	0.0002	0.0027	0.0180	0.0550	0.0020	0.0001
Portable Compaction - Vibratory Ram	0.03	0.12	0.36	0.03	0.00	0.001	0.005	0.015	0.001	0.000	0.0004	0.0019	0.0057	0.0004	0.0000	0.0001	0.0006	0.0019	0.0001	0.0000
Portable Compaction Roller	1.28	4.06	12.90	0.50	0.02	0.053	0.169	0.537	0.021	0.001	0.0202	0.0639	0.2031	0.0079	0.0003	0.0067	0.0213	0.0677	0.0026	0.0001
Portable Power Generators	0.25	1.25	3.70	0.28	0.00	0.011	0.052	0.154	0.012	0.000	0.0040	0.0198	0.0583	0.0044	0.0001	0.0013	0.0066	0.0194	0.0015	0.0000
Truck Crane - Greater than 200 ton	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Truck Crane - Greater than 300 ton	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vibratory Roller Ingersol-Rand 20 ton	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**6.88**	**40.12**	**69.93**	**4.24**	**0.09**						**0.1225**	**0.7024**	**1.2209**	**0.0779**	**0.0015**	**0.0361**	**0.2106**	**0.3671**	**0.0223**	**0.0005**

D - Diesel

1. Hourly emission rate used for short-term impact analysis were developed based on the projected highest activity level during the fifth month grading period.
2. Table A-3 of NR-009c document ""Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling -- Compression - Ignition", EPA420-P-04-009, April 2004. A "high" load factor is taken to be 100%.
3 Appendix A, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, EPA420-P-04-005, April 2004. These load factors are assumed to be representative for the El Centro site.
4. The emission rate for diesel nonroad equipment as determined using methods in NR-009c were for certain load factor conditions. Emission rate is adjusted based on representative load condition at the El Centro site .
5. Hourly emission rate (lb/hr) = hourly fuel usage (gals) x EF (lbs/gal).
6. Daily emission (lbs) = daily fuel usage (gals) x EF (lbs/gal)
7. 24-HR Emission Rate = Daily Emissions / 24

EMISSION CALCULATIONS FOR CONSTRUCTION EQUIPMENT COMBUSTION

TABLE B-4 EMISSION RATES FOR CONSTRUCTION EQUIPMENT COMBUSTION - ANNUAL

Equipment	Total Fuel Usage (gal)	LF Adjusted EF (lbs/gal fuel)[1]					Project Emissions (lbs)[2]					Emission Rate - Annual (lbs/hr)[3]					Modeled Annual Emission Rate (g/s)				
		HC	CO	NOx	PM	SO2	HC	CO	NOx	PM	SO2	HC	CO	NOx	PM	SO2	HC	CO	NOx	PM	SO2
Air Compressor 185 CFM	610	0.0125	0.0618	0.1822	0.0139	0.0002	7.6314	37.6452	111.0678	8.4489	0.1267	0.0009	0.0043	0.0127	0.0010	0.0000	0.0001	0.0005	0.0016	0.0001	0.0000
Air Compressor 750 CFM	0	0.0125	0.0618	0.1822	0.0139	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Articulating Boom Platform	80	0.0083	0.0377	0.1857	0.0047	0.0002	0.6663	3.0198	14.8579	0.3779	0.0166	0.0001	0.0003	0.0017	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000
Bulldozer D10R	0	0.0051	0.0572	0.1747	0.0062	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bulldozer D4C	720	0.0101	0.1444	0.1704	0.0095	0.0002	7.2789	103.9793	122.6613	6.8446	0.1495	0.0008	0.0119	0.0140	0.0008	0.0000	0.0001	0.0015	0.0018	0.0001	0.0000
Concrete Pumper Truck	313	0.0000	0.0340	0.1671	0.0040	0.0002	0.0000	10.6276	52.2900	1.2601	0.0651	0.0000	0.0012	0.0060	0.0001	0.0000	0.0000	0.0002	0.0008	0.0000	0.0000
Concrete Trowel Machine	254	0.0130	0.0935	0.1714	0.0174	0.0002	3.3057	23.7612	43.5291	4.4098	0.0528	0.0004	0.0027	0.0050	0.0005	0.0000	0.0000	0.0003	0.0006	0.0001	0.0000
Concrete Vibrators	50	0.0130	0.0935	0.1714	0.0174	0.0002	0.6507	4.6774	8.5687	0.8681	0.0104	0.0001	0.0005	0.0010	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000
Crane - Mobile 65 ton	0	0.0154	0.0335	0.1714	0.0047	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cranes - Mobile 35 ton	0	0.0169	0.0388	0.1757	0.0073	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cranes - Mobile 45 ton	960	0.0169	0.0388	0.1757	0.0073	0.0002	16.2109	37.2782	168.6259	6.9848	0.1994	0.0019	0.0043	0.0192	0.0008	0.0000	0.0002	0.0005	0.0024	0.0001	0.0000
Diesel Powered Welder	610	0.0243	0.1345	0.1698	0.0246	0.0002	14.8101	81.9900	103.5378	15.0100	0.1265	0.0017	0.0094	0.0118	0.0017	0.0000	0.0002	0.0012	0.0015	0.0002	0.0000
Dump Truck	2,754	0.0160	0.0507	0.1612	0.0049	0.0002	44.0814	139.7409	443.9749	13.5779	0.5722	0.0050	0.0160	0.0507	0.0015	0.0001	0.0006	0.0020	0.0064	0.0002	0.0000
Excavator - Backhoe/loader	2,600	0.0320	0.2076	0.1688	0.0168	0.0002	83.1650	539.8444	438.9924	43.6547	0.5389	0.0095	0.0616	0.0501	0.0050	0.0001	0.0012	0.0078	0.0063	0.0006	0.0000
Excavator - Earth Scraper 623	0	0.0094	0.0299	0.0951	0.0037	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Excavator - loader	2,400	0.0101	0.0852	0.1005	0.0069	0.0001	24.2630	204.4925	241.2339	16.4936	0.2941	0.0028	0.0233	0.0275	0.0019	0.0000	0.0003	0.0029	0.0035	0.0002	0.0000
Excavator - Motor Grader (CAT140H)	1,440	0.0104	0.0347	0.0975	0.0055	0.0001	14.9148	49.9768	140.3685	7.9383	0.1765	0.0017	0.0057	0.0160	0.0009	0.0000	0.0002	0.0007	0.0020	0.0001	0.0000
Excavator - Trencher (CAT320)	2,376	0.0101	0.0852	0.1005	0.0069	0.0001	24.0204	202.4476	238.8216	16.3287	0.2912	0.0027	0.0231	0.0273	0.0019	0.0000	0.0003	0.0029	0.0034	0.0002	0.0000
Forklift	3,800	0.0171	0.1444	0.1704	0.0116	0.0002	65.1126	548.7794	647.3792	44.2626	0.7893	0.0074	0.0626	0.0739	0.0051	0.0001	0.0009	0.0079	0.0093	0.0006	0.0000
Fusion Welder	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Light Plants	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pile Driver Truck	1,500	0.0087	0.0572	0.1747	0.0062	0.0002	12.9874	85.7722	262.0365	9.3527	0.3119	0.0015	0.0098	0.0299	0.0011	0.0000	0.0002	0.0012	0.0038	0.0001	0.0000
Portable Compaction - Vibratory Ram	80	0.0125	0.0618	0.1822	0.0139	0.0002	1.0015	4.9403	14.5758	1.1088	0.0166	0.0001	0.0006	0.0017	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	0.0000
Portable Compaction Roller	2,800	0.0160	0.0507	0.1612	0.0062	0.0002	44.8112	142.0544	451.3250	17.4583	0.5817	0.0051	0.0162	0.0515	0.0020	0.0001	0.0006	0.0020	0.0065	0.0003	0.0000
Portable Power Generators	610	0.0125	0.0618	0.1822	0.0139	0.0002	7.6314	37.6452	111.0678	8.4489	0.1267	0.0009	0.0043	0.0127	0.0010	0.0000	0.0001	0.0005	0.0016	0.0001	0.0000
Truck Crane - Greater than 200 ton	200	0.0154	0.0335	0.1714	0.0047	0.0002	3.0789	6.6982	34.2736	0.9447	0.0416	0.0004	0.0008	0.0039	0.0001	0.0000	0.0000	0.0001	0.0005	0.0000	0.0000
Truck Crane - Greater than 300 ton	300	0.0154	0.0335	0.1714	0.0047	0.0002	4.6183	10.0473	51.4103	1.4170	0.0623	0.0005	0.0011	0.0059	0.0002	0.0000	0.0001	0.0001	0.0007	0.0000	0.0000
Vibratory Roller Ingersol-Rand 20 ton	0	0.0176	0.0588	0.1652	0.0093	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total							**380.2**	**2275.4**	**3700.6**	**225.2**	**4.5**						**0.0055**	**0.0327**	**0.0532**	**0.0032**	**0.0001**

1. The emission rate for diesel nonroad equipment as determined using methods in NR-009c were for certain load factor conditions.
   Emission rate is adjusted based on representative load condition at the El Centro site .
2. Project Total Emissions (lbs) = Project Total Fuel Usage (gals) x EF (lbs/gal).
3. Emission Rate for annual impact (lbs/hr) = Project Total Emissions (lbs) / 8760 (hrs/yr)

EMISSION CALCULATIONS FOR CONSTRUCTION EQUIPMENT COMBUSTION

TABLE B-5 EMISSION RATES FOR GASOLINE POWERED CONSTRUCTION EQUIPMENT [1]

Equipment	Fuel	Number of Units	Daily Op. Hours	Actual Fuel Input			EF (lb/MMBtu)					ER For 1-HR Standards (lbs/hr)					ER For 24-HR Standards (lbs/hr) [5]				
				gal/hr/ Unit	lbs/hr/ Unit [3]	MMBtu /hr/ Unit [4]	TOG	CO	NOx	PM10	SO2	TOG	CO	NOx	PM10	SO2	TOG	CO	NOx	PM10	SO2
Portable Compaction - Vibratory Plate	G	1	8	0.25	1.78	0.0360	3.03	62.7	1.63	0.1	0.084	0.109	2.259	0.059	0.004	0.003	0.036	0.753	0.020	0.001	0.001
Pumps[2]	G	2	8	0.13	0.92	0.0187						0.162	7.222	0.048	0.001	0.059	0.054	2.407	0.016	0.000	0.020
Total																					

Equipment					ER For 24-HR Standards (g/s)						ER For Annual Standards (g/s) [6]				
	TOG	CO	NOx	PM10	SO2	TOG	CO	NOx	PM10	SO2	TOG	CO	NOx	PM10	SO2
Portable Compaction - Vibratory Plate	0.0138	0.2847	0.0074	0.0005	0.0004	0.0046	0.0949	0.0025	0.0002	0.0001	0.0005	0.0104	0.0003	0.00002	0.00001
Pumps	0.0204	0.9100	0.0061	0.0002	0.0074	0.0068	0.3033	0.0020	0.0001	0.0025	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0138**	**0.2847**	**0.0074**	**0.0005**	**0.0004**	**0.0046**	**0.0949**	**0.0025**	**0.0002**	**0.0001**	**0.0005**	**0.0104**	**0.0003**	**0.00002**	**0.00001**

1. Hourly emission rate is determined using AP-42 emission factors in Table 3.3-1 and the heat input of the vibratory plate.
2. Hourly emission rate is determined by using Table 4, Exhaust Emission Factors for Nonroad Engine Modeling --Spark Ignition, EPA420-P-04-010, April 2004.
3. Based on the gasoline density of 7.1 lbs/gal.
4. Back calculated from fuel usage and gasoline heat value of 20,300 Btu/lb, AP-42, Table 3.3-1, footnote "c".
5. 24-HR emission rate = Daily emissions (lbs) / 24 (hrs/day)
6. Hourly emission rate for annual impact = project total emissions (lbs) / 8760 (hrs/yr).

TABLE B-6 EMISSION CALCULATION FOR GASOLINE POWERED CONSTRUCTION EQUIPMENT

Equipment	Daily Op. Hours	Total Op. Hours / Project	Daily Emissions (lbs) [1]					Project Emissions (lbs) [2]				
			TOG	CO	NOx	PM10	SO2	TOG	CO	NOx	PM10	SO2
Portable Compaction - Vibratory Plate	8	320	0.9	18.1	0.5	0.03	0.02	34.9	723.0	18.8	1.2	1.0
Pumps	8	640	1.3	57.8	0.4	0.01	0.5	103.6	4622.0	31.0	0.8	37.5
Total			**2.2**	**75.8**	**0.9**	**0.04**	**0.5**	**138.6**	**5345.0**	**49.8**	**1.9**	**38.5**

1. Daily emissions = ER (lbs/hr) x No. of Units x Daily Op. Hours/unit
2. Project emission = ER (lbs/hr) x Total Op. Hours of all units

EMISSION CALCULATIONS FOR CONSTRUCTION SITE FUGITIVE DUST (PM10)

Constants:

Material silt content (s) (%)	8.5	AP-42, Table 13.2.2-1 for construction site, used for emission calculation of material handling.
Material moisture content (M) (%)	8	This value is between the moisture content for moist and dry condition listed in SCAQMD CEQA Table A9-9-F2. The moisture content during the fall-winter season is expected to be higher than during the dry seasons due to higher precipitation.
Mean Vehicle Speed (S) (mph)	5	
PM10 Scaling Factor	0.75	For bulldozing and grading only. AP-42, Table 11.9-1.
Mean Wind Speed (mph)	7.4	2005 Annual average wind speed measured at the Imperial County Airport, California Climate Data Archive, http://www.calclim.dri.edu/ccda/stationlist.html, accessed 1/18/2006.
Water Suppression Control Efficiency	90%	Daily multiple watering

TABLE B-7 EMISSIONS FROM BULLDOZING AND DIRT PUSHING OPERATION

Equipment	Controlled PM10 EF (lbs/hr) [1]	No. Of Unit	Hrs/Day/ Unit	Total Op. Hours	Daily Emissions (lbs)	Project Emission (lbs)	PM10 Emission Rate 24-HR (lbs/hr)	PM10 Emission Rate 24-HR (g/s)	PM10 Emission Rate Annual (g/s)
Excavator - Trencher	0.0455	1	6	360	0.27	16.38	0.0114	0.0014	0.0002
Excavator - Backhoe/Loader	0.0455	2	8	1040	0.73	47.33	0.0303	0.0038	0.0007
Excavator - Loader	0.0455	1	8	480	0.36	21.84	0.0152	0.0019	0.0003
Bulldozer (D4c)	0.0455	1	8	240	0.36	10.92	0.0152	0.0019	0.0002
Dump Truck	0.0455	1	8	880	0.36	40.05	0.0152	0.0019	0.0006
Excavator - Motor Grader	0.0455	1	8	240	0.36	10.92	0.0152	0.0019	0.0002
Total					**2.46**	**147.44**		**0.0129**	**0.0021**

1. Using bulldozer equation in AP-42, Table 11.9-1 for all equipment with the 90% control efficiency of water suppression .

TABLE B-8 EMISSIONS FROM AGGREGATE HANDLING AND STORAGE

Daily Dirt Handled (tons)	Uncontrolled EF (lbs/ton) [1]	Controlled EF (lbs/ton) [2]	Daily PM10 EM (lbs)	PM10 Emission/ Project (lbs)	ER for 24-HR Standard (lbs/hr)	No. Of Days during project	ER for Annual Standard (lbs/hr)	ER for 24-Hr Standard (g/s)	ER for Annual Standard (g/s)
508.2	0.0003	2.67716E-05	0.013605325	0.544	5.67E-04	40	6.21248E-05	7.14E-05	7.828E-06

1. Calculated using AP-42 Section 13.2.4, Equation. 1
2. Based on the control efficiency of 90% for daily water suppression.

TABLE B-9 EMISSIONS FROM VEHICLE TRAFFIC ON UNPAVED ROAD AND PARKING LOT

Vehicle Type	Mean Vehicle Weight (tons)	Uncontr. PM10 EF (lbs/VMT) [1]	Adj. PM10 EF (lbs/VMT) -For Annual Impact [2]	No. Of Unit	Round Trips /Day/ Unit[3]	Round Trip Distance (mile)[4]	Daily VMT (all units)	Water Suppression Efficiency	Controlled ER for 24-HR Standard (lbs/hr)	Daily Emissions (lbs)	Total No. of Days Operated	VMT/ Project	Project ER (lbs)	Controlled ER for Annual Standard (lbs/hr)	Controlled ER for 24-HR Standard (g/s)	Controlled ER for Annual Standard (g/s)
Dump trucks	22.7	2.73	2.64	1	8	0.53	4.24	0.9	0.048	1.159	110	466.4	123.33	0.0141	0.0061	0.0018
Service trucks	4	1.25	1.21	1	2	0.53	1.06	0.9	0.006	0.133	43	45.58	5.52	0.0006	0.0007	0.0001
Trucks - Pickup 3/4 ton	1	0.67	0.65	4	2	0.53	4.24	0.9	0.012	0.284	340	1441.6	93.52	0.0107	0.0015	0.0013
Water Truck	29	3.05	2.95	1	16	0.53	8.48	0.9	0.108	2.589	175	1484.00	438.12	0.050	0.014	0.006
Light Delivery Trucks[5]	5	1.38	1.34	1	1	0.30	0.30	0.9	0.002	0.042	65	19.35	2.59	0.000	0.000	0.0000
Heavy Delivery Trucks[5]	10	1.89	1.83	1	1	0.30	0.30	0.9	0.002	0.057	35	10.50	1.92	0.0002	0.0003	0.00003
Total Unpaved Road															**0.0224**	**0.0096**
Worker's Vehicles in Parking lot[6]	1	0.67	0.65	60	1	0.50	30.00	0.9	0.084	2.012	430	12900	836.90	0.0955	0.0106	0.0120
										6.276			**1501.90**			

1. AP-42, Section 13.2.2, Equation 1a.
2. AP-42, Section 13.2.2, Equation 2. Estimated 12 days with precipitation > 0.01 inch, according to historical precipitation data collected at Niland, CA, Western Regional Climate Center, http://www.wrcc.dri.edu/summary/climsmsca.html, accessed 1/17/06.
3. Round trips/day uses 1 trip per hour for dump trucks and pickups. Water trucks operate 2 times per hour. Delivery trucks use 1 trips per day. Service trucks use 2 trips per day.
4. Distances measured from plot plan from highway along access road to center of construction area and parking lot.
5. Number of delivery trucks estimated.
6. Average number of workers (75)/1.25 persons per vehicle.

EMISSION CALCULATIONS FOR CONSTRUCTION RELATED ONROAD VEHICLES

TABLE B-10 EMISSION FACTOR FOR ONROAD VEHICLES

Onroad Vehicle	Fuel Type	Vehicle Count	Weight (lbs)	Vehicle Type	EF (lbs/VMT) [1] TOG	CO	NOx	PM10	SO2
On-Site Vehicles									
Truck - Water	D	1	58000	HHD	2.10E-03	8.40E-03	3.58E-02	9.00E-04	4.76E-05
Dump Truck	D	1	45400	HHD	2.10E-03	8.40E-03	3.58E-02	9.00E-04	4.76E-05
Service Truck - 1 ton	D	1	8000	LHD	2.10E-03	8.40E-03	3.58E-02	9.00E-04	4.76E-05
Trucks - Pickup 3/4 ton	G	4	2000	LHD	2.10E-03	8.40E-03	3.58E-02	9.00E-04	4.76E-05
Highway Vehicles (Off-site)									
Worker's Vehicles [2]	G/D	60	2000	LDA/LDT	2.30E-03	1.96E-02	2.20E-03	8.16E-05	3.93E-06
Light Delivery Trucks	D	1	10000	LDH	2.10E-03	8.40E-03	3.58E-02	9.00E-04	4.76E-05
Heavy Duty Delivery Trucks	D	1	20000	MDH	2.10E-03	8.40E-03	3.58E-02	9.00E-04	4.76E-05

1. To obtain the emission factors, EMFAC2002 was run in the "planning inventory" mode for the modeling year of 2008. The Imperial County average fleet information was chosen, and the inventory was run for winter. The emission factor for a given vehicle category was back calculated using the daily emissions and daily VMT for that vehicle category.
2. The emission factors for worker's vehicles are a weighted average, assuming 50% passenger cars and 50% light duty trucks.

TABLE B-11 EMISSION CALCULATION FOR ONROAD VEHICLES

Onroad Vehicles (Access Road)	Total Op. Hours / Project	Trips or Hours / Day / Unit	Round Trip Distance (mile)	Daily Total VMT	Daily Emissions (lbs) [1] TOG	CO	NOx	PM10	SO2	Project Emissions (lbs) TOG	CO	NOx	PM10	SO2
On-Site Vehicles														
Truck - Water	720	16	0.53	8.48	1.78E-02	7.12E-02	3.04E-01	7.63E-03	4.04E-04	1.01E-01	4.04E-01	1.72E+00	4.33E-02	2.29E-03
Dump Truck	880	8	0.53	4.24	8.90E-03	3.56E-02	1.52E-01	3.82E-03	2.02E-04	1.23E-01	4.94E-01	2.10E+00	5.29E-02	2.80E-03
Service Truck	104	2	0.53	1.06	2.23E-03	8.90E-03	3.79E-02	9.54E-04	5.05E-05	1.46E-02	5.83E-02	2.49E-01	6.25E-03	3.31E-04
Trucks - Pickup 3/4 ton	1,120	2	0.53	4.24	8.90E-03	3.56E-02	1.52E-01	3.82E-03	2.02E-04	6.28E-01	2.51E+00	1.07E+01	2.69E-01	1.42E-02
Total				**Total**	**0.04 lbs**	**0.15 lbs**	**0.65 lbs**	**0.02 lbs**	**0.00 lbs**	**0.87**	**3.47**	**14.78**	**0.37**	**0.02**
Highway Vehicles (Off-site)	**Total Days**													
Worker's Vehicles [2]	430	1	20	1200	2.8	23.5	2.6	0.1	4.72E-03	1,187	10,114	1,135	42	2
Light Delivery Trucks	65	1	15	15	0.0	0.1	0.5	0.014	7.14E-04	2	8	35	1	0
Heavy Duty Delivery Trucks	35	1	15	15	0.0	0.1	0.5	0.014	7.14E-04	1	4	19	0	0
Total				**Total**	**0.03 lbs**	**0.13 lbs**	**0.54 lbs**	**0.01 lbs**	**0.00 lbs**	**1,190 lbs**	**10,126 lbs**	**1,189 lbs**	**43 lbs**	**2 lbs**
										0.6 tons	**5.1 tons**	**0.6 tons**	**0.0 tons**	**0.001 tons**

Onroad Vehicles (Access Road)	Total Op. Hours / Project	Trips or Hours / Day / Unit	Round Trip Distance (mile)	Daily Total VMT	1-HR Emission Rate (g/s) TOG	CO	NOx	PM10	SO2	24-HR Emission Rate (g/s) TOG	CO	NOx	PM10	SO2	Annual Emission Rate (g/s) TOG	CO	NOx	PM10	SO2
On-Site Vehicles																			
Truck - Water	720	16	0.53	8.48	1.40E-04	5.61E-04	2.39E-03	6.01E-05	3.18E-06	9.35E-05	3.74E-04	1.59E-03	4.01E-05	2.12E-06	1.45E-06	5.81E-06	2.48E-05	6.22E-07	3.29E-08
Dump Truck	880	8	0.53	4.24	1.40E-04	5.61E-04	2.39E-03	6.01E-05	3.18E-06	4.67E-05	1.87E-04	7.97E-04	2.00E-05	1.06E-06	1.78E-06	7.10E-06	3.03E-05	7.61E-07	4.02E-08
Service Truck - 1 ton	104	2	0.53	1.06	1.40E-04	5.61E-04	2.39E-03	6.01E-05	3.18E-06	1.17E-05	4.67E-05	1.99E-04	5.01E-06	2.65E-07	2.10E-07	8.39E-07	3.58E-06	8.99E-08	4.76E-09
Trucks - Pickup 3/4 ton	1,120	2	0.53	4.24	5.61E-04	2.24E-03	9.56E-03	2.40E-04	1.27E-05	4.67E-05	1.87E-04	7.97E-04	2.00E-05	1.06E-06	9.04E-06	3.61E-05	1.54E-04	3.87E-06	2.05E-07
Total				**Total**	**9.82E-04**	**3.93E-03**	**1.67E-02**	**4.21E-04**	**2.23E-05**	**1.99E-04**	**7.95E-04**	**3.39E-03**	**8.51E-05**	**4.50E-06**	**1.25E-05**	**4.99E-05**	**2.13E-04**	**5.35E-06**	**2.83E-07**

1. Based on equipment usage for grading phase on the fifth construction month, which is the peak activity month.
2. The emission factors for worker's vehicles are a weighted average, assuming 50% passenger cars and 50% light duty trucks.

TABLE B-12 EMISSIONS FROM VEHICLE TRAFFIC ON PAVED ROAD

Vehicle Type	Mean Vehicles Speed (mph) [Vehicles Weight (tons)]	Total No. Of Trips / Day	PM10 EF (lbs/VMT) [1]	Round Trip Distance (mile)	Daily VMT (all units)	Total No. of Days Operated	VMT/ Project	Daily Emissions (lbs)	Project Emissions (lbs)	ER for 24-HR Standard (lbs/hr)	ER for Annual Standard (lbs/hr)	ER for 24-HR Standard (g/s)	ER for Annual Standard (g/s)
Worker's Vehicles [1]	45	60	0.0138	20	1200	430	516000	16.5041	7096.74	0.6877	0.8101	0.0866	0.1021
Light Delivery Trucks	30	1	0.0893	15	15	65	967.5	1.3391	86.37				
Heavy Duty Delivery Trucks [1]	[18]	1	0.0709	15	15	35	525	1.0641	37.24	0.0443	0.0043	0.0056	0.0005
Total								**19**	**7,220**		**Total**	**0.0922**	**0.1026**

1. EF are calculated using equations in AP-42, Section 13.2.2. Equation 1b is used for passenger cars; equation 1a is used for heavy duty delivery trucks.
EF calculations are based on the following assumptions:

Paved road silt content (%)	0.1348	SCAQMD CEQA Table A-9-C-1, 5% local, 5% collector, 90% freeway	
Silt Loading	0.04 oz/yr²	1.356 g/m²	SCAQMD CEQA Table A9-9-C-1.

SUMMARY OF EMISSION RATES IN CONSTRUCTION MODELING

TABLE B-13 COMBUSTION EMISSION RATE FOR CONSTRUCTION EQUIPMENT

	1-HR/3-HR/8-HR				24-HR			
Pollutant	Diesel Equip.	Gasoline Equip.	Service Road (ROADC1-ROADC6)	Construction Area Total	Diesel Equip.	Gasoline Equip.	Service Road (ROADC1-ROADC6)	Construction Area Total
PM10	0.0779	0.0005	2.104E-05	0.0784	0.0223	0.0002	4.257E-06	0.0224
NOx	1.2209	0.0074	8.368E-04	1.2283	0.3671	0.0025	1.693E-04	0.3696
CO	0.7024	0.2847	1.963E-04	0.9870	0.2106	0.0949	3.973E-05	0.3055
SO2	0.0015	0.0004	1.113E-06	0.0019	0.0005	1.271E-04	2.252E-07	5.78E-04

	Annual				Construction Area Long-Term ER (MAIN1C - MAIN4C) (g/s)	Construction Area Short-Term ER (MAINC1 - MAINC4) (g/s)	
Pollutant	Diesel Equip.	Gasoline Equip.	Service Road (ROADC1-ROADC6)	Construction Area Total	Annual	1-HR/3-HR/8-HR	24-HR
PM10	0.0032	1.66E-05	5.35E-06	0.00326	8.14E-04	1.96E-02	5.60E-03
NOx	0.0532	0.0003	2.126E-04	0.0535	1.34E-02	3.07E-01	9.24E-02
CO	0.0327	0.0104	4.990E-05	0.0431	1.08E-02	2.47E-01	7.64E-02
SO2	6.544E-05	1.393E-05	2.827E-07	7.937E-05	1.98E-05	4.69E-04	1.44E-04

TABLE B-14 FUGITIVE DUST (PM_{10}) EMISSION RATE FOR CONSTRUCTION ACTIVITIES (g/s)

Activity	Bulldozing/ Dirt Pushing	Aggregate Handling/ Storage	Unpaved Parking Lots	Total ER w/o Parking Lots (g/s)	Service Road ER[1] (ROADD1-ROADD6)	Construction Area Long-Term ER - (MAIN1D - MAIN4D) (g/s)	Construction Area Short-Term ER - (MAIND1 - MAIND4) (g/s)	Parking Lot ER (PKLOT1D - PKLOT2D) (g/s)
24-HR	0.0129	7.14E-05	0.0106	0.01297	1.12E-03		0.0032	0.0053
Annual	0.0021	7.82772E-06	0.0120	2.129E-03	4.78E-04	5.321E-04		0.0060

1. total divided by number of volume sources for all construction roads.
20 number of volume sources for road (6 east, 6 west, 6 north, 2 south)
4 number of volume sources for main construction area
2 number of area sources for parking lots

EMISSION INVENTORY

TABLE B-15 On-Site Daily Criteria Pollutant Construction Emissions (lbs/day)

Activities	VOC	CO	NOx	PM10	SO2
Combustion Emissions					
Construction - Diesel	6.88	40.12	69.93	4.24	0.09
Construction - Gasoline	2.17	75.85	0.86	0.04	0.49
Construction - Trucks	0.04	0.15	0.65	0.02	0.00
Construction Combustion Subtotal	*9.09*	*116.12*	*71.43*	*4.30*	*0.58*
Unpaved Road Travel/Parking Area Fugitive PM Emissions				6.28	
Grading /Bulldozing Fugitive PM Emissions				2.46	
Earth Loading/Storage Fugitive PM Emissions				0.014	
Total Max. Daily Emissions (lbs)	**9.09**	**116.12**	**71.43**	**13.04**	**0.58**

TABLE B-16 On-Site Project Criteria Pollutant Construction Emissions

Activities	VOC	CO	NOx	PM10	SO2
Combustion Emissions					
Construction - Diesel	380.2	2,275.4	3,700.6	225.2	4.5
Construction - Gasoline	138.6	5,345.0	49.8	1.9	38.5
Construction - Trucks	0.9	3.5	14.8	0.4	0.0
Construction Combustion Subtotal	*519.7*	*7,623.9*	*3,765.1*	*227.5*	*43.1*
Unpaved Road Travel / Parking Area Fugitive PM Emissions				1,501.9	
Grading /Bulldozing Fugitive PM Emissions				147.4	
Earth Loading/Storage Fugitive PM Emissions				0.5	
Total Project Emissions (lbs)	**519.7**	**7,623.9**	**3,765.1**	**1,877.4**	**43.1**
Total Project Emissions (tons)	**0.260**	**3.812**	**1.883**	**0.939**	**0.022**

TABLE B-17 Daily Regional On-Highway Criteria Pollutant Emissions

Activities	VOC	CO	NOx	PM10	SO2
Passenger Vehicle - Combustion Emissions	2.76	23.52	2.64	0.10	0.00
Delivery Truck - Combustion Emissions	0.03	0.13	0.54	0.03	0.00
Passenger Vehicle - Paved Road Dust				16.50	
Delivery Truck - Paved Road Dust				2.40	
Total (lbs)	2.79	23.65	3.18	19.03	0.01

TABLE B-18 Project Regional On-Highway Criteria Pollutant Emissions

Activities	VOC	CO	NOx	PM10	SO2
Passenger Vehicle - Combustion Emissions	1,186.8	10,113.6	1,135.2	42.1	2.0
Delivery Truck - Combustion Emissions	1.1	4.4	18.8	1.3	0.0
Passenger Vehicle - Paved Road Dust				7,096.7	
Delivery Truck - Paved Road Dust				123.6	
Total (lbs)	1,187.9	10,118.0	1,154.0	7,263.8	2.1
Total (tons)	0.6	5.1	0.6	3.6	0.001

TABLE B-19 WINTER EMISSIONS

Title : Imperial County Avg 2008 Winter El Centro version 2
Version : Emfac2002 V2.2 Apr 23 2003
Run Date : 03/11/06 11:06:52

Scen Year: 2008 -- Model Years: 1965 to 2008
Season : Winter
Area : Imperial County Average

I/M Stat : No I and M program in effect
Emissions: Tons Per Day

Vehicle Class	Worker Commuter		Delivery Truck			
	Passenger Car (50%)	Light-Duty Trucks (50%)	Heavy Duty Trucks - Diesel			
Tech Group	LDA-TOT	LDT1-TOT	LHDT1-DSL	LHDT2-DSL	MHDT-DSL	HHDT-DSL
Vehicle Info						
VMT/1000	2543	1005	28	11	59	322
TOG Emissions						
Run Exhaust	0.98	0.44	0.01	0.01	0.03	0.37
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.03
Start Exhaust	0.65	0.19	0.00	0.00	0.00	0.00
Diurnal	0.17	0.07	0.00	0.00	0.00	0.00
Hot Soak	0.26	0.12	0.00	0.00	0.00	0.00
Running	0.63	0.41	0.00	0.00	0.00	0.00
Resting	0.06	0.02	0.00	0.00	0.00	0.00
Total Exhaust (tons/day)	2.75	1.25	0.01	0.01	0.03	0.4
EF (lbs/VMT)	0.0022	0.0025				
Weighted EF (lbs/VMT)	**0.0023**		**0.0021**			
CO Emissions						
Run Exhaust	16.25	8.58	0.04	0.02	0.16	1.39
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.16
Start Exhaust	6.16	2.08	0.00	0.00	0.00	0.00
Total Exhaust (tons/day)	22.41	10.66	0.04	0.02	0.16	1.55
EF (lbs/VMT)	0.0176	0.0216				
Weighted EF (lbs/VMT)	**0.020**		**0.0084**			
NO_x Emissions						
Run Exhaust	2.16	0.96	0.16	0.07	0.70	6.08
Idle Exhaust	0.00	0.00	0.00	0.00	0.01	0.50
Start Exhaust	0.34	0.11	0.00	0.00	0.00	0.00
Total Exhaust (tons/day)	2.50	1.07	0.16	0.07	0.71	6.58
EF (lbs/VMT)	0.0020	0.0024				
Weighted EF (lbs/VMT)	**0.0022**		**0.036**			
CO_2 Emissions (1000)						
Run Exhaust	0.97	0.46	0.02	0.01	0.10	0.77
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.03
Start Exhaust	0.03	0.02	0.00	0.00	0.00	0.00
Total Exhaust (tons/day)	1.00	0.48	0.02	0.01	0.10	0.79
EF (lbs/VMT)	0.0008	0.0010				
Weighted EF (lbs/VMT)	**0.0009**		**0.0044**			
PM_{10} Emissions						
Run Exhaust	0.03	0.01	0.00	0.00	0.02	0.13
Idle Exhaust	0.00	0.00	0.00	0.00	0.00	0.01
Start Exhaust	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal Exhaust	0.03	0.02	0.00	0.00	0.02	0.14
TireWear	0.02	0.01	0.00	0.00	0.00	0.01
BrakeWear	0.04	0.01	0.00	0.00	0.00	0.00
Total Exhaust (tons/day)	0.09	0.04	0.00	0.00	0.02	0.16
EF (lbs/VMT)	0.0001	0.0001				
Weighted EF (lbs/VMT)	**8.16E-05**		**0.0009**			
Lead Emissions						
Lead Exhaust (tons/day)	0.00	0.00	0.00	0.00	0.00	0.00
Weighted EF (lbs/VMT)	0.00	0.00	**0.00**			
SO_x Emissions						
SOx (tons/day)	0.01	0.00	0.00	0.00	0.00	0.01
EF (lbs/VMT)	0.00001	0.00				
Weighted EF (lbs/VMT)	**3.93E-06**		**4.76E-05**			
Fuel Consumption (x1000 gal)						
Gasoline	106.37	50.35	0.00	0.00	0.00	0.00
Diesel	0.16	0.75	1.47	0.57	8.89	71.43

TABLE B-20 WINTER EMISSIONS DETAILS

Title : Imperial County Avg 2008 Winter El Centro version 2
Version : Emfac2002 V2.2 Apr 23 2003
Run Date : 03/11/06 11:06:52
Scen Year: 2008 -- Model Years: 1965 to 2008

Season : Winter
Area : Imperial County Average
I/M Stat : No I and M program in effect
Emissions: Tons Per Day

	- - - Light Duty Passenger Cars - - -			- - - - - Light Duty Trucks - - - - -			- - - - - Medium Duty Trucks - - - -			----- Gasoline Trucks ------	Diesel	Total HD	Urban	Motor-	All					
							- - - - H e a v y D u t y T r u c k s - - -												
	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Total	Trucks	Trucks	Buses	cycles	Vehicles
Vehicles	885	65236	185	66305	1228	44477	845	46550	262	8453	820	9535	647	2743	3389	4768	8157	248	2470	133265
VMT/1000	13	2525	4	2543	35	1669	29	1734	7	357	45	408	7	58	65	387	452	29	18	5184
Trips	3697	408635	1014	413346	5186	277823	5078	288087	2483	120209	9317	132009	12400	34225	46626	50800	97426	991	4940	936799
								Total	Organic Gas	Emissions										
Run Exh	0.09	0.9	0	0.98	0.24	0.55	0.01	0.79	0.06	0.13	0.02	0.21	0.07	0.14	0.21	0.4	0.61	0.19	0.06	2.85
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0.03	0	0	0.04
Start Ex	0.02	0.62	0	0.65	0.03	0.31	0	0.35	0.02	0.11	0	0.13	0.18	0.12	0.29	0	0.29	0.01	0.01	1.43
Total Ex	0.11	1.52	0	1.63	0.27	0.86	0.01	1.14	0.08	0.24	0.02	0.34	0.25	0.26	0.51	0.43	0.94	0.2	0.08	4.33
Diurnal	0.01	0.16	0	0.17	0.02	0.11	0	0.12	0	0.02	0	0.02	0	0	0	0	0	0	0.01	0.33
Hot Soak	0.02	0.24	0	0.26	0.03	0.17	0	0.2	0	0.03	0	0.04	0.01	0.01	0.02	0	0.02	0	0.01	0.53
Running	0.09	0.54	0	0.63	0.07	0.62	0	0.69	0.02	0.15	0	0.17	0.06	0.13	0.2	0	0.2	0.01	0.02	1.71
Resting	0	0.05	0	0.06	0.01	0.04	0	0.04	0	0.01	0	0.01	0	0	0	0	0	0	0	0.11
Total	0.24	2.51	0	2.75	0.39	1.8	0.01	2.19	0.1	0.45	0.02	0.58	0.33	0.4	0.73	0.43	1.16	0.21	0.12	7
								Carbon	Monoxide	Emissions										
Run Exh	1.01	15.24	0	16.25	2.74	12.27	0.02	15.03	0.88	2.04	0.06	2.98	1.62	2.21	3.83	1.57	5.4	1.51	0.73	41.9
Idle Exh	0	0	0	0	0	0	0	0	0	0.02	0	0.02	0.01	0.01	0.02	0.17	0.18	0	0	0.21
Start Ex	0.13	6.02	0	6.16	0.19	3.52	0	3.71	0.14	1.01	0	1.15	1.58	1.58	3.16	0	3.16	0.07	0.05	14.29
Total Ex	1.14	21.27	0	22.41	2.93	15.79	0.02	18.74	1.02	3.08	0.06	4.15	3.2	3.8	7	1.74	8.74	1.57	0.78	56.4
								Oxides	of Nitrogen	Emissions										
Run Exh	0.07	2.08	0.01	2.16	0.19	1.64	0.04	1.88	0.06	0.41	0.23	0.69	0.05	0.47	0.52	6.85	7.38	0.32	0.03	12.46
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.51	0.51	0	0	0.52
Start Ex	0.01	0.33	0	0.34	0.01	0.24	0	0.25	0	0.2	0	0.2	0.03	0.22	0.24	0	0.24	0	0	1.04
Total Ex	0.08	2.41	0.01	2.5	0.2	1.88	0.04	2.12	0.06	0.61	0.23	0.9	0.08	0.69	0.77	7.37	8.13	0.33	0.03	14.01
								Carbon	Dioxide	Emissions	(000)									
Run Exh	0.01	0.96	0	0.97	0.02	0.77	0.01	0.8	0	0.29	0.02	0.32	0.01	0.04	0.05	0.88	0.93	0.04	0	3.06
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0.03	0	0	0.03
Start Ex	0	0.03	0	0.03	0	0.03	0	0.03	0	0.01	0	0.01	0	0	0	0	0	0	0	0.08
Total Ex	0.01	0.99	0	1	0.02	0.8	0.01	0.83	0	0.3	0.02	0.33	0.01	0.04	0.05	0.9	0.96	0.04	0	3.16
									PM10	Emissions										
Run Exh	0	0.03	0	0.03	0	0.03	0	0.03	0	0.01	0	0.01	0	0	0	0.15	0.15	0	0	0.23
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0	0	0.02
Start Ex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01
Total Ex	0	0.03	0	0.03	0	0.03	0	0.04	0	0.01	0	0.01	0	0	0	0.17	0.17	0	0	0.25
TireWear	0	0.02	0	0.02	0	0.01	0	0.02	0	0	0	0	0	0	0	0.01	0.01	0	0	0.06
BrakeWr	0	0.03	0	0.04	0	0.02	0	0.02	0	0	0	0.01	0	0	0	0.01	0.01	0	0	0.07
Total	0	0.09	0	0.09	0	0.07	0	0.08	0	0.02	0	0.02	0	0	0	0.19	0.19	0	0	0.38
Lead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOx	0	0.01	0	0.01	0	0.01	0	0.01	0	0	0	0	0	0	0	0.01	0.01	0	0	0.03
								Fuel	Consumption	(000 gallons)										
Gasoline	0.97	105.39	0	106.37	2.5	84.92	0	87.42	0.67	31.04	0	31.71	1.46	5.22	6.69	0	6.69	1.96	0.41	234.55
Diesel	0	0	0.16	0.16	0	0	1.01	1.01	0	0	2.23	2.23	0	0	0	81.27	81.27	2.59	0	87.26

TABLE B-20 CONTINUED WINTER EMISSIONS DETAILS

Title : Imperial County Avg 2008 Winter El Centro versic Season : Winter
Version : Emfac2002 V2.2 Apr 23 2003 Area : Imperial County Average
Run Date : 03/11/06 11:06:52 I/M Stat : No I and M program in effect
Scen Year: 2008 -- Model Years: 1965 to 2008 Emissions: Tons Per Day

- - Light Duty Trucks 1 (T1) - - - - - Light Duty Trucks 2 (T2) - - - Medium Duty Trucks (T3) -- Light-Heavy Duty Trucks 1 (T4) Light-Heavy Duty Trucks 2 (T5) Medium-Heavy Duty Trucks (T6) - HH Duty School Buses Urban Buses Total

	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Diesel Trks	Gas	Diesel	Gas	Diesel	Buses
Vehicles	684	25688	635	27008	544	18789	210	19542	215	5938	157	6309	46	2229	453	2728	0	287	211	498	562	2487	1306	4355	3308	63	153	166	82	463
VMT/1000	20	964	22	1005	16	705	7	728	6	222	6	234	0	121	28	150	0	14	11	24	6	43	59	108	322	3	6	20	10	38
Trips	2879	160300	3828	167007	2307	117523	1249	121080	945	37034	972	38951	1534	73692	5695	80922	4	9482	2650	12136	9540	24158	33448	67145	16742	252	611	662	328	1854
								Total	Organic Gas	Emissions																				
Run Exh	0.13	0.3	0	0.44	0.11	0.25	0	0.35	0.06	0.11	0	0.16	0	0.02	0.01	0.03	0	0.01	0.01	0.01	0.05	0.07	0.03	0.14	0.37	0.01	0	0.18	0.01	0.21
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0
Start Ex	0.02	0.17	0	0.19	0.02	0.14	0	0.16	0.01	0.06	0	0.07	0.01	0.04	0	0.05	0	0.01	0	0.01	0.12	0.06	0	0.17	0	0	0	0.01	0	0.01
Total Ex	0.15	0.47	0	0.63	0.12	0.39	0	0.51	0.06	0.17	0	0.23	0.02	0.06	0.01	0.09	0	0.02	0.01	0.02	0.17	0.12	0.03	0.32	0.4	0.02	0	0.19	0.01	0.22
Diurnal	0.01	0.06	0	0.07	0.01	0.04	0	0.05	0	0.02	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Soak	0.02	0.1	0	0.12	0.01	0.07	0	0.08	0	0.03	0	0.03	0	0	0	0.01	0	0	0	0	0.01	0.01	0	0.01	0	0	0	0	0	0
Running	0.04	0.37	0	0.41	0.03	0.25	0	0.28	0.01	0.1	0	0.11	0.01	0.04	0	0.05	0	0.02	0	0.02	0.05	0.09	0	0.13	0	0	0	0.01	0	0.01
Resting	0	0.02	0	0.02	0	0.02	0	0.02	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0.22	1.03	0	1.25	0.17	0.77	0	0.94	0.07	0.32	0	0.39	0.03	0.1	0.01	0.14	0	0.03	0.01	0.04	0.22	0.22	0.03	0.47	0.4	0.02	0	0.19	0.01	0.23
								Carbon	Monoxide	Emissions																				
Run Exh	1.52	7.04	0.01	8.58	1.22	5.23	0	6.46	0.82	1.81	0	2.63	0.06	0.16	0.04	0.25	0	0.08	0.02	0.09	1.02	1.31	0.16	2.49	1.39	0.25	0.02	1.47	0.04	1.78
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0.02	0	0	0	0	0	0.01	0	0.01	0.16	0.01	0	0	0	0.01
Start Ex	0.1	1.98	0	2.08	0.08	1.54	0	1.62	0.06	0.58	0	0.64	0.08	0.34	0	0.41	0	0.09	0	0.09	0.73	0.83	0	1.56	0	0.02	0	0.07	0	0.09
Total Ex	1.63	9.01	0.01	10.66	1.3	6.78	0	8.08	0.88	2.39	0	3.28	0.14	0.51	0.04	0.69	0	0.17	0.02	0.19	1.75	2.15	0.16	4.06	1.55	0.28	0.02	1.53	0.04	1.87
								Oxides	of Nitrogen	Emissions																				
Run Exh	0.11	0.82	0.03	0.96	0.09	0.82	0.01	0.92	0.05	0.35	0.01	0.41	0	0.05	0.16	0.21	0	0.01	0.07	0.08	0.03	0.19	0.7	0.92	6.08	0.01	0.07	0.13	0.19	0.41
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0.5	0	0.01	0	0	0.01
Start Ex	0	0.11	0	0.11	0	0.13	0	0.14	0	0.05	0	0.05	0	0.13	0	0.13	0	0.02	0	0.02	0.01	0.1	0	0.11	0	0	0	0	0	0
Total Ex	0.11	0.93	0.03	1.07	0.09	0.95	0.01	1.05	0.06	0.39	0.01	0.46	0	0.18	0.16	0.34	0	0.04	0.07	0.1	0.04	0.29	0.71	1.04	6.58	0.01	0.08	0.13	0.19	0.42
(00								Carbon	Dioxide	Emissions	(000)																			
Run Exh	0.01	0.45	0.01	0.46	0.01	0.33	0	0.34	0	0.14	0	0.15	0	0.13	0.02	0.15	0	0.01	0.01	0.02	0	0.03	0.1	0.14	0.77	0	0.01	0.02	0.03	0.06
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0
Start Ex	0	0.02	0	0.02	0	0.01	0	0.01	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ex	0.01	0.46	0.01	0.48	0.01	0.34	0	0.35	0	0.15	0	0.15	0	0.13	0.02	0.15	0	0.02	0.01	0.02	0.01	0.03	0.1	0.14	0.79	0	0.01	0.02	0.03	0.06
								PM10	Emissions																					
Run Exh	0	0.01	0	0.01	0	0.02	0	0.02	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0.13	0	0	0	0	0.01
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0
Start Ex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ex	0	0.01	0	0.02	0	0.02	0	0.02	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0.14	0	0	0	0	0.01
TireWear	0	0.01	0	0.01	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0
BrakeWr	0	0.01	0	0.01	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0.04	0	0.04	0	0.04	0	0.04	0	0.01	0	0.01	0	0.01	0	0.01	0	0	0	0	0	0	0.02	0.02	0.16	0	0	0	0	0.01
Lead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0
								Fuel	Consumption	(000 gallons)																				
Gasoline	1.39	48.96	0	50.35	1.11	35.96	0	37.07	0.57	15.58	0	16.14	0.1	13.88	0	13.99	0	1.58	0	1.58	1.01	3.84	0	4.85	0	0.28	0	1.96	0	2.24
Diesel	0	0	0.75	0.75	0	0	0.26	0.26	0	0	0.2	0.2	0	0	1.47	1.47	0	0	0.57	0.57	0	0	8.89	8.89	71.43	0	0.94	0	2.59	3.53

Project Emissions Data Files
Submitted on Separate DVDs

Attachment C
Supporting Information on Estimation of Project Operation Emissions

TABLE C-1 EMISSIONS CALCULATIONS

ECGS-3 Repowering Emissions Calculations Rev 2

Annual Emissions

Emissions Total (lbs)	Hours	NOx	CO	VOC	PM10
CTG/HRSG Purge Event	50.00				
CTG Startup Event	50.00	3,150	5,700	83	250
CTG Load Ramp Event	75.00	5,900	4,238	109	375
HRSG Warm-up Event	112.50	3,600	6,075	203	563
SCR Warm-up Event	37.50	718	1,170	54	188
Uncontrolled Operation	20.00	640	1,080	36	100
Controlled Operation (unfired)	4,980	31,305	41,864	5,336	24,900
Controlled Operation (fired)	3,000	21,333	25,920	3,279	15,000
CTG Load Ramp Event	75.00	5,900	4,238	109	375
CTG Shutdown Event	75.00	3,750	6,750	98	375
	8,475	76,296	97,035	9,304	42,125
Emissions Total (tons)		**38.15**	**48.52**	**4.65**	**21.06**
ERC Estimates (tons)		41.31	52.01	7.35	20.75

Daily Emissions

Emissions Total (lbs)	Hours	NOx	CO	VOC	PM10
CTG/HRSG Purge Event	0.67				
CTG Startup Event	0.67	42.00	76.00	1.10	3.33
CTG Load Ramp Event	1.00	78.67	56.50	1.45	5.00
HRSG Warm-up Event	1.50	48.00	81.00	2.70	7.50
SCR Warm-up Event	0.50	9.57	15.60	0.72	2.50
Uncontrolled Operation	2.00	64.00	108.00	3.60	10.00
Controlled Operation (unfired)	8.00	50.29	67.25	8.57	40.00
Controlled Operation (fired)	7.67	54.52	66.24	8.38	38.33
CTG Load Ramp Event	1.00	78.67	56.50	1.45	5.00
CTG Shutdown Event	1.00	50.00	90.00	1.30	5.00
	24.00	475.72	617.10	29.26	116.67

Hourly Emissions

Emissions Total (lbs)	Hours	NOx	CO	VOC	PM10
CTG Startup Event	0.33	21.00	38.00	0.55	1.67
CTG Load Ramp Event	0.50	39.33	28.25	0.72	2.50
HRSG Warm-up Evnet (partial)	0.17	5.33	9.00	0.30	0.83
	1.00	65.67	75.25	1.57	5.00

Commissioning Emissions

Emissions Total (lbs)	Hours	NOx	CO	VOC	PM10
CTG No-Load Testing	40	1,600	3,600	50	200
CTG/HRSG Load Testing	200	20,000	15,000	400	1,000
Uncontrolled Operation	120	3,840	6,480	216	600
	360	25,440	25,080	666	1,800

Reference Information

Annual Start/Stop Events	150.00
Annual Uncontrolled Hours	20.00
Annual Controlled Hours (unfired)	4,980.00
Annual Controlled Hours (fired)	3,000.00

Daily Start/Stop Events	2.00
Daily Uncontrolled Hours	2.00
Daily Controlled Hours (unfired)	8.00
Daily Controlled Hours (fired)	7.67

CTG/HRSG Purge Time (20 min)	0.33
CTG Startup Time (20 min)	0.33
CTG Load Ramp Time (30 min)	0.50
HRSG Warm-UP Time (45 min)	0.75
SCR Warm-up Time (15 min)	0.25
CTG Shutdown Time (30 min)	0.50

Emissions Rate (lbs/hour/unit)	NOx	CO	VOC	PM10
CTG No-Load Testing	40.00	90.00	1.25	5.00
CTG/HRSG Load Testing	100.00	75.00	2.00	5.00
Uncontrolled Operation	32.00	54.00	1.80	5.00
Controlled Operation (unfired)	6.29	8.41	1.07	5.00
Controlled Operation (fired)	7.11	8.64	1.09	5.00

Emissions Rate (ppm)	NOx	CO	UHC	VOC
Uncontrolled Operation (unfired)	9.00	25.00	7.00	1.40
Uncontrolled Operation (fired)	10.18	25.69	7.14	1.43
BACT Controlled Operation (fired)	2.00	4.00		2.00

Start/Stop Emissions (lbs/event/unit)	NOx	CO	VOC	PM10
CTG Startup Emissions	21.00	38.00	0.55	1.67
CTG Load Ramp Emissions	39.33	28.25	0.72	2.50

HRSG Warm-Up Emissions	24.00	40.50	1.35	3.75
SCR Warm-Up Emissions	4.79	7.80	0.36	1.25
CTG Shutdown Emissions	25.00	45.00	0.65	2.50

Notes:

1) Uncontrolled emissions are based upon GE data at annual average ambient temperature of 73F.
2) Controlled emissions are based upon BACT at annual average ambient temperature of 73F.
3) CTG Startup and shutdown emissions are based upon GE data at ISO conditions.
4) CTG load ramp (0 to 60%) emissions are based upon GE data at ISO conditions.
5) HRSG warm-up emissions are based upon uncontrolled emissions.
6) SCR warm-up emissions are based upon linear ramp from uncontrolled to controlled emissions.
7) VOC emissions are based upon 20% of UHC and 40% SCR removal rate (less than BACT achieved).

Amb Temp F	Load %	Exh Flow lb/hr	Exh Temp F	Exh Vel ft/s	NOx lb/hr	CO lb/hr
115	100	2,239,290	320	70.36	6.67	8.00
	80	1,726,000	316	53.95	4.51	6.08
	60	1,545,000	316	48.29	3.92	30.89
73	100	2,358,000	322	74.26	7.11	8.64
	80	1,897,000	317	59.37	5.10	6.71
	60	1,628,000	316	50.88	4.31	6.71
40	100	2,481,000	326	78.57	7.56	9.12
	80	2,021,000	319	63.41	5.49	7.64
	60	1,709,000	316	53.41	4.70	6.08
Stack inside diameter/area =			15.00	feet	176.63	square-feet

Notes:

1) Full-load cases are based upon heat balances with evap cooling and duct firing.
2) Part-load cases are based upon GE performance runs without evap cooling or duct firing.
3) Stack exhaust temperatures for part-load cases are based upon CTG exhaust temp and HRSG full-load temp trends.
4) Emissions rates for part-load cases are based upon full-load removal efficiencies.
5) CO emissions at 115F amb and 60% load appears to be an abnormal non-guaranteed case.

ECGS Unit 3 100% Load Scenarios

TABLE C-2 Case Parameters

Case	1	2	3	4	5
Ambient Temperature (°F)	115	115	73	73	40
Stack Diameter (ft)	15	15	15	15	15
Exhaust Flow (lb/hr)	2240000	2077000	2358000	2302000	2481000
CTG Load Level	**100%**	**100%**	**100%**	**100%**	**100%**
Evap. Cooler	ON	OFF	ON	OFF	OFF

Data from Vendor Area = 176.71 ft2

TABLE C-3 Expected Operation of New Unit 3 Gas Turbine - Normal Operation

(Reference: Emission Summary GE PG7121 Turbine/Site Specific Information

Heat Consumed (MMBTU/hr)	824.3	748.4	877.4	850.1	928.5
Turbine Outlet Temperature (°F)	1016	1043	1006	1014	990
HRSG Stack Outlet Temperature (°F)	320	320	322	322	326
Exhaust Flow @ T stack (acfm)	751916	694103	790219	770302	832859
Stack Exit Velocity, ft/m	4255.0	3927.8	4471.7	4359.0	4713.0
Stack Exit Velocity, m/s	21.62	19.95	22.72	22.14	23.94
Nitrogen, % Vol	73.58	74.46	74.44	74.76	75.15
Oxygen, % Vol	13.64	13.99	13.77	13.91	13.91
Carbon Dioxide, % Vol	3.13	3.08	3.18	3.16	3.21
Argon, % Vol	0.89	0.90	0.90	0.89	0.90
Water Vapor, % Vol	8.77	7.58	7.72	7.28	6.83
Molecular Weight	28.28	28.41	28.40	28.44	28.50

Data from Vendor

ECGS Unit 3 100% Load Scenarios

TABLE C-4 Average Emission Rates from New Unit 3 Gas Turbine (lbs/hr) - Normal Operations with Duct Firing

NO_X at pre-BACT level	34.62	31.62	36.20	35.20	
NO_x ppmvd	10.39	10.39	10.18	10.18	
NO_X at 2.0 ppmvd BACT level	6.67	6.09	7.11	6.91	
CO at pre BACT level	52.65	48.65	55.50	54.50	
CO ppmvd	25.81	25.81	25.69	25.69	
CO at 4.0 ppmvd BACT level	8.16	7.54	8.64	8.48	
UHC at pre-BACT level	9.20	8.20	9.18	9.18	
VOC at pre-BACT level	1.84	1.64	1.84	1.84	
VOC ppmvd	7.16	7.16	7.14	7.14	
VOC at 2.0 ppmvd BACT level	1.10	0.98	1.10	1.10	
SO_2	1.72	1.57	1.84	1.78	
PM_{10}	5.00	5.00	5.00	5.00	
NH_3 at 10 ppmvd tBACT level	12.39	11.44	13.11	12.88	
NH_3 at 5 ppmvd BACT level	6.19	5.72	6.56	6.44	
Sulfur content in fuel basis for above:	0.75	grain total S/100 scf			

Data from Vendor
Full load cases assume evap cooling and duct firing
Part load cases assume no evap cooling and no duct firing
VOC emissions are based upon 20% of UHC and 40% SCR removal rate (less than BACT achieved).

TABLE C-5 Average Emission Rates from New Unit 3 Gas Turbine (lbs/hr) - Normal Operations with No Duct Firing

NO_X at 9 ppmvd pre-BACT level	30.00	27.00	32.00	31.00	34.00
NO_X at 2.0 ppmvd BACT level	5.78	5.20	6.29	6.09	6.73
CO at 25 ppmvd pre BACT level	51.00	47.00	54.00	53.00	57.00
CO at 4.0 ppmvd BACT level	7.90	7.28	8.41	8.25	8.89
UHC at 7 ppmvd pre-BACT level	9.00	8.00	9.00	9.00	10.00
VOC at 7 ppmvd BACT level	1.80	1.60	1.80	1.80	2.00
VOC at 2.0 ppmvd BACT level	1.08	0.96	1.08	1.08	1.20
SO_2	1.72	1.57	1.84	1.78	1.94
PM_{10}	5.00	5.00	5.00	5.00	5.00
NH_3 at 10 ppmvd tBACT level	12.39	11.41	13.11	12.87	13.84
NH_3 at 5 ppmvd BACT level	6.19	5.71	6.56	6.44	6.92
Sulfur content in fuel basis for above:	0.75	grain total S/100 scf			

Data from Vendor
Full load cases assume evap cooling and duct firing
Part load cases assume no evap cooling and no duct firing
VOC emissions are based upon 20% of UHC and 40% SCR removal rate (less than BACT achieved).

TABLE C-6 Startup / Shutdown Emissions from Turbine

Startup

duration in minutes	20	20	30	45	15	130	Average
	CTG Purge	Startup	CTG Rampup	HRSG Warmup	SCR Warmup	Total Startup	Startup
	Emissions	Emissions	Emissions	Emissions	Emissions	Emissions	Emissions
	lb/event	**lb/event**	**lb/event**	**lb/event**	**lb/event**	**lb/event**	lb/hour
NO_X	0.00	21.00	39.33	24.00	4.79	89.12	41.13
CO	0.00	38.00	28.25	40.50	7.80	114.55	52.87
VOC	0.00	0.55	0.72	1.35	0.36	2.98	1.38
SO_2	0.00	0.65	0.97	1.46	0.49	3.56	1.64
PM_{10}	0.00	1.67	2.5	3.75	1.25	9.17	4.23

Assumptions:

Startup Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and IID.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Shutdown

duration in minutes	30	30	60
	Shutdown	G Load Ra	Total Shutdown
	Emissions	Emissions	Emissions
	lb/event	**lb/event**	lb/hour
NO_X	25.00	39.33	64.33
CO	45.00	28.25	73.25
VOC	0.65	0.72	1.37
SO_2	0.89	0.89	1.78
PM_{10}	2.50	2.50	5.00

Assumptions:

Shutdown Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and IID.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Commissioning Emissions

			Total Pounds Emitted		
	Hours	NO_x	CO	VOC	PM_{10}
CTG No Load Testing	40	1600.00	3600.00	50.00	200.00
CTG/HRSG Load Testing	200	20000.0	15000.00	400.00	1000.00
Uncontrolled Operations	120	3840.00	6480.00	216.00	600.00
			Maximum Emission Rates lb/hr		
		NO_x	CO	VOC	PM_{10}
CTG No Load Testing		40.00	90.00	1.25	5.00
CTG/HRSG Load Testing		100.00	75.00	2.00	5.00
Uncontrolled Operations		32.00	54.00	1.80	5.00

ECGS Unit 3 100% Load Scenarios

TABLE C-7 Worst-Case 1-Hour Emissions

UNCONTROLLED EMISSIONS FOR DIFFERENT OPERATING SCENARIOS (lb/hr); DIFFERENT STARTUP ONE HOUR SCENARIO TIMES; COMMISSIONING EMISSIONS

						startup, rampup	rampup + part			COMMISSIONING EMISSIONS		
						total/2	part of HRSG	of HRSG	HRSG + SCR	CTG	CTG/HRSG	Uncontrolled
						Maximum	Maximum	Maximum	Maximum	No Load	Load	
	lb/hr					Emissions	Emissions	Emissions	Emissions	Emissions	Emissions	Emissions
Emissions per turbine	115F		73F		40F	lb/hour	lb/hour	lb/hour	lb/hour	lb/hour	lb/hour	lb/hour
NO_2	34.62	31.62	36.20	35.20	34.00	41.13	65.66	55.33	28.79	40.00	**100.00**	32.00
CO	52.65	48.65	55.50	54.50	57.00	52.87	75.25	55.25	48.30	**90.00**	75.00	54.00
VOC	1.84	1.64	1.84	1.84	**2.00**	1.38	1.57	1.62	1.71	1.25	**2.00**	1.80
SO_2	1.72	1.57	1.84	1.78	**1.94**	1.64	**1.94**	**1.94**	**1.94**	**1.94**	**1.94**	**1.94**
PM_{10}	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	4.23	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**

TABLE C-8 Worst-Case 3 Hour Emission Rate

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

Emissions per turbine	Worst-case Total (lb/hr)	Normal Operations	Worst-case Total (g/s)
Total Hours of Operation	3		
SO_2	1.94	5.83	0.59

TABLE C-9 Worst-Case 8-Hour Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

Worst-case 8-Hour Scenario includes 1 hour at Maintenance rate, 1 Startups, 1 Shutdown, and remaing time at controlled duct firing rate.

	lb/hr					Total lbs					g/s	Commissioning CTG	Commissioning CTG/HRSG	
Emissions per turbine	**Worst-case Total**	**Startup /Warmup**	**Shutdown**	**Maintenance - Uncontrolled**	**Normal Operations**	**Worst-case Total**	**Startup /Warmup**	**Shutdown**	**Maintenance - Uncontrolled**	**Normal Operations**	**Worst-case Total**	No Load Emissions	No Load Emissions	Uncontrolled Emissions
Total Hours of Operation	8	2.17	1	1	3.83		2.17	1	1	3.83		4	8	8
CO Uncontrolled	34.55	52.87	73.25	55.50	8.64	276.42	114.55	73.25	55.50	33.12	4.35	360	600	432
CO Commissioning CTG No Load	45.00													
CO Commissioning CTG/HRSG Load	75.00													
CO Commissioning Uncontrolled	54.00													

CTG Commissioning No load testing could operate no more than 4 out of any 8 hours (off other 4) and no more than 8 out of 24, off the other 16 hours.

CTG/HRSG Commissioning Load testing could operate no more than 12 out of any 24 hours and be off the other 12 hours.

Uncontrolled commissioning operations could last 24 hours.

ECGS Unit 3 100% Load Scenarios

TABLE C-10 Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.

Worst-case 24-Hour Scenario includes 2 Startups, 2 Shutdowns, 2 hour maintenance, and remaining time at controlled duct firing rate.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations Fired	Normal Operations Unfired	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations	Worst-case Total	Commissioning: CTG No Load Emissions	Commissioning: CTG/HRSG No Load Emissions	Commissioning: Uncontrolled Emissions
	lb/hr						Total lbs					g/s	Total lbs		
Total Hours of Operation	24	4.33	2	2	0.5	15.17		4.33	2	2	15.67		8	12	24
NO_X	20.02	41.13	64.33	34.00	7.11	6.73	480.47	178.24	128.66	68.00	105.57	2.52	320	1200	768
CO	26.20	52.87	73.25	57.00	8.64	8.89	628.68	229.10	146.50	114.00	139.08	3.30	720	900	1296
VOC	1.31	1.38	1.37	2.00	1.10	1.20	31.45	5.96	2.74	4.00	18.75	0.17	10	24	43.2
SO_2	1.87	1.64	1.78	1.94	1.84	1.94	44.96	7.12	3.56	3.89	30.39	0.24	15.54	23.32	46.63
PM_{10}	4.86	4.23	5.00	5.00	5.00	5.00	116.67	18.34	10.00	10.00	78.33	0.61	40.00	60.00	120.00

SO_2 Commissioning CTG No Load	0.65	CTG Commissioning No load testing could operate no more than 4 out of any 8 hours (off other 4) and no more than 8 out of 24, off the other 16 hours
SO_2 Commissioning CTG/HRSG Load	0.97	CTG/HRSG Commissioning Load testing could operate no more than 12 out of any 24 hours and be off the other 12 hours
SO_2 Commissioning Uncontrolled	1.94	Uncontrolled commissioning operations could last 24 hours
PM_{10} Commissioning CTG No Load	1.67	CTG Commissioning No load testing could operate no more than 4 out of any 8 hours (off other 4) and no more than 8 out of 24, off the other 16 hours
PM_{10} Commissioning CTG/HRSG Load	2.50	CTG/HRSG Commissioning Load testing could operate no more than 12 out of any 24 hours and be off the other 12 hours
PM_{10} Commissioning Uncontrolled	5.00	Uncontrolled commissioning operations could last 24 hours

TABLE C-11 Average Annual Emissions

Average Operation lb/hr Emission Rates presented below for normal fired and unfired operations are based on the 73°F; 100% load; with Evap. Cooler On operation scenario for 8,000 hours, plus 150 startup/warmup events and 150 shutdown events and 20 maintenance hours. Worst-case total emission rate incorporates estimated operating hours at different temperatures.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations Fired	Normal Operations Unfired	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations Fired	Normal Operations Unfired	Worst-case Total
	lb/hr						Total lbs						g/s
Total Hours of Operation	8475	325.00	150.00	20	3000	4980							
Number per Scenario		150	150	20	3000	4980							
Duration of Event (min)		130	60	60	60	60							
NO_X	8.49	41.13	64.33	30.80	6.74	6.12	74353.4	13368.0	9649.5	616.0	20222.2	30497.7	1.07
CO	10.85	52.87	73.25	52.40	8.24	8.25	95027.8	17182.5	10987.5	1048.0	24720.0	41089.8	1.37
VOC	1.09	1.38	1.37	9.00	1.10	1.09	9579.3	447.0	205.5	180.0	3310.8	5436.0	0.14
SO_2	1.72	1.64	1.78	1.77	1.74	1.80	15039.8	534.3	266.8	35.4	5230.4	8972.8	0.22
PM_{10}	4.81	4.23	5.00	5.00	5.00	5.00	42125.5	1375.5	750.0	100.0	15000.0	24900.0	0.61

Note: Worst-case lb/hr is the total emissions (lbs) over 8760 hours/year

Estimated annual normal operating hours

40F Duct Fired	0	Total Hours Duct Fired	Total Hours No Duct Fired
40F No Duct Fired	480.00	3000	4980.00
73F No Duct Fired	2500		
73F Duct Fired	500		
115F No Duct Fired	2000		
115F Duct Fired	2500		

ECGS Unit 3 75% Load Scenarios

TABLE C-12 Case Parameters

Case	1	2	3	
Ambient Temperature (°F)	115	73	40	
Stack Diameter (ft)	15	15	15	
Exhaust Flow (lb/hr)	1807500	1866000	1947000	
CTG Load Level	**75%**	**75%**	**75%**	
Evap. Cooler	OFF	OFF	OFF	

Data from Vendor   Area = 176.71 ft2

TABLE C-13 Expected Operation of each Gas Turbine - Normal Operation

(Reference: Emission Summary GE PG7121 Turbine/Site Specific Information)

Heat Consumed (MMBTU/hr)	674.8	714.4	751.7
Turbine Outlet Temperature (°F)	1084	1063	1037
HRSG Stack Outlet Temperature (°F)	316	317	319
Exhaust Flow @ T stack (acfm)	601272	620641	647881
Stack Exit Velocity, ft/m	3402.5	3512.1	3666.3
Stack Exit Velocity, m/s	17.3	17.8	18.6
Nitrogen, % Vol	74.41	74.70	75.10
Oxygen, % Vol	13.82	13.73	13.77
Carbon Dioxide, % Vol	3.16	3.24	3.28
Argon, % Vol	0.89	0.89	0.90
Water Vapor, % Vol	7.70	7.44	6.96
Molecular Weight	28.39	28.43	28.49

Data from Vendor

TABLE C-14 Average Emission Rates from each Gas Turbine (lbs/hr/turbine) - Normal Operations

NO_X at 9 ppmvd pre-BACT level	24.00	26.00	27.00
NO_X at 2.0 ppmvd BACT level	5.33	5.78	6.00
CO at 25 ppmvd pre BACT level	41.00	43.00	52.00
CO at 4.0 ppmvd BACT level	6.56	6.88	7.17
VOC at 7 ppmvd pre-BACT level	7.00	7.00	8.00
VOC at 2.0 ppmvd BACT level	0.84	0.84	0.96
SO_2	1.41	1.49	1.57
PM_{10}	5.00	5.00	5.00
NH_3 at 10 ppmvd tBACT level	9.96	10.44	12.63
NH_3 at 5 ppmvd BACT level	4.98	5.22	6.31
Sulfur content in fuel basis for above:	0.75	grain total S/100 scf	

Data from Vendor

Full load cases assume evap cooling and duct firing

Part load cases assume no evap cooling and no duct firing

TABLE C-15 Startup / Shutdown Emissions from Turbine

Startup

duration in minutes	20	20	30	45	15	130	Average
	CTG Purge	Startup	CTG Rampu	HRSG Warmup	SCR Warmup	Total Startup	Startup
	Emissions	Emissions	Emissions	Emissions	Emissions	Emissions	Emissions
	lb/event	**lb/event**	**lb/event**	**lb/event**	**lb/event**	**lb/event**	lb/hour
NO_X	0.00	21.00	39.33	24.00	4.79	89.12	41.13
CO	0.00	38.00	28.25	40.50	7.80	114.55	52.87
VOC	0.00	0.55	0.72	1.35	0.36	2.98	1.38
SO_2	0.00	0.52	0.79	1.18	0.39	2.88	1.33
PM_{10}	0.00	1.67	2.5	3.75	1.25	9.17	4.23

Assumptions:

Startup Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and IID.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Shutdown

duration in minutes	30	30	60
	Shutdown	G Load Ra	otal Shutdown
	Emissions	Emissions	Emissions
	lb/event	**lb/event**	lb/hour
NO_X	25.00	39.33	64.33
CO	45.00	28.25	73.25
VOC	0.65	0.72	1.37
SO_2	0.79	0.79	1.57
PM_{10}	2.50	2.50	5.00

Assumptions:

Shutdown Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and IID.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

ECGS Unit 3 75% Load Scenarios

TABLE C-16 Worst-Case 1-Hour Emissions per Turbine

Worst-Case 1-Hour Emissions are equal to the Maintenance emission rates. (ie uncontrolled emissions)

Emissions per turbine	lb/hr										g/s
NO_2	27.00										3.40
CO	52.00										6.55
VOC	8.00										1.01
SO_2	1.57										0.20
PM_{10}	5.00										0.63

TABLE C-17 Worst-Case 3 Hour Emission Rate per Turbine

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard. Since the SO_2 emission rate does not change during Startup, Maintenance or Normal operations, the worst-case 3-hour emission rate is the maximum SO_2 rate for 100% load case (72°F; with Sprint and Evap. Cooler On).

	Worst-case Total				Normal Operations	Worst-case Total				Normal Operations	Worst-case Total
Emissions per turbine	lb/hr					Total lbs					g/s
Total Hours of Operation	3				3						
SO_2	1.57				1.57	4.72				4.72	0.20

TABLE C-18 Worst-Case 8-Hour Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.
Worst-case 8-Hour Scenario includes 1 hours at Maintenance rate, 1 Startups, 1 Shutdown, and remaining time at Normal rate.

	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Maintenance- Uncontrolled	Normal Operations	Worst-case Total
Emissions per turbine	lb/hr					Total lbs					g/s
Total Hours of Operation	8	2.17	1	1	3.83		2.17	1	1	3.83	
CO	33.43	52.87	73.25	52.00	7.17	267.45	114.73	73.25	52.00	27.47	4.21

ECGS Unit 3 75% Load Scenarios

TABLE C-19 Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.

Worst-case 24-Hour Scenario includes 2 Startups, 2 Shutdowns, 2 hours maintenance, and remaining time at Normal rate.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Maintenance-Uncontrolled	Normal Operations	Worst-case Total
	lb/hr					Total lbs					g/s
Total Hours of Operation	24	4.33	2	2	15.67						
NO_X	18.95	41.13	64.33	27.00	6.00	454.90	178.24	128.66	54.00	94.00	2.39
CO	24.67	52.87	73.25	52.00	7.17	591.97	229.10	146.50	104.00	112.37	3.11
VOC	1.66	1.38	1.37	8.00	0.96	39.74	5.96	2.74	16.00	15.04	0.21
SO_2	1.53	1.33	1.57	1.57	1.57	36.70	5.77	3.15	3.15	24.64	0.19
PM_{10}	4.86	4.23	5.00	5.00	5.00	116.67	18.34	10.00	10.00	78.33	0.61

TABLE C-20 Average Annual Emissions

Average Operation Emission Rates are based on the average operation scenario (72°F; 100% load; with Sprint and Evap. Cooler On) for 2,980 hours plus 250 startup/warmup events and 250 shutdown events and 20 maintenance hours. The two turbines will each have these operating conditions

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Maintenance-Uncontrolled	Normal Operations	Worst-case Total
	lb/hr					Total lbs					g/s
Total Hours of Operation	5475	325.00	150.00	20	4980						
Number per Scenario		150	150	20	4980						
Duration of Event (min)		130	60	60	60						
NO_X	5.88	41.13	64.33	25.67	5.62	51521.9	13368.0	9649.5	513.3	27991.1	0.74
CO	7.17	52.87	73.25	45.33	6.78	62839.4	17182.5	10987.5	906.7	33762.8	0.90
VOC	0.58	1.38	1.37	7.33	0.85	5040.0	447.0	205.5	146.7	4240.8	0.07
SO_2	0.91	1.33	1.57	1.49	1.47	8015.1	432.6	236.0	29.9	7316.7	0.12
PM_{10}	3.10	4.23	5.00	5.00	5.00	27125.5	1375.5	750.0	100.0	24900.0	0.39

Note: Worst-case lb/hr is the total emissions (lbs) over 8760 hours/year

Estimated annual normal operating hours

40F Duct Fired	0		Total Hours	Total Hours	Total Hours
40F No Duct Fired	480.00		Duct Fired	No Duct Fired	
73F No Duct Fired	2500		3000	4980	7980
73F Duct Fired	500				
115F No Duct Fired	2000				
115F Duct Fired	2500				

ECGS Unit 3 50% Load Scenarios

TABLE C-21 Case Parameters

Case	1	2	3
Ambient Temperature (°F)	115	73	40
Stack Diameter (ft)	15	15	15
Exhaust Flow (lb/hr)	1517000	1543000	1577000
CTG Load Level	**50%**	**50%**	**50%**
Evap. Cooler	OFF	OFF	OFF

Data from Vendor   Area = 176.71 ft2

TABLE C-22 Expected Operation of each Gas Turbine - Normal Operation

(Reference: Emission Summary GE PG7121 Turbine/Site Specific Information)			
Heat Consumed (MMBTU/hr)	544.1	577.4	609.5
Turbine Outlet Temperature (°F)	1100	1100	1100
HRSG Stack Outlet Temperature (°F)	316	316	316
Exhaust Flow @ T stack (acfm)	504217	512264	522692
Stack Exit Velocity, ft/m	2853.3	2898.8	2957.8
Stack Exit Velocity, m/s	14.5	14.7	15.0
Nitrogen, % Vol	74.52	74.77	75.12
Oxygen, % Vol	14.15	13.95	13.83
Carbon Dioxide, % Vol	3.01	3.14	3.25
Argon, % Vol	0.89	0.90	0.90
Water Vapor, % Vol	7.44	7.25	6.91
Molecular Weight	28.41	28.45	28.49

Data from Vendor

TABLE C-23 Average Emission Rates from each Gas Turbine (lbs/hr/turbine) - Normal Operations

NO_X at 9 ppmvd pre-BACT level	19.00	21.00	22.00
NO_X at 2.0 ppmvd BACT level	4.22	4.67	4.89
CO at 25 ppmvd pre BACT level	317.00	156.00	76.00
CO at 4.0 ppmvd BACT level	5.54	5.62	5.85
VOC at 7 ppmvd pre-BACT level	51.00	25.00	12.00
VOC at 2.0 ppmvd BACT level	1.73	1.72	1.71
SO_2	1.14	1.21	1.28
PM_{10}	5.00	5.00	5.00
NH_3 at 10 ppmvd tBACT level	76.99	37.89	18.46
NH_3 at 5 ppmvd BACT level	38.49	18.94	9.23
Sulfur content in fuel basis for above:	0.75	grain total S/100 scf	

Data from Vendor
Full load cases assume evap cooling and duct firing
Part load cases assume no evap cooling and no duct firing

TABLE C-24 Startup / Shutdown Emissions from Turbine

Startup

duration in minutes	20	20	30	45	15	130	Average
	CTG Purge	Startup	CTG Rampup	HRSG Warmup	SCR Warmup	Total Startup	Startup
	Emissions	Emissions	Emissions	Emissions	Emissions	Emissions	Emissions
	lb/event	**lb/event**	**lb/event**	**lb/event**	**lb/event**	**lb/event**	lb/hour
NO_X	0.00	21.00	39.33	24.00	4.79	89.12	41.13
CO	0.00	38.00	28.25	40.50	7.80	114.55	52.87
VOC	0.00	0.55	0.72	1.35	0.36	2.98	1.38
SO_2	0.00	0.43	0.64	0.96	0.32	2.34	1.08
PM_{10}	0.00	1.67	2.5	3.75	1.25	9.17	4.23

Assumptions:

Startup Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and IID.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Shutdown

duration in minutes	30	30	60
	Shutdown	CTG Load Ramp	Total Shutdown
	Emissions	Emissions	Emissions
	lb/event	**lb/event**	lb/hour
NO_X	25.00	39.33	64.33
CO	45.00	28.25	73.25
VOC	0.65	0.72	1.37
SO_2	0.86	0.86	1.71
PM_{10}	2.50	2.50	5.00

Assumptions:

Shutdown Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and IID.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

ECGS Unit 3 50% Load Scenarios

TABLE C-25 Worst-Case 1-Hour Emissions per Turbine

Worst-Case 1-Hour Emissions are equal to the Maintenance emission rates. (ie uncontrolled emissions)

Emissions per turbine	lb/hr										g/s
NO_2	22.00										2.77
CO	317.00										39.94
VOC	51.00										6.43
SO_2	1.28										0.16
PM_{10}	5.00										0.63

TABLE C-26 Worst-Case 3 Hour Emission Rate per Turbine

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard. Since the SO_2 emission rate does not change during Startup, Maintenance or Normal operations, the worst-case 3-hour emission rate is the maximum SO_2 rate for 100% load case (72°F; with Sprint and Evap. Cooler On).

	Worst-case Total				Normal Operations	Worst-case Total				Normal Operations	Worst-case Total
Emissions per turbine	lb/hr					Total lbs					g/s
Total Hours of Operation	3				3						
SO_2	1.28				1.28	3.83				3.83	0.16

TABLE C-27 Worst-Case 8-Hour Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.
Worst-case 8-Hour Scenario includes 1 hours at Maintenance rate, 1 Startups, 1 Shutdown, and remaining time at Normal rate.

	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Maintenance-Uncontrolled	Normal Operations	Worst-case Total
Emissions per turbine	lb/hr					Total lbs					g/s
Total Hours of Operation	8	2.17	1	1	3.83						
CO	65.90	52.87	73.25	317.00	5.85	527.21	114.55	73.25	317.00	22.41	8.30

ECGS Unit 3 50% Load Scenarios

TABLE C-28 Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.

Worst-case 24-Hour Scenario includes 2 Startups, 2 Shutdowns, 2 hours at Maintenance rate, and remaining time at Normal rate.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Maintenance-Uncontrolled	Normal Operations	Worst-case Total
	lb/hr					Total lbs					g/s
Total Hours of Operation	24	4.33	2	2	15.67						
NO_X	17.81	41.13	64.33	22.00	4.89	427.49	178.24	128.66	44.00	76.59	2.24
CO	45.88	52.87	73.25	317.00	5.85	1101.19	229.10	146.50	634.00	91.59	5.78
VOC	5.74	1.38	1.37	51.00	1.73	137.78	5.96	2.74	102.00	27.08	0.72
SO_2	1.28	1.08	1.71	1.28	1.28	30.64	4.68	3.43	2.55	19.98	0.16
PM_{10}	4.86	4.23	5.00	5.00	5.00	116.67	18.34	10.00	10.00	78.33	0.61

TABLE C-29 Average Annual Emissions

Average Operation Emission Rates are based on the average operation scenario (72°F; 100% load; with Sprint and Evap. Cooler On) for 2,980 hours plus 250 startup/warmup events and 250 shutdown events and 20 maintenance hours. The two turbines will each have these operating conditions.

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Maintenance - Uncontrolled	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Maintenance-Uncontrolled	Normal Operations	Worst-case Total
	lb/hr					Total lbs					g/s
Total Hours of Operation	5475	325.00	150.00	20	4980						
Number per Scenario		150	150	20	4980						
Duration of Event (min)		130	60	60	60						
NO_X	5.24	41.13	64.33	20.67	4.51	45888.6	13368.0	9649.5	413.3	22457.8	0.66
CO	6.82	52.87	73.25	183.00	5.61	59764.4	17182.5	10987.5	3660.0	27934.4	0.86
VOC	1.12	1.38	1.37	29.33	1.73	9830.0	447.0	205.5	586.7	8590.8	0.14
SO_2	0.75	1.08	1.71	1.21	1.19	6542.2	350.8	257.1	24.1	5910.1	0.09
PM_{10}	3.10	4.23	5.00	5.00	5.00	27125.5	1375.5	750.0	100.0	24900.0	0.39

Note: Worst-case lb/hr is the total emissions (lbs) over 8760 hours/year

Estimated annual normal operating hours				
40F Duct Fired	0	Total Hours	Total Hours	Total Hours
40F No Duct Fired	480.00	Duct Fired	No Duct Fired	
73F No Duct Fired	2500	3000	4980	7980
73F Duct Fired	500			
115F No Duct Fired	2000			
115F Duct Fired	2500			

TABLE C-30 ECGS Unit 3 Cooling Tower Drift Calculation

Past Operations	circulating water rate	36,000	gallons/min
	cycles of concentration	4	
	TDS	905	mg/liter
		7.55	lb/1000 gallons
	Drift Eliminator Control	0.000020	
	Average operating hours per year	3094	
	Drift PM emissions	1.30	lb/hr
		2.02	**tpy**
Future Operations			
	circulating water rate	31,500	gallons/min
	cycles of concentration	4	
	TDS	905	mg/liter
		7.55	lb/1000 gallons
	Drift Eliminator Control	0.000010	
	Operating hours per year	8200	
	Drift PM emissions	0.57	lb/hr
		2.34	**tpy**
	Net increase in emissions	**0.32**	**tons per year**

Plant Operating Emissions Used in ISCST3 Model

TABLE C-31 1-Hour Worst-Case Emission Scenario for ECGS

Only NO_2, CO and SO_2 are considered for the 1-hour Ambient Air Quality Standard.

Worst-case 1-Hour Scenario for NO_2 and SO_2 includes new Unit 3 turbine operating for 1 hour at Commissioning rate.

For CO, worst-case scenario is uncontrolled rate at 50% load for 115 F conditions.

Emissions from Unit 3 turbine	lb/hr	g/s
NO_2	100.00	12.60
CO	317.00	39.94
SO_2	1.94	0.24

TABLE C-32 3 Hour Emissions Scenarios for ECGS

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

The worst-case 3-hour emission rate is the maximum SO_2 rate for 100% load case (40°F; with Evap. Cooler Off).

Emissions per turbine	lb/hr	g/s
SO_2	1.94	0.24

TABLE C-33 8-Hour Emissions Scenarios for ECGS

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

CTG/HRSG Commissioning Load testing could operate no more than 12 out of any 24 hours and be off the other 12 hours.

Emissions per turbine	lb/hr	g/s
CO	75.00	9.45

TABLE C-34 24-Hour Emissions Scenarios for ECGS

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.

Uncontrolled commissioning operations could last 24 hours for SO_2 and PM_{10}.

Emissions per turbine	lb/hr	g/s
NO_2	20.02	2.52
CO	45.88	5.78
VOC	5.74	0.72
SO_2	1.94	0.24
PM_{10}	5.00	0.63
Emissions from Cooling Tower 3 with new Unit 3 rates	**lb/hr**	**g/s**
PM_{10}	0.57	0.07

TABLE C-35 Average Annual Emissions for ECGS

Average Operation Emission Rates are based on the annual operation scenarios for 7,980 hours plus 150 startup/warmup events and 150 shutdown events and 20 maintenance hours.

Emissions per turbine	lb/hr	g/s
NO_X	8.49	1.07
CO	10.85	1.37
VOC	1.09	0.14
SO_2	1.72	0.22
PM_{10}	4.81	0.61
Emissions from Cooling Tower 3 with new Unit 3 rates		
PM_{10}	0.57	0.07

(Continued)

I. Gas Quality (Continued)

2. All gas delivered into the Utility's system for the account of the customer for which there is no existing contract between the delivering pipeline and the Utility shall be at a pressure such that the gas can be integrated into the Utility's system at the point(s) of receipt and shall conform to the following minimum specifications:

   a. Heating Value: The minimum heating value is nine hundred and seventy (970) Btu (gross) per standard cubic foot on a dry basis. The maximum heating value is one thousand one hundred fifty (1150) Btu (gross) per standard cubic foot on a dry basis.

   b. Moisture Content or Water Content: For gas delivered at or below a pressure of eight hundred (800) psig, the gas shall have a water content not in excess of seven (7) pounds per million standard cubic feet. For gas delivered at a pressure exceeding of eight hundred (800) psig, the gas shall have a water dew point not exceeding 20F at delivery pressure.

   c. Hydrogen Sulfide: The gas shall not contain more than twenty-five hundredths (0.25) of one (1) grain of hydrogen sulfide per one hundred (100) standard cubic feet. The gas shall not contain any entrained hydrogen sulfide treatment chemical (solvent) or its by-products in the gas stream.

   d. Mercaptan Sulfur: The mercaptan sulfur is not to exceed three tenths (0.3) grains per hundred standard cubic feet.

   e. Total Sulfur: The gas shall not contain more than seventy-five hundredths (0.75) of a grain of total sulfur compounds per one hundred (100) standard cubic feet. This includes COS and CS2, hydrogen sulfide, mercaptans and mono, di and poly sulfides.

   f. Carbon Dioxide: The gas shall not have a total carbon dioxide content in excess of three percent (3%) by volume.

   g. Oxygen: The gas shall not at any time have an oxygen content in excess of two-tenths of one percent (0.2%) by volume, and customer will make every reasonable effort to keep the gas free of oxygen.

   h. Inerts: The gas shall not at any time contain in excess of four percent (4%) total inerts (the total combined carbon dioxide, nitrogen, oxygen and any other inert compound) by volume.

   i. Hydrocarbons: For gas delivered at a pressure of 800 psig or less, the gas hydrocarbon dew point is not to exceed 45F at 400 psig or at the delivery pressure if the delivery pressure is below 400 psig. For gas delivered at a pressure higher than 800 psig, the gas hydrocarbon dew point is not to exceed 20F at a pressure of 400 psig.

(Continued)

TABLE C-36 Cumulative SO_2 and NO_x for ECGS

Annual heat input values from CEMS spreadsheet received from Mike Taylor on 3/16/2006

SO_2 and NO_x values calculated from annual operating hours and annual heat input from CEMS spreadsheet

Unit 3 emissions not calculated, unit being replaced

Annual SO_2 emissions from CEMS spreadsheet

UNIT 2	Annual heat input	Annual operating hrs	**SO_2** Annual emissions	**SO_2** Short term	**SO_2** Long term
2002	2136314 MM BTU	2892 hours	0.6 tpy	0.41 lb/hr	0.14 lb/hr
2003	2890562 MM BTU	3605 hours	0.9 tpy	**0.50** lb/hr	**0.21** lb/hr
2004	3070555 MM BTU	4177 hours	0.9 tpy	0.43 lb/hr	0.21 lb/hr

	NO_x Annual emissions	**NO_x** Short term	**NO_x** Long term
2002	0.035 lb/MM BTU	**25.85** lb/hr	8.54 lb/hr
2003	0.032 lb/MM BTU	25.66 lb/hr	10.56 lb/hr
2004	0.035 lb/MM BTU	25.73 lb/hr	**12.27** lb/hr

UNIT 4	Annual heat input	Annual operating hour	**SO_2** Annual emissions	**SO_2** Short term	**SO_2** Long term
2002	2013284 MM BTU	5864 hours	0.6 tpy	0.20 lb/hr	0.14 lb/hr
2003	2285909 MM BTU	6315 hours	1.4 tpy	**0.44** lb/hr	**0.32** lb/hr
2004	2041710 MM BTU	6041 hours	0.6 tpy	0.20 lb/hr	0.14 lb/hr

	NO_x Annual emissions	**NO_x** Short term	**NO_x** Long term
2002	0.221 lb/MM BTU	75.88 lb/hr	50.79 lb/hr
2003	0.234 lb/MM BTU	**84.70** lb/hr	**61.06** lb/hr
2004	0.232 lb/MM BTU	78.41 lb/hr	54.07 lb/hr

TABLE C-37 Cumulative CO and PM_{10} for ECGS

Annual heat input values from CEMS spreadsheet received from Mike Taylor on 3/16/2006

CO and PM_{10} values calculated from data sent by JSL on 3/22/06 and data from CEMS spreadsheet

Unit 3 emissions not calculated, unit being replaced

UNIT 2	Annual heat input	Annual operating Hrs	CO Short term	PM_{10} Short term	PM_{10} Long term
2002 NG only	2136314 MM BTU	2892 hours	60.57 lb/hour	4.88 lb/hour	1.61 lb/hour
2003	2890562 MM BTU	3605 hours	**65.60** lb/hour	**5.30** lb/hour	2.18 lb/hour
2004 NG only	3070555 MM BTU	4177 hours	60.28 lb/hour	4.85 lb/hour	**2.31** lb/hour
1175 bbl oil used in 2003	6909 MM BTU	from oil (from JSL)			

	AP-42 EF	Natural Gas	
CO	8.20E-02	lb/MM BTU	Table 3.1-1 uncontrolled natural gas-fired turbine
PM_{10}	6.60E-03	lb/MM BTU	Table 3.1-2a uncontrolled natural gas-fired turbine
	AP-42 EF	Distillate Fuel	
CO	3.30E-03	lb/MM BTU	Table 3.1-1 uncontrolled distillate oil-fired turbine
PM_{10}	1.20E-02	lb/MM BTU	Table 3.1-2a uncontrolled distillate oil-fired turbine

UNIT 4	Annual heat input	Annual operating Hrs	CO Short term	PM_{10} Short term	PM_{10} Long term
2002 NG only	2013284 MM BTU	5864 hours	28.27 lb/hour	2.56 lb/hour	1.71 lb/hour
2003	2285909 MM BTU	6315 hours	**29.64** lb/hour	**2.68** lb/hour	**1.93** lb/hour
2004 NG only	2041710 MM BTU	6041 hours	27.83 lb/hour	2.52 lb/hour	1.74 lb/hour
1823 bbl oil used in 2003	1.33E+04 MM BTU	from oil (from JSL)			
42 gallons/bbl	76.566 M gal				

	AP-42 EF	Natural Gas	
CO	84	lb/MM scf	Table 1.4-1 uncontrolled/controlled natural gas-fired large wall fired boilers (>100 MM BTU/hr)
PM_{10}	7.6	lb/MM scf	Table 1.4-2 EF from natural gas combustion (total PM)
	AP-42 EF	Distillate Fuel	
CO	5.00	lb/M gal	Table 1.3-1 EF for fuel oil combustion for boilers >100 MM BTU/hr
PM_{10}	21.60	lb/M gal	Table 1.3-1 EF for fuel oil combustion for boilers >100 MM BTU/hr

S content 2.00 percent (assumed)

1020 BTU/scf

TABLE C-38 Cumulative PM_{10} Cooling Towers for ECGS

Unit 3 Cooling Tower Drift Calculation

Past Operation	circulating water rate	36,000	gallons/min		
	cycles of concentration	4			
	TDS	905	mg/liter		
		7.55	lb/1000 gallons		
	Drift Eliminator Control	0.000020			
	Average operating hours per year (2004/5)	3094			
	Drift PM emissions	1.30	lb/hr		
		2.02	**tpy**		
Future Operations					
	circulating water rate	31,500	gallons/min		
	cycles of concentration	4			
	TDS	905	mg/liter		
		7.55	lb/1000 gallons		
	Drift Eliminator Control	0.000010			
	Operating hours per year	8200			
	Drift PM emissions	0.57	lb/hr		
		2.34	**tpy**		
		Net increase in emissions		**0.32**	**tons per year**

Unit 2 Cooling Tower					
	design circulating water rate	27,700	gallons/min		
	cycles of concentration	4			
	TDS	905	mg/liter		
		7.55	lb/1000 gallons		
	Drift Eliminator Control	0.000010			
	Operating hours per year	8200			
	Drift PM emissions	0.50	lb/hr	**2.06**	**tpy**
	Number of cells Cumua	7			
	Emission rate per cell	0.0714			

Unit 4 Cooling Tower					
	design circulating water rate	40,800	gallons/min		
	cycles of concentration	4			
	TDS	905	mg/liter		
		7.55	lb/1000 gallons		
	Drift Eliminator Control	0.000010			
	Operating hours per year	8200			
	Drift PM emissions	0.74	lb/hr	**3.03**	**tpy**
	Number of cells	3			
	Emission rate per cell	0.2465			

Attachment D
Modeling Protocol

REPORT

MODELING PROTOCOL FOR THE EL CENTRO GENERATING STATION UNIT #3 REPOWER PROJECT IMPERIAL COUNTY, CALIFORNIA

Prepared for

Imperial County Air Pollution Control District

and

California Energy Commission

URS Project No. 22238279

April 7, 2006

URS

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San Diego, CA 92108-4314
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Fax: 619.293.7920

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List of Acronyms

$\mu g/m^3$	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AFC	Application for Certification
AOI	area of influence
AQRV	Air Quality Related Values
ASOS	automated surface observing systems
ATC	Authority to Construct
BACT	best available control technology
BPIP	Building Parameter Input Program
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CEC	California Energy Commission
CO	carbon monoxide
CTG	combustion turbine generator
DOC	determination of compliance
ECGS	El Centro generating station
g/s	gram per second
GE	General Electric
GEP	good engineering practice
HRSG	heat recovery steam generator
H1H	high first high
H2H	high second high
H6H	highest sixth high
HARP	Hotspots Analysis and Reporting Program
HRA	health risk assessment
ICAPCD	Imperial County Air Pollution Control District
IID	Imperial Irrigation District
ISCST3	Industrial Source Complex Short Term 3
km	kilometers

LAER	lowest achievable emission rate
LORS	laws, ordinances, regulations, and standards
MEI	maximally exposed individual
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NNSR	non-attainment new source review
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NSR	new source review
NWS	National Weather Service
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OLM	ozone limiting method
Pb	lead
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
ppm	parts per million
PSD	prevention of significant deterioration
ROC	reactive organic compounds
SCR	selective catalytic reduction
SCRAM	Support Center for Regulatory Air Modeling
SIL	significant impact level
SIP	State Implementation Plan
SO_x	sulfur oxides
SO_2	sulfur dioxide
SPPE	Small Power Plant Exemption
STG	steam turbine generator
TAC	toxic air contaminants
T-BACT	best available control technology for toxics
tpy	tons per year
USEPA	U. S. Environmental Protection Agency

USGS	U.S. Geological Society
UTM	Universal Transverse Mercator
VOC	volatile organic compound
ZOI	Zone of Impact

1.1 BACKGROUND

Imperial Irrigation District (IID) is proposing to repower the existing Unit 3 steam turbine generator (STG) with a new General Electric (GE) Frame 7EA dry low NO_x combustion turbine generator (CTG) and heat recovery steam generator (HRSG) to supply steam to Unit 3. This new CTG will be an approximately 128 megawatt (MW) (with duct firing) natural gas-fired combined cycle unit at the existing El Centro Generating Station (ECGS) located in the City of El Centro in Imperial County, California (Figure 1-1, Location Map of El Centro Generating Station, and Figure 1-2, Site Plan Showing ECGS Unit 3 Repower Project). The new Unit 3 will replace the existing 50 MW Unit 3; therefore, the new Unit 3 will only increase generating capacity at ECGS by 78 MW. The project is subject to the site licensing requirements of the California Energy Commission (CEC) and is applying for licensing under the CEC Small Power Plant Exemption (SPPE) program. The CEC will coordinate its independent air quality evaluations with the Imperial County Air Pollution Control District (ICAPCD) through the Determination of Compliance (DOC) process.

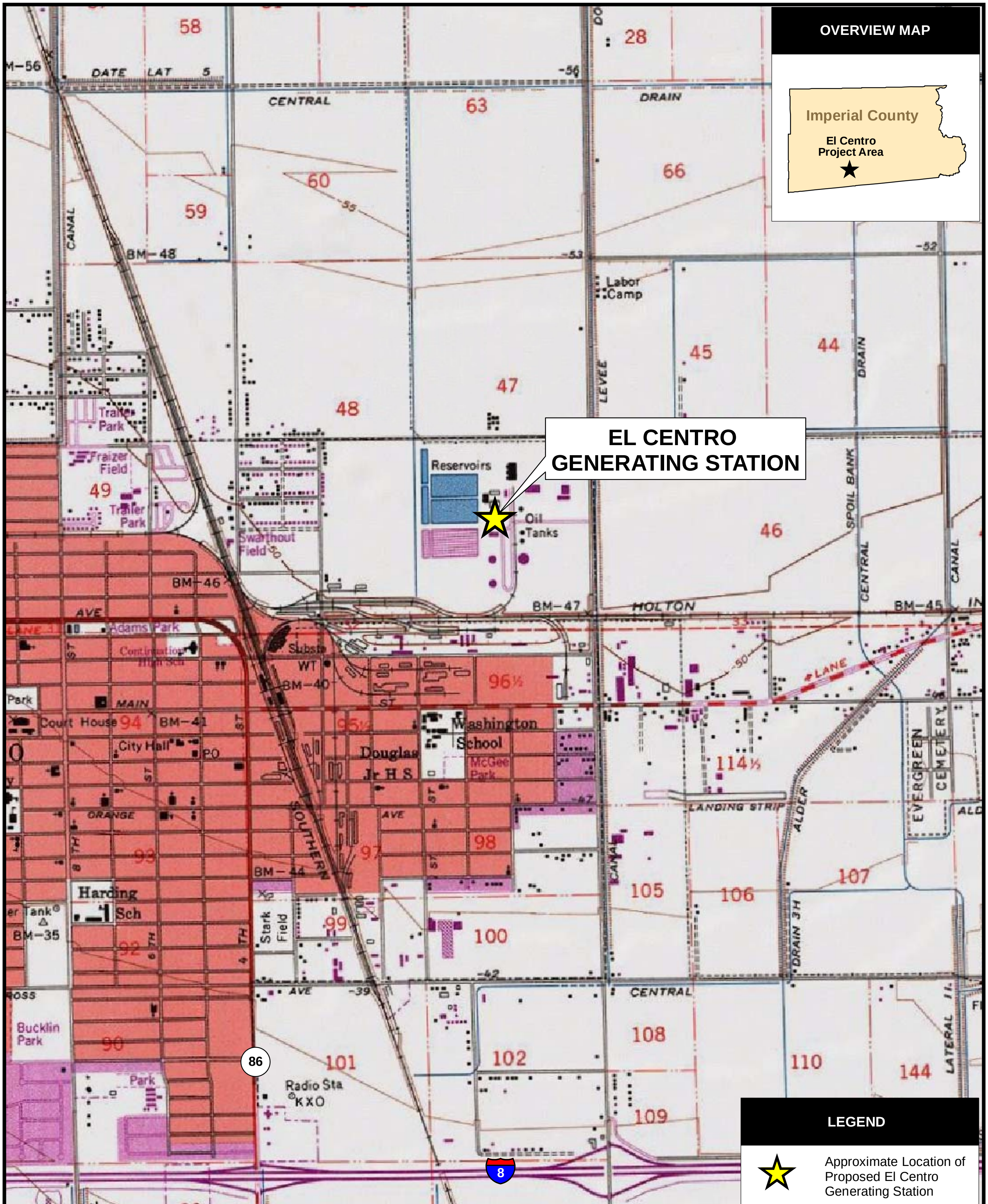
Annual emissions of all criteria pollutants will be below the allowable levels specified in ICAPCD Rules and Regulations. Also, the annual emissions increases of all criteria pollutants will be below the significant emission thresholds specified by the U. S. Environmental Protection Agency's (USEPA) Prevention of Significant Deterioration (PSD) regulations for Major Modifications, except for particulate matter less than 10 microns in diameter (PM_{10}). Specifically, the incremental increases in the ECGS emissions will be less than: 40 tons per year (tpy) each of nitrogen oxides (NO_x), reactive organic compounds (ROC) and sulfur oxides (SO_x), less than 100 tpy of carbon monoxide (CO), less than 0.6 tpy of lead (Pb), and less than 7 tpy of sulfuric acid mist. PM_{10} emissions will increase by approximately 19 tpy, which exceeds the Major Modification threshold of 15 tpy. However, Imperial County is designated a federal non-attainment area for PM_{10}, so the Project does not trigger the PSD program.

Even though federal PSD regulations will not apply to the Unit 3 Repower at ECGS, the air dispersion modeling for this Project will be conducted in conformance with PSD requirements in certain ways. For example, worst-case predicted impacts due to the new unit alone will be compared with the applicable monitoring exemption limits to demonstrate that the Project will be exempt from the requirements relating to pre-construction ambient air quality monitoring. The PSD regulations apply only to those pollutants for which the Project study area is in attainment of the National Ambient Air Quality Standards (NAAQS). State and local new source review (NSR) and non-attainment NSR regulations potentially apply to all criteria pollutants, depending on the quantity of pollutants emitted. The area around ECGS is designated as attainment or unclassified for the federal nitrogen dioxide (NO_2), CO, particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) and sulfur dioxide (SO_2) standards, and non-attainment for ozone (O_3) and PM_{10}. With respect to the California Ambient Air Quality Standards (CAAQS), the area around the ECGS is classified as attainment for NO_2, CO, sulfates, Pb, hydrogen sulfide, and SO_2, and non-attainment for O_3 and PM_{10}, and unclassified for $PM_{2.5}$. NO_x and SO_2 and are regulated as PM_{10} precursors, and NO_x and ROC as O_3 precursors. Project emissions of non-attainment pollutants and their precursors will be offset to satisfy state and local NSR regulations.

1.2 PURPOSE

The CEC and ICAPCD require the use of atmospheric dispersion modeling to demonstrate compliance with applicable air quality standards, and both agencies require modeling to determine the potential impacts on human health from emissions of toxic air contaminants. Finally, CEC siting regulations also require that the cumulative impacts of the Project and other new and reasonably foreseeable projects within 6 miles of the Project site be assessed via modeling.

This document summarizes the procedures that will be used for the air dispersion modeling in support of project certification and permitting. Modeling of both construction and operations emissions will be performed in accordance with CEC guidance (CEC 1997). This Protocol is being submitted to the CEC and ICAPCD for their review and comment prior to completion of the SPPE Application for the El Centro Unit 3 Repower Project The proposed model selection and modeling approach is based on review of applicable regulations and agency guidance documents, as well as discussions with agency staff.



SOURCES: ESRI (roads);
USGS (7.5 El Centro quad);
U.S. Census (TIGER Base Layers 2002).

PROJECT LOCATION MAP
EL CENTRO GENERATING STATION

URS

1000 0 1000 2000 Feet
SCALE: 1" = 2000' (1:24,000)

CHECKED BY: LG | DATE: 12-20-05 | FIG. NO: 1-1
PM: DD | PROJ. NO: 22238279.20006

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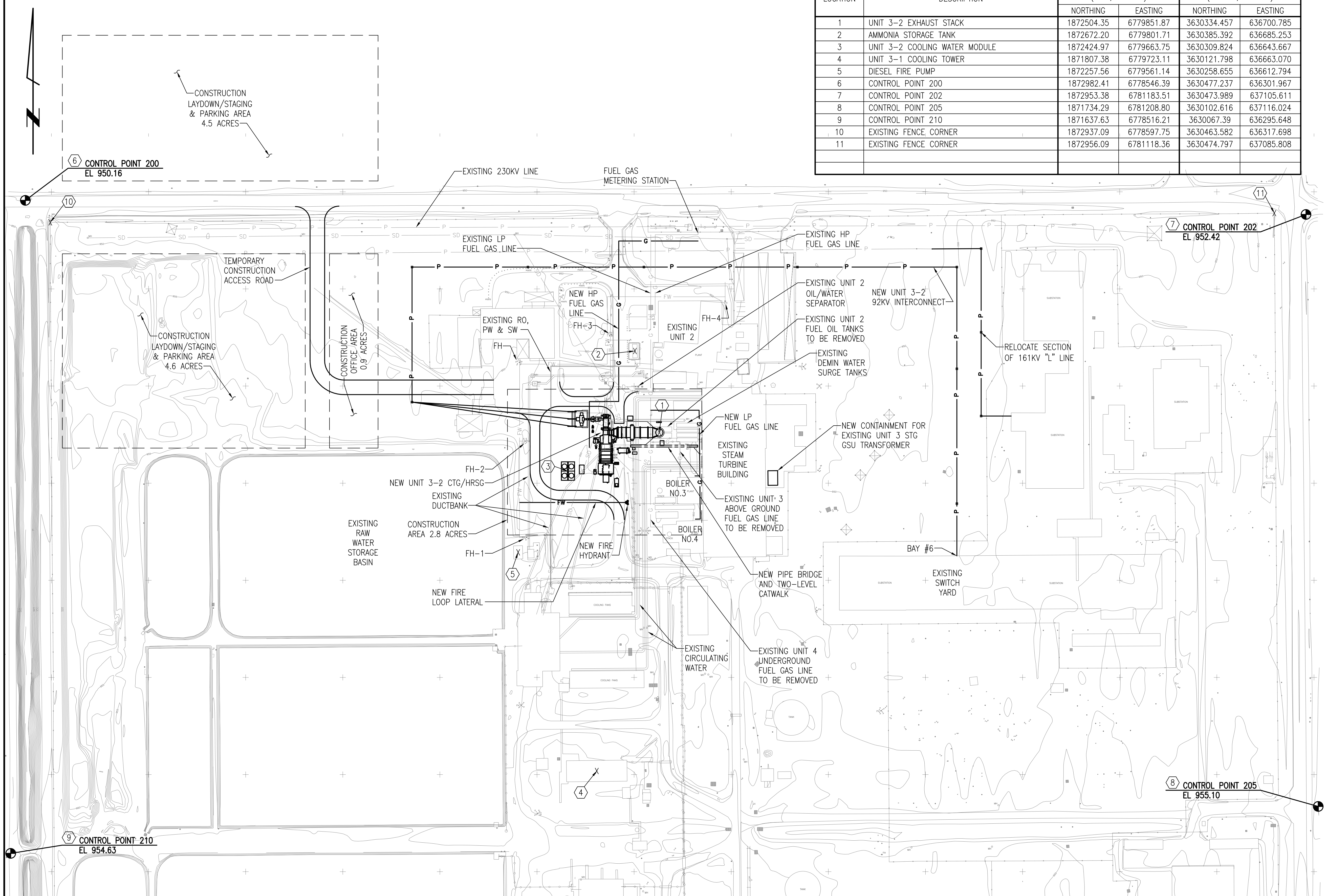
LOCATION	DESCRIPTION	STATE PLANE COORDINATE (FEET, NAD 83)		UTM COORDINATE (METERS, NAD 83)	
		NORTHING	EASTING	NORTHING	EASTING
1	UNIT 3-2 EXHAUST STACK	1872504.35	6779851.87	3630334.457	636700.785
2	AMMONIA STORAGE TANK	1872672.20	6779801.71	3630385.392	636685.253
3	UNIT 3-2 COOLING WATER MODULE	1872424.97	6779663.75	3630309.824	636643.667
4	UNIT 3-1 COOLING TOWER	1871807.38	6779723.11	3630121.798	636663.070
5	DIESEL FIRE PUMP	1872257.56	6779561.14	3630258.655	636612.794
6	CONTROL POINT 200	1872982.41	6778546.39	3630477.237	636301.967
7	CONTROL POINT 202	1872953.38	6781183.51	3630473.989	637105.611
8	CONTROL POINT 205	1871734.29	6781208.80	3630102.616	637116.024
9	CONTROL POINT 210	1871637.63	6778516.21	3630067.39	636295.648
10	EXISTING FENCE CORNER	1872937.09	6778597.75	3630463.582	636317.698
11	EXISTING FENCE CORNER	1872956.09	6781118.36	3630474.797	637085.808

LEGEND

- — — — PROPERTY LINE
- P — EXISTING OVERHEAD ELECTRICAL LINE
- FW — EXISTING FIRE WATER
- PW — EXISTING POTABLE WATER
- SD — EXISTING STORM DRAIN
- D — EXISTING DRAIN
- G — EXISTING GAS
- x — FENCE
- P — OVERHEAD ELECTRICAL LINE
- FW — FIRE WATER
- G — GAS
- FIRE HYDRANT



NOTES

1. TOPOGRAPHIC INFORMATION PROVIDED BY TRI STATE SURVEYING, LTD. (775) 358-9491. PROJECT NO. 05383.01, 8-25-05.
2. PROPERTY CORNER AND BOUNDARY INFORMATION OBTAINED FROM *.
3. EXISTING FEATURES ARE DEPICTED BY LIGHTER WEIGHT (SCREENED) LINES. NEW STRUCTURES AND FACILITIES ARE SHOWN IN HEAVIER LINES.

0 50 100 200 300 FEET
1"= 100'

53ecc1_1.dwg

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
B	ISSUED FOR REVIEW	02/24/06	WMT	WKW	WKW	DEJ
A	ISSUED FOR REVIEW	01/26/06	WMT	WKW	WKW	DEJ

REFERENCE DRAWINGS	
M1-1	GENERAL ARRANGEMENT NEW UNIT 3

DSGN	WKW	10/21/05
DRN	WMT	10/21/05
CKD	WKW	10/21/05
SCALE:	1"= 100'	

FOR 22x34 DWG ONLY

IID ENERGY
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 REPOWERING
SITE PLAN AND UTILITY INTERFACE

JOB NUMBER 108745
REV B
DRAWING NUMBER 1-2

2.1 PROJECT LOCATION

The Unit 3 Repower Project will be implemented at the existing ECGS at 485 East Villa Avenue in the City of El Centro, California (see Figure 1-1, Location Map of El Centro Generating Station). The Project Site is within approximately 20 miles (33 kilometers [km]) of complex terrain (i.e., elevations exceeding the proposed Unit 3 stack height), and is surrounded by generally vacant or agricultural land to the east, northeast, and north. The City of El Centro is to the northwest, west, southwest, south, and southeast.

2.2 DESCRIPTION OF THE PROPOSED SOURCES

The existing ECGS comprises three active generating units. Unit 2 is a 30 MW steam unit that was repowered by a GE 7EA combined cycle gas turbine in 1993 to provide a total power output of about 110 MW. Unit 2 will remain in operation following the Unit 3 Repower Project. Unit 4 is an 80 MW steam boiler that will also continue to operate. Unit 1 was a 20 MW steam unit that has been retired and largely dismantled. For the Repower Project, the existing Unit 3 boiler will be replaced by a GE Frame 7EA dry low NO_x CTG and associated HRSG with duct firing, transformers, and other ancillary facilities. Improvements to the existing STG for this unit will also result in a generation increase of about 4 MW, bringing the total Unit 3 output to about 128 MW and the entire plant output from 233 MW to about 311 MW. The fact that the net increase in generating capacity will be less than 100 MW justifies the decision of IID to pursue licensing as an SPPE project. However, as described in subsequent sections of this Protocol, the proposed modeling approach is identical to that which would be used in the Application for Certification (AFC) for a larger project.

Note that the net change in emissions for this Project will consist of the decrease caused by the retirement of the existing Unit 3 boiler, as well as the increase due to the addition of the new combined cycle unit.

The new Unit 3 gas turbine will be fired exclusively on natural gas, and will be equipped with dry low NO_x combustors and selective catalytic reduction (SCR) for the control of NO_x emissions and a CO oxidation catalyst for control of CO emissions. The new CTG will operate in combined cycle mode and will have an exhaust stack with a height of 100 feet. An existing Unit 3 evaporative cooling tower will remain in service for the new Unit 3, but will be outfitted with an improved drift elimination system as part of the Repower Project. Ammonia reagent for the Unit 3 SCR will be provided by the existing anhydrous ammonia storage tank, which currently serves an existing SCR at the ECGS.

3.1 CALIFORNIA ENERGY COMMISSION REQUIREMENTS

For projects with electrical power generation capacity of greater than 50 MW, CEC requires that Applicants prepare a comprehensive AFC or SPPE document addressing the project's environmental and engineering features. An AFC or SPPE Application must include the following air quality information (CEC 1997):

- A description of the project, including project emissions, fuel type(s), control technologies and stack characteristics
- The basis for all emission estimates and/or calculations
- An analysis of Best Available Control Technology (BACT) according to ICAPCD rules
- Existing baseline air quality data for all regulated pollutants
- Existing meteorological data, including temperature, wind speed, and direction and mixing height
- A listing of applicable laws, ordinances, regulations and standards (LORS) and a determination of compliance with all applicable LORS
- An emissions offsets strategy
- An air quality impact assessment (i.e., national and state ambient air quality standards [AAQS] and PSD review) and protocol for the assessment of cumulative impacts of the project along with permitted and under construction projects within a 10 km radius
- An analysis of human exposure to air toxics (i.e., health risk assessment [HRA])

In the case of the Unit 3 Repower Project, the submittal to CEC will actually be in the form of an SPPE Application, but the proposed modeling approaches for evaluating the ECGS Unit 3 Repower Project's incremental and cumulative air quality impacts, and the HRA for the Project's emissions of toxic air contaminants will be the same as for an AFC air quality assessment.

3.2 IMPERIAL COUNTY AIR POLLUTION CONTROL DISTRICT REQUIREMENTS

The ICAPCD has promulgated NSR requirements under Rule 207. In general, all equipment with the potential to emit air pollutants is subject to NSR requirements. NSR has four major requirements that potentially apply to new sources:

- Installation of BACT
- Ambient air quality impact modeling to demonstrate compliance with NAAQS and CAAQS
- Emission offsets
- Certification of statewide compliance with air quality requirements

Assembly Bill 2588, California Air Toxics Hot Spots Program (and ICAPCD Rule 216) allows a predicted incremental cancer risk from toxic air contaminants (TAC) at any receptor up to 10 in one million, prior to public notification, if best available control technology for toxics (T-BACT) is implemented. A TAC analysis should include TAC emission estimates and a modeling analysis to identify the Zone of Impact (ZOI) and the Maximally Exposed Individual (MEI). The

ZOI encompasses the area within which the incremental carcinogenic risk (due to the inhalation pathway only) equals or exceeds one in one million.

3.3 U.S. ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS

USEPA has promulgated PSD regulations applicable to criteria pollutant emissions from major sources in Imperial County. The ECGS Unit 3 Repower Project will not be a major modification under the PSD rules, because PM_{10} is the only criteria pollutant for which a net emissions increase may exceed a PSD significant modification threshold (PM_{10} greater than 15 tpy). But the Project study area is designated non-attainment with respect to both the California and federal ambient standards for $PM_{10,}$ so the PSD program does not apply to this pollutant. However, the same significance criteria pertain to increases in non-attainment pollutant emissions under the non-attainment New Source Review (NNSR) process. Many of the PSD requirements are the same as the AFC/SPPE and NSR requirements described above (e.g., project description, BACT, AAQS analysis); however, PSD requires the following additional analyses:

- A PSD increment (consumption) analysis
- An analysis of air quality related values (AQRV) to ensure the protection of visibility of federal Class I wilderness areas within 100 km of the project
- An evaluation of potential impacts on soils and vegetation of commercial and recreational value
- An evaluation of potential growth-inducing impacts

The ECGS 3 Repower Project will not be a major modification for criteria pollutants other than PM_{10}. Since Imperial County is classified as non-attainment for PM_{10}, the PSD requirements will not apply. However, the federal NNSR program will be applicable for PM_{10}. The NNSR regulations differ from the PSD regulations. The following four specific issues must be addressed in NNSR:

- A different emission control requirement, i.e., lowest achievable emission rates (LAER) must be used instead of BACT for the pollutant(s) of concern.
- The new emission source is required to obtain offsets for its emissions of the non-attainment pollutant(s) and their precursors from other sources that impact the same non-attainment area.
- The Applicant must certify that all other sources owned by the Applicant in the state are complying with all applicable requirements of the Clean Air Act (CAA) and the State Implementation Plan (SIP).
- Any sources impacting visibility in nearby Class I areas must be reviewed by the appropriate federal land manager.

This section describes the dispersion models and modeling techniques that will be used in performing the air quality analysis for the ECGS. The objectives of the modeling are to demonstrate that air emissions from the ECGS will not cause or contribute to an exceedance of an ambient air quality standard violation, and will not cause a significant health risk.

In November 2005, USEPA officially recognized the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD) as the preferred dispersion model for regulatory Applications, replacing the Industrial Source Complex Short Term 3 (ISCST3) model. USEPA allowed a one-year “grace period” commencing November 9, 2005 during which the use of either model is acceptable, depending on the preference of the local air quality jurisdiction When contacted on this point, the ICAPCD suggested that one or the other model be proposed with justification provided for the selection. Originally, the IID team selected AERMOD, since this is consistent with the most recent USEPA policy and the data needed to support its Application are available in Imperial County. However, we have recently become aware of two problems with the model for this particular Application that have caused us to question the wisdom of using it for ECGS permit modeling.

1. USEPA has posted a notice on the Support Center for Regulatory Air Modeling (SCRAM) website to warn that AERMOD may underpredict maximum concentrations in receptor areas with gently downward sloping terrain. This is precisely the situation on the south and southwest side of the ECGS Site.
2. In the initial model runs for the Niland Gas Turbine Project, another IID facility, URS has found what appears to be an error in AERMAP (the terrain data processing module of AERMOD), in the terrain heights for areas that are below sea level. Most, if not all, of the area that would be included in the ECGS modeling receptor grid is below sea level. URS has notified Bowman Environmental Engineering (the company we buy our BEEST modeling software from) about this problem, and they agree that the version they are marketing provides inaccurate terrain elevations below sea level. They are checking their software to determine whether the problem in AERMAP exists in the original USEPA model or has been introduced in adapting the model to the BEEST commercial software package. They believe it is inherent in the original model and, if that proves to be correct, they will contact USEPA so that a fix can be initiated as required.

Given these problems, we have decided to do the ECGS permit modeling with the ISCST3 model until the problems with AERMOD can be resolved.

4.1 SCREENING MODELING

An initial screening analysis will be conducted to identify which operating mode for the turbine results in worst-case ambient air impacts. The most recent version of the USEPA ISCST3 model will be used to model worst-case conditions for each of three operating modes across the load range (100, 75, and 50 percent loads) and each of three ambient temperature conditions (40, 73 and 115 degrees Fahrenheit). A unit emission rate of 1.0 gram per second (g/s) will be modeled using stack parameters corresponding to the different combinations of turbine load and ambient temperature. Building downwash effects will be addressed, as described in Section 4.4, Building Wake Effects. Concentrations for each pollutant, expressed in units of micrograms per cubic meter ($\mu g/m^3$), will be obtained by multiplying the unit concentrations obtained from the ISCST3 screening results (expressed in $\mu g/m^3$ per g/s) by the emission rate calculated for each pollutant (expressed in g/s) for each operating mode. This is a streamlined process, because it allows ISCST3 to be executed only once for all pollutants for each operating mode, instead of having to execute the model iteratively for each pollutant. The operating mode that yields the highest concentrations for each averaging time pertaining to the National and California AAQS will be considered the worst-case Unit 3 gas turbine/HRSG operating mode for that averaging time. The worst-case operating mode will be used as the basis for selecting Unit 3 stack parameters in all subsequent ISCST3 modeling analyses. Refined modeling (discussed in the following section) will be used to determine the worst-case annual and short-term impacts of the turbine/HRSG unit in combination with other Project and plant sources. Screening modeling will not be used to eliminate pollutants from the refined modeling analysis.

4.2 REFINED MODELING

The purpose of the refined modeling analysis is to demonstrate that air pollutant emissions from the ECGS will not cause or contribute to an AAQS violation; and will not cause a significant health risk impact. Two refined modeling scenarios will be examined, first emissions from the new Unit 3 alone, and second emissions from the new Unit 3 with the other sources at the ECGS facility. The most recent version (04300) of the ISCST3 model will be used for the refined modeling. The regulatory default option will be selected. ISCST3 will be used for modeling concentrations of pollutants having short-term (e.g., 1- to 24-hour) ambient standards with the appropriate averaging time selected. Modeling for pollutants having annual standards (i.e., $PM_{10,}$ SO_2, and NO_2), will be conducted using ISCST3 with the PERIOD option to predict impacts for comparison with the annual standards. Specific modeling techniques for conducting the AAQS and HRA analyses are discussed below.

The SPPE Application for the ECGS Repower Project will include an analysis of the land use adjacent to the Project. This analysis will be conducted in accordance with Section 7.2.3 of the Guideline on Air Quality Models (USEPA 2005 and Auer [1978]).

Based on the Auer land use procedure, less than 40 percent of the area within a 3 km radius of the ECGS could be classified as urban. The remaining area is rural, and since the Auer classification scheme requires more than 50 percent of the area within the 3 km radius around a source to be non-rural for an urban classification, the rural mode will be used in the ISCST3 modeling analyses.

The following ISCST3 regulatory default settings will also be used:

- Wind profile exponents of 0.7, 0.7, 0.10, 0.15, 0.35, and 0.35
- Final plume rise
- Stack tip downwash effects included
- Buoyancy-induced dispersion option

4.2.1 PSD Increment Analysis

As stated earlier in this Protocol, a PSD increment analysis will not be required because the ECGS Unit 3 Repower Project will not qualify as a major modification (except for PM_{10}, which is a non-attainment pollutant). However, the monitoring exemption thresholds from the PSD regulations will be included in the analysis as justification for using agency-collected local ambient air quality monitoring data as background levels for the AAQS analysis discussed in the following section. Also, criteria pollutant impacts from the ECGS Unit 3 Repower Project will be compared to the PSD significant impact levels (SIL), since these often serve as significance criteria for new source impacts from new sources in California (see Table 4-1, Relevant Ambient Air Quality Standards and Significance Levels).

TABLE 4-1
RELEVANT AMBIENT AIR QUALITY STANDARDS AND SIGNIFICANCE LEVELS

Pollutant	Averaging Time	CAAQS (a,c)	NAAQS (b,c)	Ambient Impact Significance Levels (μg/m^3)	PSD/NNSR Significant Modification Thresholds (tpy)	PSD Increments (μg/m^3)	
						Class I	Class II
CO	8-hour	9.0 ppm (10,000 μg/m^3)	9.0 ppm (10,000 μg/m^3)	500	100		
	1-hour	20 ppm (23,000 μg/m^3)	35 ppm (40,000 μg/m^3)	2,000			
NO_2 (d)	Annual		0.053 ppm (100 μg/m^3)	1	40	2.5	25
	1-hour	0.25 ppm (470 μg/m^3)					
SO_2	Annual		0.03 ppm (80 μg/m^3)	1	40	2	20
	24-hour	0.04 ppm(e) (105 μg/m^3)	0.14 ppm (365 μg/m^3)	5		5	91
	3-hour		0.5 ppm (1,300 μg/m^3)	25		25	512
	1-hour	0.25 ppm (655 μg/m^3)					
PM_{10}	Annual	20 μg/m^3	50 μg/m^3	1	15	4	17
	24-hour	50 μg/m^3	150 μg/m^3	5		8	30
$PM_{2.5}$	Annual	12 μg/m^3	15 μg/m^3				
	24-hour		65 μg/m^3				
O_3	8-hour	0.07 ppm (137 μg/m^3)	0.08 ppm (157 μg/m^3)	See footnote(f)	40 (of VOCs)		
	1-hour	0.09 ppm (180 μg/m^3)	See footnote(g)				

Notes:

a. California standards for ozone (as volatile organic compounds, carbon monoxide, sulfur dioxide (1-hour), nitrogen dioxide, and PM_{10}, are values that are not to be exceeded. The visibility standard is not to be equaled or exceeded.

b. National standards, other than those for ozone and based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

c. Concentrations are expressed first in units in which they were promulgated. Equivalent units are given in parentheses and based on a reference temperature of 25° C and a reference pressure of 760 millimeters of mercury. All measurements of air quality area to be corrected to a reference temperature of 25° C and a reference pressure of 760 millimeters of mercury (1,013.2 millibar).

d. Nitrogen dioxide (NO_2) is the compound regulated as a criteria pollutant; however, emissions are usually based on the sum of all oxides of nitrogen (NO_x).

e. At locations where the state standards for ozone and/or PM_{10} are violated. National standards apply elsewhere.

f. Modeling is required for any net increase of 100 tpy or more of VOCs subject to PSD.

g. New federal 8-hour ozone and fine particulate matter ($PM_{2.5}$) standards were promulgated by USEPA on July 18, 1997. The federal 1-hour ozone standard was revoked by USEPA on June 15, 2005.

μg/m^3 = micrograms per cubic meter
Blanks = Not applicable
CAAQS = California Ambient Air Quality Standard
CO = carbon monoxide
NAAQS = National Ambient Air Quality Standard
O^3 = ozone
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
ppm = parts per million by volume, or micromoles of pollutant per mole of gas
PSD = prevention of significant deterioration
SO_2 = sulfur dioxide
tpy = ton per year
USEPA = U.S. Environmental Protection Agency
VOC = volatile organic compounds

4.2.2 Ambient Air Quality Standard Analysis

The purpose of the AAQS analysis is to determine whether the ECGS Unit 3 Repower Project will cause or contribute to an AAQS violation. The Project will not be considered to cause or contribute to an AAQS violation unless impacts from the Project itself combined with the background concentration exceed the AAQS, or the Project has a significant impact at the same location and time as a predicted AAQS violation. The following approach is proposed for performing the AAQS analysis:

1. The receptor grid deployment spacing described in Section 4.5, Receptor Grid, will be used for the AAQS analysis.
2. Short-term and annual AAQS modeling will be performed using ISCST3. Annual AAQS modeling will be performed using ISCST3 with the PERIOD option. Both short-term and annual analyses will be run using sequential hourly meteorological data for 5 years. For short-term standards, one exceedance is allowed per year; the second is a violation. Therefore, the maximum impact (i.e., high first high [H1H]) can exceed a short-term standard; however, a high second high (H2H) concentration must be below the standard or a violation exists and further analysis is required. Maximum impact equals modeled impact plus background. For ECGS modeling, the H1H will be used.

   For CO modeling, the PLOTFILE output option in ISCST3 will be invoked to save any H1H events that, when added to background, exceed the AAQS. If 1-hour and 8-hour concentrations do not exceed the AAQS, then compliance is demonstrated and no further modeling is necessary for CO.

   For NO_2 modeling, the PLOTFILE output option in ISCST3 will be invoked to save any H1H events that exceed the AAQS (minus background). Initially, the modeling will assume full conversion of NO_x to NO_2. Should it be required, NO_2 estimates will be reduced using the USEPA ozone limiting method (OLM) (for either hourly or annual impacts). If 1-hour and annual concentrations do not exceed the applicable AAQS, then compliance is demonstrated and no further modeling is necessary for NO_2.

   For SO_2 modeling, the PLOTFILE output option in ISCST3 will be invoked to save any H1H events that, when added to background exceed the AAQS. If 3-hour and 24-hour concentrations do not exceed the AAQS, then compliance is demonstrated and no further modeling is necessary for SO_2.

   For PM_{10} modeling, the MULTYEAR processing option will not be invoked in order to determine the 24-hour, highest sixth high (H6H) concentration at each receptor over the 5 years modeled for comparison, when added to background, to the 24-hour AAQS. Instead the maximum of the five 1-year average PM_{10} concentrations will be reported. If concentrations do not exceed the AAQS (minus background), then compliance is demonstrated and no further modeling is necessary for PM_{10}.
3. The events exceeding the AAQS will be rerun to determine if the Project has a significant event during a predicted CAAQS or NAAQS exceedance event. The ISCST3 model will be used to analyze short-term events and annual events. If the Project does not have a significant impact during these exceedance events, then AAQS compliance is demonstrated and no further modeling is necessary.

4. If the Project has a significant event during an AAQS exceedance event, then the subject receptor locations will be analyzed to determine if they reside within another facility's boundary. The corresponding facility's contribution to the maximum concentration at that receptor will be determined and subtracted from the concentration modeled at that receptor. If the revised total predicted impact at the receptor is below the AAQS, then compliance is demonstrated and no further analysis is necessary.
5. For any remaining events, a culpability analysis using ISCST3 will be performed to determine which sources contribute the greatest impact. These sources may then be updated by contacting the facility owning the source or applicable regulatory agency and verifying the source's input parameters. For any culpable Project sources, the modeling inventory, including source locations and stack parameters used to estimate emissions, will be reviewed to ensure they are reasonable. Adjustments will be made as appropriate.
6. An ISCST3 run will be performed using the revised inventory in (5) above to determine if the AAQS exceedance still exists. If no AAQS exceedance exists, then AAQS compliance is demonstrated and no further modeling is necessary.

Comparison of model-predicted impacts with AAQS will require assumptions regarding background pollutant concentrations, i.e., the contributions of sources other than those of the sources being modeled. For purposes of the ECGS modeling analyses, background values for each pollutant and averaging time will be represented using the highest measured levels at the nearest air quality monitoring station in Imperial County over the last 5 years. Section 4.6.2, Background Air Pollutant Monitoring Data, discusses the representativeness of the air quality monitoring data that are available for this purpose.

4.2.3 Health Risk Assessment Analysis

The CEC and ICAPCD require an HRA of TAC emissions from the operation of the Project. Contaminants potentially emitted by the ECGS Unit 3 Repower Project with potential carcinogenic or chronic or acute non-carcinogenic health effects will be considered. This HRA will be performed following the Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics Hot Spots Program Risk Assessment Guidelines* (OEHHA 2003). As recommended by this guideline, the California Air Resources Board (CARB) Hotspots Analysis and Reporting Program (HARP) (CARB 2005) will be used to perform a refined HRA for the Project. HARP includes two modules: a dispersion module and a risk module. The HARP dispersion module incorporates the USEPA ISCST3 air dispersion model, and the HARP risk module implements the latest Risk Assessment Guidelines developed by OEHHA.

First, ground-level impacts from the ECGS Unit 3 sources alone will be estimated using the ISCST3 atmospheric dispersion modeling. The HARP modeling analysis will be consistent with, and use similar appropriate parameters as the modeling approach discussed above for the AAQS analyses using ISCST3. Based on the impacts modeled using ISCST3 (the dispersion model incorporated by HARP), the HARP model will be used to estimate health risk. The year(s) of meteorological data resulting in the highest 1-hour and annual impacts as determined above will be used and receptors will be placed at 25 meter spacing around the ECGS facility fence line and 500 meter spacing outside of the fence out to 10 km. All receptors that HARP creates that are inside the fence will be excluded. HARP will also include the census receptors out to 10 km.

Receptors will also be placed at all sensitive locations (e.g., schools, hospitals, etc.) out to 1 mile. The HRA will be performed using HARP and will follow the following steps:

1. Define the location of the MEI (i.e., the location where the highest carcinogenic risk may occur)
2. Define the locations of the maximum chronic non-carcinogenic adverse health effects and the maximum acute adverse health effects
3. Calculate concentrations and adverse health effects at locations of maximum impact for each pollutant

The HARP model will be performed for the inhalation pathway for diesel particulate and for all applicable uptake pathways for all other TACs. A discussion of the surrounding land use, sensitive receptors, and local meteorology will be provided in the SPPE Application.

Per a discussion with CEC, the combined impacts of all ECGS TAC emission sources will also be evaluated using HARP, excluding any emergency equipment.

4.2.4 Air Quality Related Values and Visibility Analysis

A PSD analysis of AQRV will not be required because the ECGS Unit 3 Repower Project will not be a major source. However, per ICAPCD Rule 207D.6.f, an Authority to Construct (ATC) permit must address the potential of the Project to impact air quality (including visibility) of any federal Class 1 area. A screening level modeling analysis will be conducted to evaluate these impacts at the only Class I area within 100 km from the Project Site, i.e., Joshua Tree National Park, the closest part of which is about 97 km north from ECGS. This analysis will be conducted using the screening version of the CALPUFF model and the same meteorological input data used for the AAQS modeling analysis.

4.3 EMISSIONS SOURCES REPRESENTED IN MODELING ANALYSES

4.3.1 Project Sources

The ECGS Unit 3 Repower Project will entail replacement of the existing Unit 3 boiler by a new GE 7EA gas turbine and HRSG with duct firing. Thus the net change in emissions resulting from the Project will be a combination of increases from the new turbine/HRSG line and decreases from the retirement of the existing boiler. Table 4-2, Preliminary Estimated Emissions for ECGS Combustion Turbine Generator, presents preliminary annual emission estimates for the new turbine with HRSG, as well as the emissions decrease that will result from eliminating the existing Unit 3 boiler. Conceptual plant design includes SCR for NO_x and CO oxidation catalysts for CO that will match recent BACT determinations for similar projects. As shown in Table 4-2, use of this control equipment will ensure a net emissions decrease for NO_x and only relatively small net increases for CO and volatile organic compounds (VOC). Unit 3 emissions of SO_2 and PM_{10} will also be low, owing to the exclusive use of interstate pipeline quality natural gas as fuel for the gas turbine and HRSG duct burner.

TABLE 4-2
PRELIMINARY ESTIMATED EMISSIONS FOR ECGS COMBUSTION TURBINE GENERATOR
(tpy)

Unit	NO_x	CO	SO_2	VOC	PM_{10}
New turbine/HRSG[1]	38.15	48.52	8.17[3]	4.65	21.06
Retiring Boiler[2]	51.82	26.61	0.50	1.74	2.41
Net Emission Change	-13.67	+21.91	+7.67	+2.91	+18.65

[1] Based on 8,000 hours per year, (5,000 hours without duct firing, 3,000 hours with duct firing) and 150 startups/shutdowns per year
[2] Average historical Unit 3 emissions for 2001 – 2003 based on CEMS and fuel use data.
[3] SO_2 for new unit based on assumed fuel gas sulfur content of 0.75 grains per 100 dry standard cubic feet, the maximum value allowed in the current tariff.

CO = carbon monoxide
ECGS = El Centro generating station
HRSG = heat recovery steam generator
NO^x = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in diameter
SO_2 = sulfur dioxide
tpy = ton per year
VOC = volatile organic compounds

Worst-case emissions scenarios will be determined and modeled for each pollutant and averaging time using realistic combinations of normal operations, turbine/HRSG startups/shutdowns and maintenance conditions. Initial commissioning activities, will also be evaluated. The modeling to address all of these operating conditions is discussed below.

Normal operating CTG emissions will vary with ambient temperature and turbine load, as well as use or non-use of duct burners. The screening modeling analysis described in Section 4.1, Screening Model, will be used to determine the turbine/HRSG operating mode and ambient conditions that will produce the highest incremental air quality impacts for each averaging time addressed by the ambient standards, and the corresponding emission parameters will be used to represent the turbine/HRSG contributions for all refined modeling of normal operations.

Startup and shutdown conditions will also be considered. The emissions from these events will be quantified conservatively, using data provided by the turbine vendors and a reasonable maximum number of startups/shutdowns will be assumed in developing the worst-case emissions scenarios for each relevant averaging time.

IID is also proposing up to 20 hours of turbine operations for maintenance, which will be represented as full load operation without SCR and CO oxidation catalyst controls. Emissions for these periods will thus be equivalent to operation with only dry low-NO_x burners, based on turbine manufacturer emissions guarantees.

Emissions resulting from turbine/HRSG commissioning immediately following equipment installation will also be represented, based on the sequence of commissioning activities recommended by the equipment manufacturers and the expected durations and pollutant emissions profiles for each step in the commissioning process. Care will be taken to ensure that conservative assumptions are used for all parameters in order to avoid underestimating these one-time emissions.

Equipment emissions and stack parameters for all of the operating modes described above will be examined and modeled to determine which activity will produce the highest ground-level concentrations for all pollutants and averaging times, and the maximum impacts will be reported in the SPPE and Authority to Construct (ATC) Applications as evidence of the Project's compliance with applicable air quality standards. Where applicable, emissions estimates of all pollutants and all modes of operation will be provided in both parts per million (ppm) and pounds per hour values.

TACs will also be emitted from the operational ECGS due to turbine/HRSG combustion of natural gas. These emissions have not been estimated at this time; however, because only natural gas will be used as fuel for the CTG, only small quantities of TAC including benzene, formaldehyde, and polycyclic aromatic hydrocarbons may potentially be emitted. In addition, TACs potentially contained in the cooling tower circulating water will be quantified and included in the HRA described in Section 4.2.4, Air Quality Related Values and Visibility Analysis. Emissions estimates for TAC will be based on published emission factors (AP-42 or the CARB's CATEF database) and/or speciation profiles (for PM_{10} and ROC) available from CARB and/or vendor data, if available.

The Repowered Unit 3 equipment will use the existing Unit 3 cooling tower. As part of the Repower Project, more efficient drift eliminators will replace the existing system to reduce the associated particulate emission rates below current levels, despite a projected increase in annual water circulation through the tower. The PM_{10} emission data for the cooling tower will incorporate this control measure.

No new fired emergency equipment (e.g., generators or firewater pumps) will be installed for the ECGS Unit 3 Repower Project. Thus, the new turbine/HRSG train will be the only change in fuel burning equipment within the power plant.

Temporary construction emissions will result from equipment exhaust (primarily NO_x and diesel particulate emissions) and fugitive dust (PM_{10}) from earthmoving activities and vehicle and equipment traffic on unpaved surfaces. A construction schedule and equipment list provided by the Project engineering design firm will be consulted to determine the scenarios that will produce the highest emissions for the different averaging times addressed in the AAQS. For the ECGS, the fugitive PM_{10} emissions from construction will be initially estimated using data on the area to be disturbed and the extent of equipment operations, and will take into account the effects of implementing control measures for controlling fugitive dust during construction. The air quality impacts of the heavy equipment exhaust and fugitive dust emissions will then be modeled using ISCST3. The construction site, parking area, and laydown area will be modeled as volume sources. Low sulfur diesel fuel (15 ppm by weight) will be utilized in any emission calculations for construction equipment used at the ECGS Site.

4.3.2 Modeling of Contemporaneous Sources within ECGS

There are several existing sources at the ECGS. This Project will entail the repowering of the existing Unit 3. The new Unit 3 will first be modeled using only the emissions from the new Unit 3 equipment. Next, the other existing sources at the ECGS facility will be modeled together with the new Unit 3, i.e., including Units 2 and 4. Emissions and operating scenarios from the past 3 years for Units 2 and 4 will be reviewed and the highest annual average emission rates for Units 2 and 4 during that time period will be used in the modeling analysis to represent these sources. The worst-case operating scenario used for the new Unit 3 turbine/HRSG will be used in this modeling analysis. PM_{10} emission from all operational cooling towers at the ECGS, including the reconfigured Unit 3 cooling tower, will also be included. No other intermittent sources (e.g., existing fire pump, black start engines, etc.) will be included in this modeling analysis of combined sources. Predicted maximum off-site pollutant concentrations due to the combined ECGS operations will be compared with the NAAQS and CAAQS for compliance.

4.3.3 Cumulative Impact Analysis Including Sources Outside ECGS

A cumulative impact analysis will evaluate the combined air quality impacts of all routinely operating sources within the ECGS together with the emission from other projects within 6 miles from the ECGS that are currently either under construction, currently in an air quality permitting or CEQA review process, or reasonably expected to enter these processes in the near future. A request will be made to ICAPCD asking for a list of all newly permitted sources or other sources that are reasonably anticipated to be permitted within 6 miles of the ECGS. This list, when compiled will be forwarded onto CEC for review. Based on this information, additional sources may be included in the cumulative source modeling analysis

4.4 BUILDING WAKE EFFECTS

The effect of building wakes (i.e., downwash) upon the stack plumes of emission sources at the El Centro plant will be evaluated in accordance with USEPA guidance (USEPA 1985). Direction-specific building data will be generated for stacks below good engineering practice (GEP) stack height, using the most recent version of USEPA Building Parameter Input Program – Prime (BPIP-Prime). Appropriate information will be provided in the SPPE Application and other permit Applications that describe the input assumptions and output results from the BPIP-Prime model. The ISCST3 model considers direction-specific downwash using both the Huber Snyder and Schulman-Scire algorithms as evaluated in the BPIP-Prime program.

4.5 RECEPTOR GRID

This section presents the receptor grids that will be used in the AAQS modeling analyses. The receptor grid to be used for determining the area of influence (AOI) is as follows:

- 25-meter spacing along the property line and extending from the property line out to 1,000 meters beyond the property line
- 100-meter spacing from 1 km to 5 km of project sources
- 250-meter spacing within 5 km to 10 km of project sources

If a maximum concentration value is located in the 100-meter or 250-meter grid, a dense receptor grid will be placed around the maximum concentration point and the model will be rerun. The dense grid will use 25-meter spacing and will extend at least 500 meters in all directions from the original point of maximum concentration.

For the HRA modeling, receptors will be placed at 25-meter spacing around the fenceline and 500-meter spacing outside of the fence out to 10 km. All receptors that HARP creates that are inside the ECGS fenceline will be excluded. HARP will also include all census receptors out to 10 km. These census receptors will include the population locations in and around the City of El Centro. Receptors will also be placed at all sensitive locations (e.g., schools, hospitals, etc.) out to 1 mile.

A detailed Project map and a 7½- minute U.S Geological Survey (USGS) map will be provided in the SPPE Application showing the receptors used in the modeling. Actual Universal Transverse Mercator (UTM) coordinates will be used. The CAAQS and NAAQS apply to all locations off-site of the Applicant's facility, i.e., where public access is not under the control of the Applicant. The CAAQS and NAAQS are not evaluated for receptors on the property controlled by the Applicant.

4.6 METEOROLOGICAL AND AIR QUALITY DATA

4.6.1 Meteorological Data

Meteorological data suitable for direct input to ISCST3 were obtained from the National Climatic Data Center (NCDC) for the Imperial County Airport meteorological station, outside the town of Imperial, located approximately 2.5 miles northwest of El Centro and ECGS. The 5 years of meteorological data to be used in this modeling analysis include data from 1991 through 1995. Data were missing from each year's dataset. There was 3 percent missing data in the records for 1991, 1992, and 1993, 5 percent missing for 1994, and 9 percent missing for 1995. Years with 10 percent or more missing data are not recommended for use in permit modeling Applications. NCDC replaced these missing data by following USEPA approved techniques for filling in missing data.

The meteorological data recorded at Imperial County Airport are acceptable for use at ECGS for two reasons: proximity and terrain similarity. As mentioned above, the Imperial County Airport is located approximately 2.5 miles northwest of the ECGS Site. The airport is located in the middle of the Imperial Valley with the closest elevated terrain approximately 20 miles to the northwest. This is the closest meteorological recording station to the ECGS Site, and there are no intervening terrain features between the two locations; thus meteorological conditions at the ECGS Site will be very similar to those at the Imperial Valley Airport.

The terrain in the Salton Sea Imperial Valley area is relatively flat and below sea level. The Chocolate Mountains and the Sand Hills provide the terrain boundaries of the valley to the north, east, and southeast. The highest point in the Chocolate Mountains is just below 3,000 feet. The highest point in the Sand Hills is just below 600 feet. The Santa Rosa Mountains, Fish Creek Mountains, and Coyote Mountains form the western terrain boundary of the Imperial Valley. The highest points in these mountains are more then 4,800 feet, more than 2,300 feet, and more than 2,400 feet, respectively. The Imperial Valley is approximately 13 miles across at the northern edge of the Salton Sea and expands to more than 54 miles wide along the southern border with Mexico. The ECGS Site is located in the middle portion of the valley approximately 32 miles southwest of the Chocolate Mountains and 22 miles southeast of the Salton Sea.

The next closest weather recording stations are Palm Springs and Blythe. These two stations are automated surface observing systems (ASOS) as is the Imperial County Airport site. The Palm Springs station is approximately 92 miles to the northwest. The Palm Springs monitoring station is at the airport. The terrain at this location is somewhat similar to the Imperial Valley in that the Coachella Valley is orientated in a northwest to southeast direction. However, the Coachella Valley is approximately 8-miles wide at the Palm Springs Airport which tends to increase the wind speeds in this area. In fact, this area has hundreds of windmills to convert this wind energy to electrical power due to the near constant winds. The meteorological conditions at the Palm

Springs Airport are not similar to the conditions at ECGS, and thus are not appropriate for use in the permit modeling for the ECGS Project.

The Blythe station is located approximately 84 miles to the northeast of the ECGS Site. The Blythe station is at the airport located approximately 2 miles west of the Colorado River at the southern edge of the Parker Valley. Parker Valley is oriented in a north-northeast to south-southwest direction. Terrain features in the Blythe vicinity include the Dome Rock Mountains to the east (across the Colorado River in Arizona), the Big Maria Mountains to the north, the McCoy Mountains to the west-northwest, and the Mule Mountains to the southwest. The terrain differences at the Blythe location would make the meteorological conditions quite dissimilar to those at ECGS. Thus, the data recorded at Blythe would not be appropriate for use in the permit modeling for the ECGS Project.

The closest National Weather Service (NWS) stations are at Daggett and San Diego. Both of these NWS stations are over 100 miles away (165 miles for Daggett, 100 miles for San Diego) and neither has climate or terrain similar to the conditions at the ECGS Site. Therefore, these two sites do not have representative meteorological conditions acceptable for use in the permit modeling for the ECGS Project.

Data from the Imperial County Airport were recently used to support modeling for the proposed Salton Sea Unit 6 geothermal project Application to CEC, which would be located about 27 miles northwest of the ECGS Site. The data from the Imperial County Airport are representative of conditions at ECGS and are appropriate for use in permit modeling. Wind roses for each season are provided as Appendix A, Windrose Figures, of this Protocol.

4.6.2 Background Air Pollutant Monitoring Data

Available ICAPCD/CARB air quality data from 2000 through 2004 will be used to represent background air pollutant concentrations. Data from El Centro and Calexico monitoring stations will be evaluated as potentially representative of the Project Site conditions.

The El Centro 9th Street monitoring station records CO, NO_2, PM_{10}, $PM_{2.5}$, and O_3. The El Centro monitoring station is located approximately 1.5 miles to the southwest of ECGS. Monitoring data recorded at this location are by far the most representative information available to characterize conditions at ECGS. Calexico Ethel Street station located approximately 10 miles to the south-southeast of ECGS is the only location in Imperial County where SO_2 is recorded. Data recorded at this location will be influenced by emissions from Calexico and the Mexican city of Mexicali, which is significantly larger than the City of El Centro. Data recorded at Calexico would thus represent a worst-case representation of ambient conditions at ECGS. Data completeness percentages for each year for each pollutant at these monitoring stations will be provided.

For both the construction and operational phase modeling, the highest reported concentration that has occurred within the last 5 years will be used as the background values for each pollutant and averaging time and will be added to the maximum modeled contributions of Project sources to obtain totals suitable for comparison with the AAQS. This is a conservative approach because it assumes that the highest recorded value and the modeled maximum impact both occur at the same time and at the same location.

5.1 NAAQS AND CAAQS ANALYSIS

The AAQS analyses for the new Unit 3 source alone and the cumulative sources at ECGS will be presented in a summary table. A figure indicating the location of the maximum pollutant concentrations will be provided. For CO, NO_2, and SO_2, the H1H short-term and highest annual concentrations will be reported. For PM_{10}, the H1H 24-hour concentration (of the individual 5 years) over the 5 years modeled will be presented. Background concentrations will be added to yield the total concentration, which will be compared with the NAAQS and CAAQS.

5.2 HEALTH RISK ASSESSMENT ANALYSIS

Maps at a scale of 1:24,000 will depict the following data:

- Elevated terrain within a 10-km radius of the project
- Distribution of population via census data with 10-km radius of the project and sensitive receptors, including schools, pre-schools, etc., within a 1-mile radius of the project
- Current and future residential land uses
- Location of proposed new or modified transmission lines
- Isopleths of any areas where predicted exposures to air toxics result in estimated chronic non-cancer impacts and acute impacts equal to or exceeding a hazard index of 1.0
- Isopleths of any areas where exposures to air toxics lead to an estimated carcinogenic risk equal to or exceeding one in one million

HRA modeling results will be summarized to include maximum annual (chronic both carcinogenic and non-carcinogenic) and hourly (acute) adverse health effects from TAC emissions. Health risk values will be calculated and presented in the summary table for the points of maximum impact and the sensitive receptors with the maximum risk values.

5.3 DATA SUBMITTAL

Electronic copies of the modeling input and output files will be provided to ICAPCD and CEC.

Air Resources Board (ARB). 2003. *HARP User Guide – Software for Emission Inventory Database Management, Air Dispersion Modeling Analyses, and Health Risk Assessment version 1.3*, Air Resources, Board, California Environmental Protection Agency. December.

Auer, August H., Jr. 1978. American Meteorological Society. *Journal of Applied Meteorology*, 17(5): 636-643. "*Correlation of Land Use and Cover with Meteorological Anomalies.*" May.

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California Energy Commission (CEC). 1997. "Regulations Pertaining to the Rules of Practice and Procedure and Plant Site Certification." Title 20, California Code of Regulations. Chapter 1, 2, 5.

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_____. 1995. *User's Guide for the Industrial Source Complex Dispersion Models. Volume I – User's Instructions*. EPA-454/B-95-003a. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. September.

_____. 1997. *Addendum to ISC3 User's Guide. The Prime Plume Rise and Building Downwash Model.* November.

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_____. 2005. "*Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule*", 40 CFR Part 51, AH-FRL07990-9, November 9.

U.S. Forest Service et al. 2000. *Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase 1 Report.* Prepared by U.S. Forest Service Air Quality Program, National Park Service Air Resources Division, U.S. Fish and Wildlife Service Air Quality Branch. December.

Appendix A

Seasonal Wind Roses – Imperial County Airport (1995-1999)

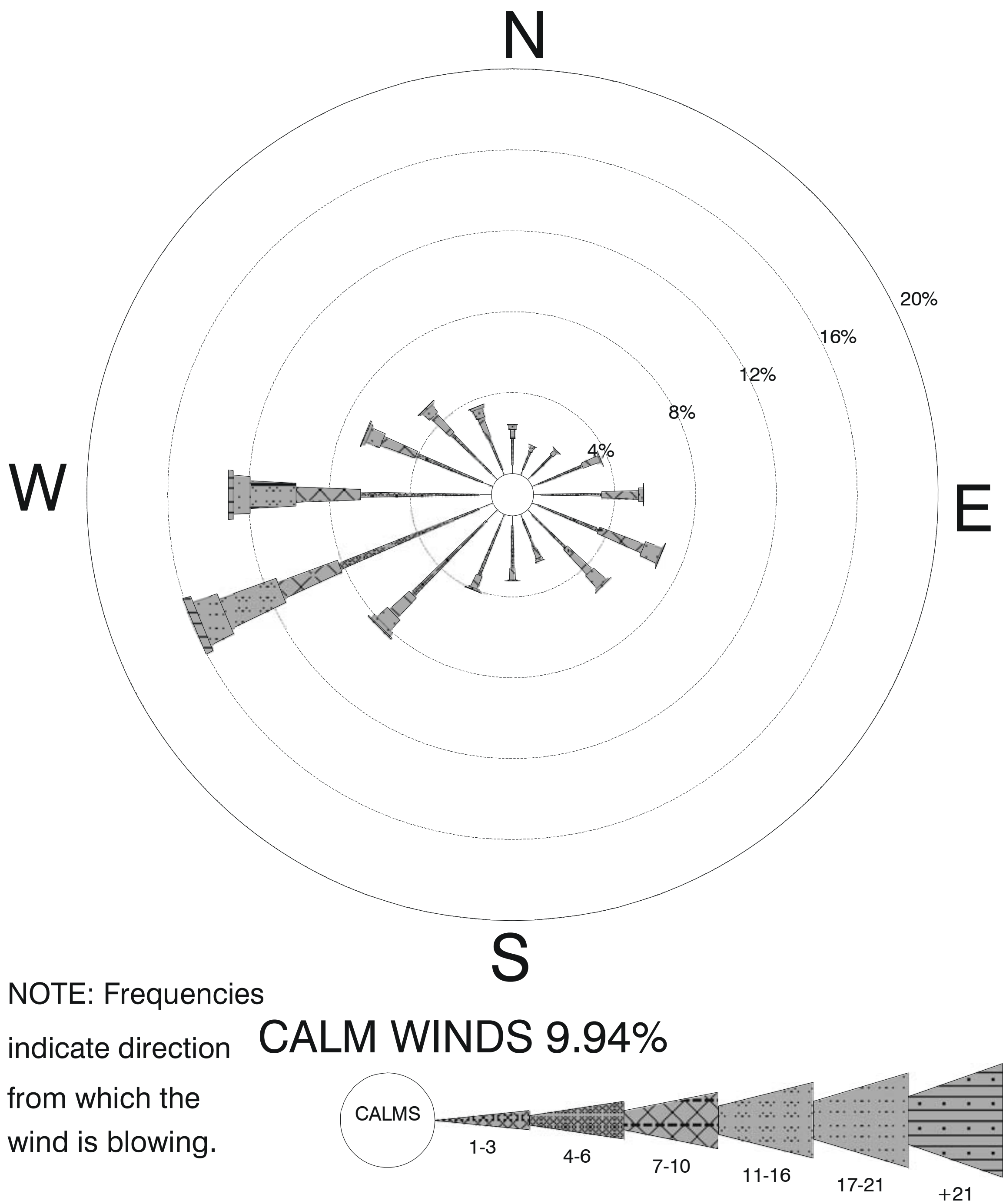

Figure A-1
Windrose for All Months 1991 – 1995
Imperial County Airport

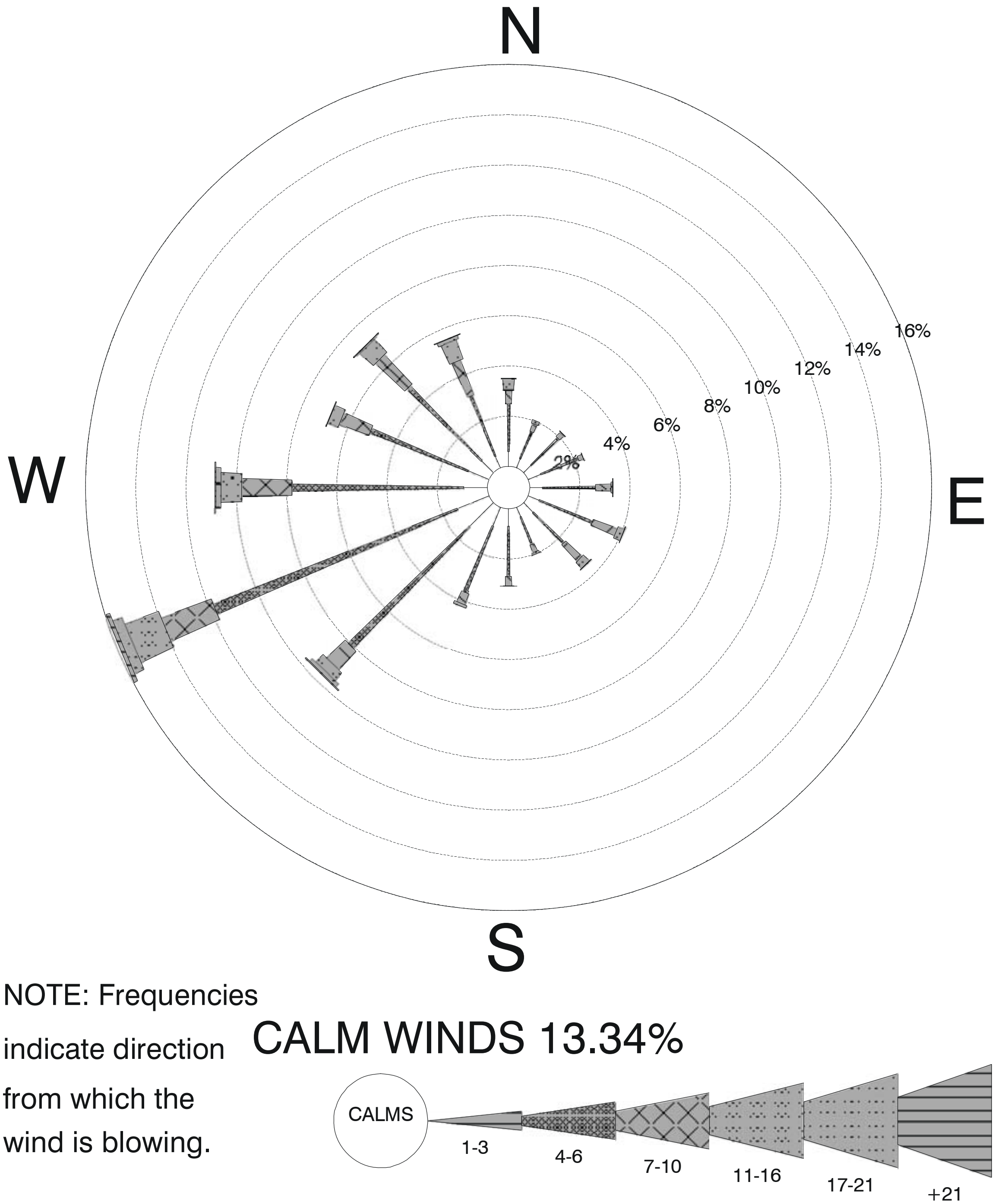

Figure A-2
Windrose for Winter Months (December – February) 1991 – 1995
Imperial County Airport

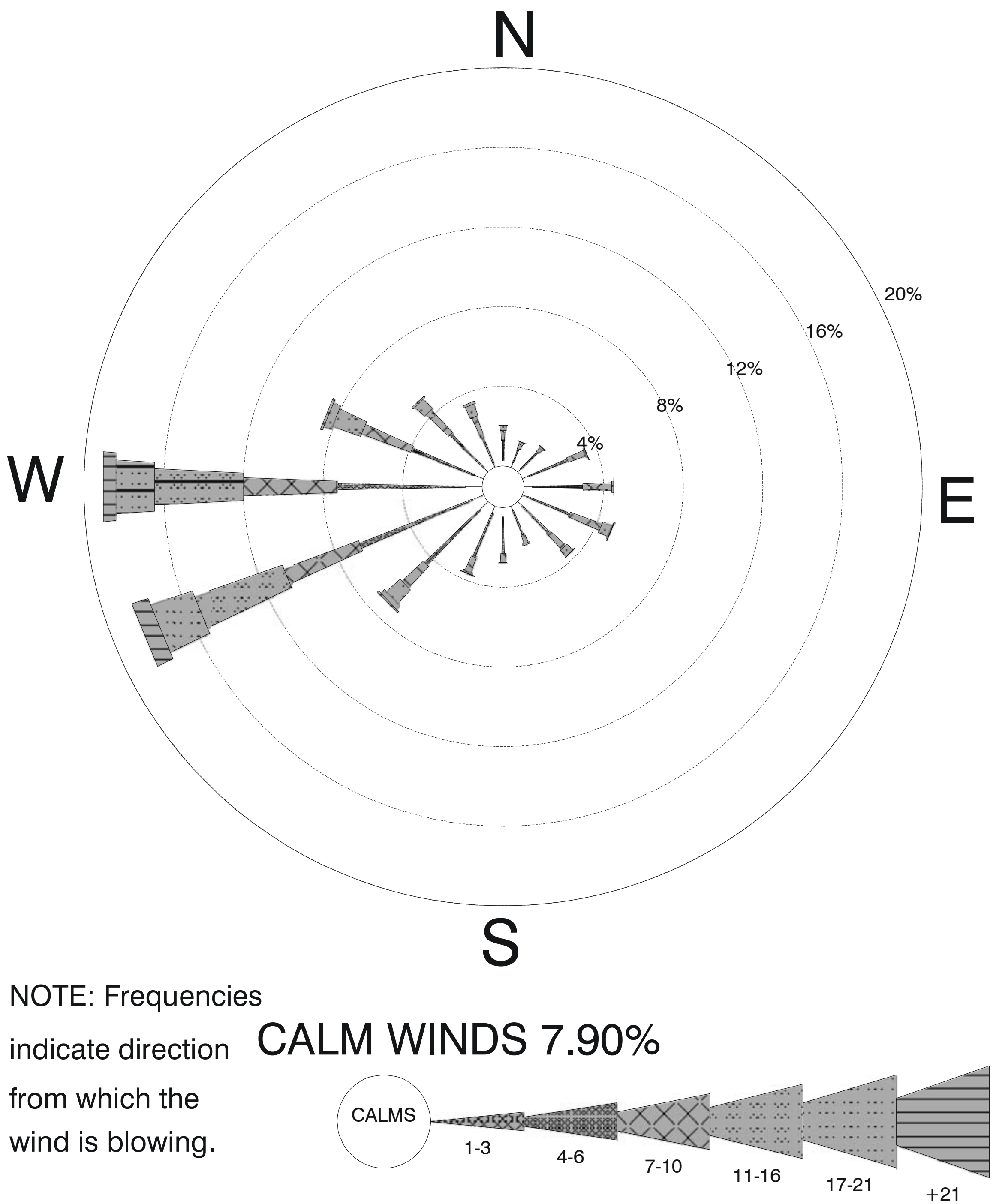

Figure A-3
Windrose for Spring Months (March – May) 1991 – 1995
Imperial County Airport

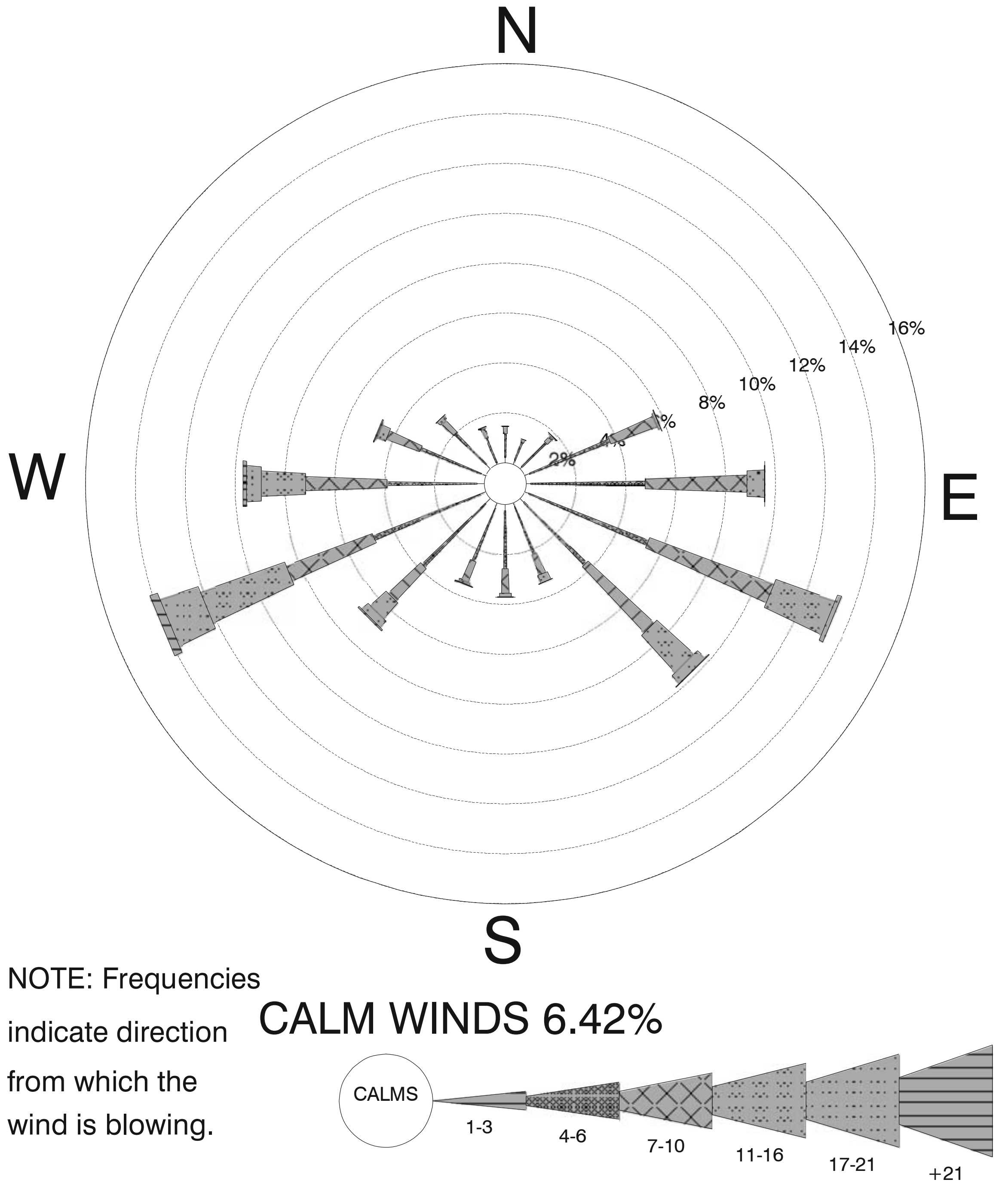

Figure A-4
Windrose for Summer Months (June – August) 1991 – 1995
Imperial County Airport

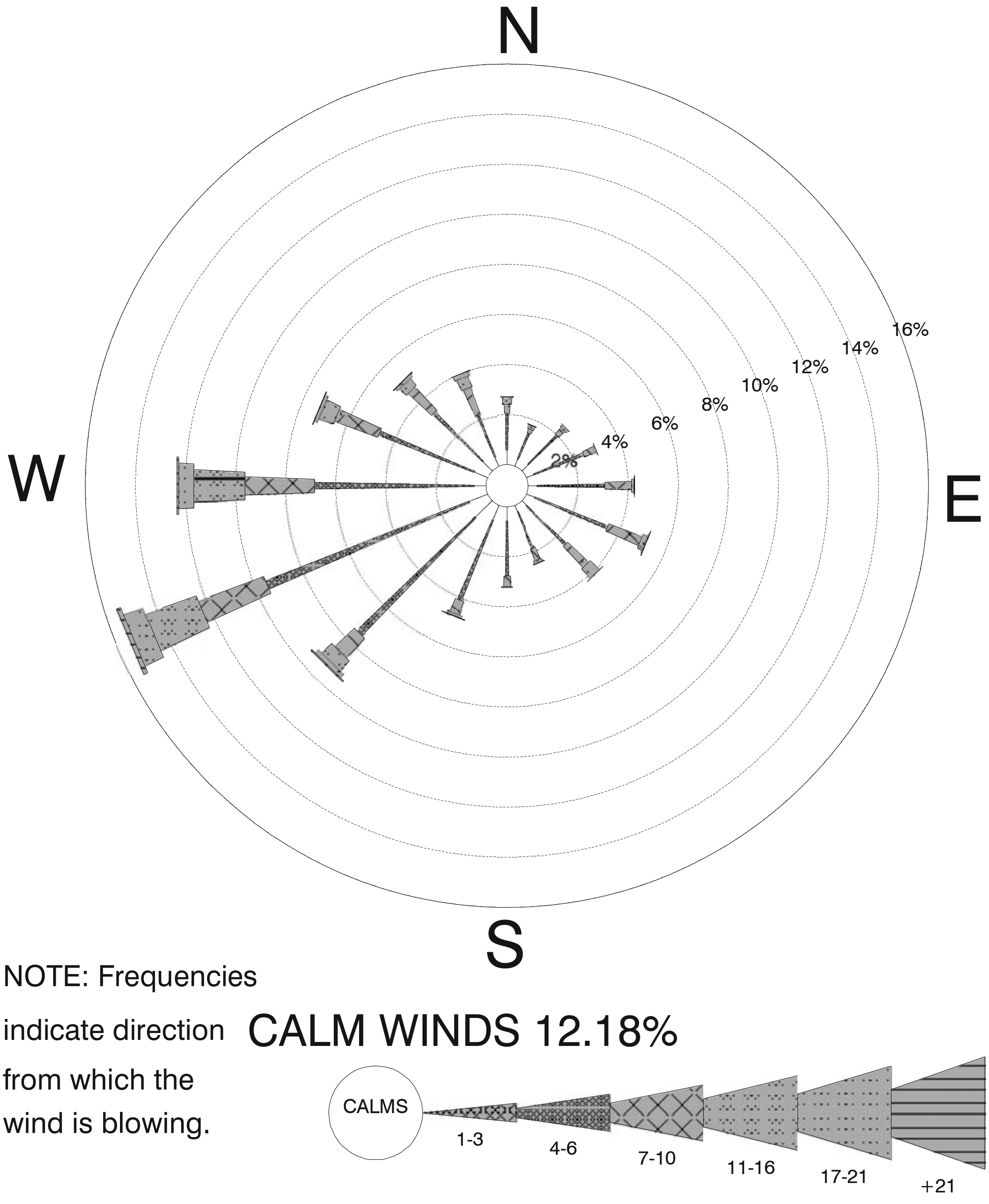

Figure A-5
Windrose for Autumn Months (September – November) 1991 – 95
Imperial County Airport

Attachment E
BACT Assessment

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AFC	Application for Certification
BACT	best available control technology
Btu	British thermal unit
CARB	California Air Resources Board
CEC	California Energy Commission
CO	carbon monoxide
CO_2	carbon dioxide
CTG	combustion turbine generator
DLE	dry low emissions
HRSG	heat recovery steam generator
ICAPCD	Imperial County Air Pollution Control District
N_2	nitrogen
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_2	oxygen
PM_{10}	particulate matter less than 10 microns in diameter
ppm	parts per million
ppmvd	parts per million by volume
SCR	selective catalytic reduction
SO_x	sulfur oxides
USEPA	U.S. Environmental Protection Agency

The best available control technology (BACT) assessment conducted for the Project considered all emission control technologies currently proposed or in use on natural-gas-fired combustion turbines (>50 MM British thermal unit per hour [Btu/hour] heat input) in combined cycle configurations. To identify feasible emission limits, several information sources were consulted, including the following:

- U.S. Environmental Protection Agency (USEPA) BACT/Lowest Achievable Emission Rate Clearinghouse (USEPA 1985) and updates
- California Air Resources Board (CARB) BACT Clearinghouse database and CARB BACT Guidelines for Power Plants (Adopted 7/22/99)
- Recent California Energy Commission (CEC) Applications for Certification
- Research conducted by El Centro Unit 3 Repower design engineers

Table 1, Summary of Recent NO_x BACT Determinations for Combustion Turbine Generators in Combined Cycle Configurations, lists selected recent nitrogen oxides (NO_x) BACT determinations for natural-gas-fired combined cycle power projects in California using advanced technology combustion turbines. BACT for the most recent projects that have come on-line in the state has been determined to be either 2.0 or 2.5 parts per million (ppm) by volume (ppmvd) (at 15 percent oxygen [O_2]), to be achieved by means of selective catalytic reduction (SCR) with ammonia injection. All of the five most recent projects to be approved by CEC committed to a NO_x BACT level of 2.0 ppmvd at 15 percent O_2. The combustion turbine generator (CTG) in this Project will achieve the BACT concentration of 2.0 ppmvd at 15 percent O_2 using dry low-NOx combustor technology (rather than steam or water injection, as a means of water conservation), and SCR.

Similarly, the most recent combined cycle turbine projects have been approved with a carbon monoxide (CO) emissions limit between 3 and 6 ppmvd and a reactive organic compounds (ROC) emissions limit at or near 2 ppmvd (both at 15 percent O_2), based on the use of a CO oxidation catalyst. The CTG in this Project will employ the same control technology to achieve comparable CO and ROC stack exhaust levels. Exclusive use of natural gas fuel has been determined to be BACT for sulfur oxides ($SO_{x)}$ and particulate matter less than 10 microns in diameter (PM_{10}) in all other comparable projects for several years.

E.1 ASSESSMENT OF NO_X CONTROL TECHNOLOGIES

Based on a review of materials described above, the following NO_x control technologies were evaluated to determine whether they are able to achieve BACT NO_x levels in practice:

- Dry low emissions and Goal Line SCONOx™
- DLE and SCR with ammonia injection

SCONOx™

SCONOx™ is a new NO_x reduction system produced by Goal Line Environmental Technologies (now distributed by EmeraChem) for gas turbine applications. This system uses a coated catalyst to oxidize both NO_x and CO, thereby reducing plant emissions of these pollutants. CO emissions are reduced in SCONOx™ by the oxidation of CO to carbon dioxide (CO_2). A two-step process reduces the NO_x emissions. First, NO_x emissions are oxidized to nitrogen dioxide (NO_2) and then adsorbed onto the catalyst. In the second step, a proprietary regenerative gas is passed through the catalyst periodically. This gas de-desorbs the NO_2 from the catalyst and reduces it to nitrogen (N_2). The system does not use ammonia as a reagent; rather, it uses natural gas as the basis for a proprietary catalyst regeneration process.

TABLE 1
SUMMARY OF RECENT NO_X BACT DETERMINATIONS FOR COMBUSTION TURBINE GENERATORS IN COMBINED CYCLE CONFIGURATIONS

Name	Location	Emission Limit[1]			Control(s)	On-Line Date
		NOx	CO	ROC		
Projects Recently Coming On-Line						
PICO	CA	2.0 ppm	4.0 ppm	2 ppm	SCR with ammonia CO oxidation catalyst	March 05
Metcalf	CA	2.5 ppm	6.0 ppm	2 ppm	SCR with ammonia CO oxidation catalyst	May 05
Pastoria – Phase 1	CA	2.5 ppm	3.0 ppm	6 ppm	SCR with ammonia CO oxidation catalyst	July 05
Magnolia	CA	2.0 ppm	2.0 ppm	2 ppm	SCR with ammonia CO oxidation catalyst	September 05
Malburg	CA	2.0 ppm	2.0 ppm	2 ppm	SCR with ammonia CO oxidation catalyst	2 October 05
Projects Recently Permitted by CEC						
East Altamont	CA	2.0 ppm	6.0 ppm	2.0 ppm	SCR with ammonia CO oxidation catalyst	
SMUD Consumnes	CA	2.0 ppm	4.0 ppm	1.4 ppm	SCR with ammonia CO oxidation catalyst	
Inland Empire	CA	2.0 ppm	3.0 ppm	2.0 ppm	SCR with ammonia CO oxidation catalyst	
San Joaquin	CA	2.0 ppm	4.0 ppm	2.0 ppm	SCR with ammonia CO oxidation catalyst	
Roseville	CA	2.0 ppm	4.0 ppm	2.0 ppm	SCR with ammonia CO oxidation catalyst	

Notes:
[1]All emission limits are in ppm by volume referenced to 15% O_2
SCR = selective catalytic reduction
NOx = nitrogen oxides
ROC = reactive organic compounds
CO = carbon monoxide
ppm = parts per million
CA = California

As demonstrated by an initial installation on several gas turbines where energy is recovered from the exhaust gas to produce steam, SCONOx™ is capable of achieving NO_x emission concentrations of 2 ppm based on a maximum inlet concentration of 25 ppm, and 90 percent CO reduction based on a maximum inlet concentration of 50 ppm. However, the effectiveness of the SCONOx™ technology has not been demonstrated on turbines as large as the GE 7EA turbine proposed for the El Centro Unit 3 Repower Project.

Vendors of the SCONOx™ technology have stated that it is commercially ready for any size turbine. However, the largest turbine that SCONOx™ has actually been applied to thus far is a GE LM2500, approximately 25 MW in capacity, or about 1/5th the size of the Project. The Otay Mesa Power Project (which would have used frame 7F turbines in a combined cycle configuration) was permitted with a commitment to use the SCONOx™ technology as the primary NO_x and CO control method if possible, but construction of that project has been postponed for several years. The Application for Certification (AFC) filed in 2000 for the Nueva Azalea Project also proposed to use the SCONOx™ technology, but ultimately, this project was never built.

SCONOx™ would not require an oxidation catalyst or the use of ammonia reagent to control CO and NO_x emissions. The SCONOx™ technology employs a reactive catalyst that must be regenerated on a regular basis. The catalyst reacts with CO and NO_x to form CO_2, which is emitted, and NO_2, which is absorbed on the surface of the catalyst until it is saturated. Prior to saturation, the catalyst is regenerated. This is accomplished by sealing off the catalyst from the exhaust stream by means of a pair of mechanical louver doors and subjecting it to a mixture of natural gas and steam that forms hydrogen to produce elemental nitrogen and CO_2, which are emitted through the stack.

The manufacturer of SCONOx™ recommends that the catalyst in each module be removed and put through a regenerative bathing process once a year. An on-line catalyst washing system design has not yet been fully developed. There is some concern that the bathing process may result in an additional hazardous waste stream. The time required for this process is not clearly known, but it is likely to be approximately 1 to 2 weeks. Also, there may be a requirement that liquefied natural gas be stored on-site for use during the regular regeneration process of the catalyst throughout the year.

For large gas turbines, an assembly of multiple SCONOx™ modules would be required to control NO_x and CO to 2 ppm each. For example, proposals for installation of the technology on frame 7F turbine have specified up to 15 such modules, with a capital cost of $26 million (Three Mountain Power Plant, 99-AFC-2). Testing has not yet been conducted to demonstrate the successful operation of the louver doors used by each module under realistic flow and emissions conditions that would be found in large turbines. Also, control algorithms have not yet been developed nor tested for controlling large numbers of SCONOx™ modules. Due to the lack of appropriate testing and information, some heat recovery steam generator (HRSG) manufacturers have expressed reluctance to issue guarantees for their equipment if SCONOx™ is installed (Beck 2000).

Although the SCONOx™ technology has been demonstrated to be an effective NO_x and CO emission abatement system on a few small combined cycle turbine installations and does not require the use of ammonia reagent, an SCR system has virtually the same NO_x emissions guarantee as the SCONOx™ at a much lower price, and has been successfully demonstrated extensively on large frame-type turbines.

Potential advantages of the SCONOx™ process include:

- **No ammonia.** The SCONOx™ process does not use ammonia. This eliminates the ammonia storage and transportation safety issues entirely and the potential for ammonia slip or ammonia-based particulate formation.
- **Carbon monoxide reduction.** SCONOx™ will reduce CO emissions as well as NO_x emissions.

Potential disadvantages of the SCONOx™ process include:

- **Unproven for large gas turbines.** While demonstrated to be effective on smaller turbines, several aspects of the technology have not been demonstrated for a system configured for a larger turbine.
- **Catalyst "washing."** A proprietary catalyst washing system must be used and an on-line catalyst washing system design has not yet been fully developed. If an on-line catalyst washing system is not used, then the facility must be shut down for cleaning.
- **High capital and operating cost.** SCONOx™ is significantly more expensive than SCR with ammonia injection, primarily due to the higher cost of initial and replacement catalyst. The SCONOx™ catalyst is a precious metal catalyst, which is very expensive.

Because the performance of SCONOx™ has not been sufficiently demonstrated as "achieved in practice" on large combined cycle turbines, as discussed above, SCONOx™ does not represent BACT for the ECGS Unit 3 Project at this time.

SCR with Ammonia Injection

SCR with ammonia injection systems for reduction of NO_x emissions have been widely used in combined cycle gas turbine applications for many years and are considered a proven technology. SCR systems are commercially available from several vendors, unlike SCONOx™, which is available from a single vendor. The SCR process involves the injection of ammonia into the flue gas stream via an ammonia injection grid upstream of a catalyst. The ammonia reacts with the NO_x gases in the presence of the catalyst. The catalyst is not regenerated and requires periodic replacement. SCR vendors typically offer a 3-year guarantee on catalyst life. SCR with ammonia injection systems have been used in numerous larger combined cycle applications including 7EA Class units.

The Project will use DLE and SCR and ammonia injection designed to achieve a NO_x emission limit of 2.0 ppm (at 15 percent O_2) on a 3-hour average. As noted in Table 1, Summary of Recent NO_x BACT Determinations for Combustion Turbine Generators in Combined Cycle Configurations, this level of NO_x control is consistent with other recent similar projects, and is considered to be BACT for the El Centro Unit 3 Repower Project. It has also been approved by the Imperial County Air Pollution Control District (ICAPCD).

E.2 OTHER TECHNOLOGIES

Technologies that cannot achieve a NO_x emissions limit of 2.0 ppmvd (at 15 percent O_2) in practice were not considered as potential BACT candidates. These technologies include SCR without DLE and DLE without SCR.

E.3 ASSESSMENT OF CO CONTROL TECHNOLOGIES

The El Centro Unit 3 CTG is guaranteed to achieve 4 ppm (at 15 percent O_2) over a 3-hour average with natural gas fuel and use of a CO oxidation catalyst (except during unit startup and shutdown). The ICAPCD has already confirmed that the use of a CO oxidation catalyst will result in emissions of CO that will conform to current ICAPCD BACT requirements.

The following CO control technologies are evaluated:

- Combustion design/control
- CO oxidation catalyst

Combustion Design/Control

Gas turbine combustion technology has significantly improved over recent years with respect to lowering CO emissions. This turbine design that will be used for the El Centro Unit 3 Repower Project has been guaranteed by the manufacturer to achieve a CO rate of 25 ppm (at 15 percent O_2) without post-combustion control technologies under a wide range of operating conditions (60 percent to 100 percent load) and ambient conditions (15°F to 115°F).

CO Oxidation Catalyst

CO oxidation catalysts have been used with natural-gas-fired turbines for over a decade when uncontrolled CO emission levels are considered unacceptably high. CO oxidation catalysts operate at elevated temperatures within the exhaust stream and are considered technically feasible, having been successfully demonstrated in numerous combined cycle frame turbine applications. Thus, installation of a CO oxidation catalyst on the Project turbines is considered to be BACT for CO in the case of the El Centro Unit 3 Application.

E.4 ASSESSMENT OF ROC CONTROL TECHNOLOGIES

The proposed BACT level of 2 ppmvd (at 15 percent O_2) for ROC control achieved by a CO oxidation catalyst is consistent with the most stringent level that has been demonstrated in practice by the latest combined cycle units to come on-line in California and is therefore considered to be BACT for the El Centro Unit 3 Repower Project.

E.5 ASSESSMENT OF SO_2 AND PM_{10} CONTROL TECHNOLOGIES

Sulfur dioxide and PM_{10} emissions will be controlled through the exclusive use of clean-burning pipeline quality natural gas. This control technology has been widely and uniformly implemented for control of SO_2 and PM_{10} emissions from combustion turbines in California and throughout the United States, and is considered to be BACT for the El Centro Unit 3 Repower Project.

E.6 ASSESSMENT OF AMMONIA SLIP CONTROL TECHNOLOGIES

The proposed BACT level of 5 ppmvd (at 15 percent O_2) is the most rigorous control requirement that has been imposed to date on any gas turbine power plant project in California, and is thus considered to represent an appropriate BACT level for the El Centro Unit 3 Repower Project.

E.7 COOLING TOWER DRIFT PM_{10} CONTROL TECHNOLOGIES

The Project will include improvements to the Unit 3 cooling tower, including a retrofitting of the existing drift elimination system to achieve an extremely low level of PM_{10} emissions from this source. Based on data provided by the cooling tower manufacturer, the new drift eliminator will control drift to a level of no more than 0.001 percent of the circulating water flow rate. The ICAPCD has already agreed that this level of control constitutes BACT for the cooling tower.

E.8 REFERENCES

Beck, R.W. 2000. Towantic Energy Project Revised BACT Analysis. February 18.

U.S. Environmental Protection Agency (EPA). 1985. http://cfpub.epa.gov/rblc/htm/bl02.cfm

150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

IMPERIAL COUNTY CALIFORNIA

AIR POLLUTION CONTROL DISTRICT

TELEPHONE: (760) 482-4606
FAX: (760) 353-9904

January 13, 2006

Mr. Henryk A. Olstowski, P.E.
Imperial Irrigation District
General Superintendent
Power Generation
P.O. Box 937,
Imperial, CA 92251

Dear Mr. Olstowski:

The District has conducted a review of your letter dated December 20, 2005 regarding IID's proposed Best Available Control Technology (BACT) emission levels for the Niland Gas Turbine Plant and the El Centro Generating Station Unit 3 Repowering Projects.

Based on information available under Guidance for the Permitting of Electrical Generation Technologies, CalEPA ARB, Stationary Source Division, July 2002, and Guidance for Power Plant Siting and BACT, CalEPA ARB, Stationary Source Division, September 1999, the ICAPCD has the following considerations and comments:

Niland

IID project involves the installation of 2@ GE LM6000 gas turbines with an output between 50 and 100 MW, equipped with SCR and Oxidation Catalysts. This emissions are based for each individual unit.

	IID Proposal	ICAPCD Considerations & Comments
NOX	2.5 ppmv @ 15% O_2	2.5 ppmvd @ 15% O_2, 3 hr avg.
CO	6.0 ppmv @ 15% O_2	6.0 ppmvd @ 15% O_2, 3 hr avg.
VOC	2.0 ppmv @ 15% O_2	2.0 ppmvd @ 15% O_2, 3 hr avg.
PM10	3 lb/hr turbine	3 lb/hr
NH3	5.0 ppmv @ 15% O_2	5.0 ppmvd @ 15% O_2, 3 hr avg.
SOX	Pipeline quality natural gas	Natural gas shall not contain more than 0.75 grains of total sulfur compounds per 100 scf.

El Centro Generating Station Unit 3 Repowering

IID project involves the retiring of the utility boiler and replacing it with a new GE 7EA gas turbine equipped with a heat recovery steam generator with duct firing. The project includes the installation of SCR system and oxidation catalyst.

	IID Proposal	ICAPCD Considerations & Comments
NOX	2.0 ppmv @ 15% O_2	2.0 ppmvd @ 15% O_2, 3 hr avg.
CO	4.0 ppmv @ 15% O_2	4.0 ppmvd @ 15% O_2, 3 hr avg.
VOC	2.0 ppmv @ 15% O_2	2.0 ppmvd @ 15% O_2, 3 hr avg.
PM10	5 lb/hr	5 lb/hr
NH3	5.0 ppmv @ 15% O_2	5.0 ppmvd @ 15% O_2, 3 hr avg.
SOX	Pipeline quality natural gas	Natural gas shall not contain more than 0.75 grains of total sulfur compounds per 100 scf.
Cooling tower	Highly efficient drift eliminator system	BACT drift loss to be determined by manufacturer based on air velocity through the fill material, recirculation rate, type of fill material and drift eliminator used.

In addition, emission limits shall not apply to startup or shutdowns periods, and this periods shall not exceed two hours.

I hope this letter satisfies IID's request. If you have any questions regarding this letter please contact me or Jesus A. Ramirez, APC Engineer at (760) 482-4606.

Sincerely,

Brad Poiriez
APC Senior Manager
ICAPCD

BP/jar

Attachment F
Certificates for Banked Emission Reduction Credit to Offset Project Emissions

Emission Reduction Credit Certificate

#2030(P)

issued to

Imperial Irrigation District

Valid for 23.0 tons/yr of NO_x

CERTIFIED

IMPERIAL COUNTY CALIFORNIA

Date: February 23, 2000

Stephen L. Birdsall
Air Pollution Control Officer

Imperial County Air Pollution Control District

Emission Reduction Credit Certificate

#4483P

issued to

Imperial Irrigation District

Valid for 15.4 tons of Fugitive PM 10

CERTIFIED

Date: October 12, 2005

Date of Origin: January 7, 2005

Stephen L. Birdsall
Air Pollution Control Officer

Imperial County Air Pollution Control District

Emission Reduction Credit Certificate

#4279P

issued to

Imperial Irrigation District

Valid for 0.15 tons of SOX

CERTIFIED

Date: April 28, 2003
Date Original Certificate Issued:
September 12, 2002

IMPERIAL COUNTY CALIFORNIA 1907

Stephen L. Birdsall
Air Pollution Control Officer

Imperial County Air Pollution Control District

Emission Reduction Credit Certificate

#3053A

issued to

Imperial Irrigation District

Valid for 51.82 tons of SOX

Date: June 15, 2004
Original issue: July 19, 2001

Stephen L. Birdsall
Air Pollution Control Officer

Imperial County Air Pollution Control District

Attachment G
Letter from Imperial County Air Pollution Control District Regarding Approval of Emission Reduction Package

150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

IMPERIAL COUNTY CALIFORNIA
AIR POLLUTION CONTROL DISTRICT

TELEPHONE: (760) 482-4606
FAX: (760) 353-9904

January 05, 2006

Mr. Henryk A. Olstowski, P.E.
Imperial Irrigation District
General Superintendent
Power Generation
P.O. Box 937,
Imperial, CA 92251

Dear Mr. Olstowski:

The District has conducted a review of your letter dated December 02, 2005 regarding emission offset requirements for the El Centro Unit 3 Repowering project.

Based on the staff meeting conducted on December 12, 2005 between IID and ICAPCD staff and John Lague, URS Consultant, the ICAPCD has the following observations.

At this time, emission credits are analyzed exclusively for the El Centro Unit 3 Repowering project. The Niland Gas Turbine Plant project has been analyzed separately on our letter dated November 29, 2005. Proposed credits to be purchased from Border Valley Press are not considered in analysis.

Based on initial estimates of offsets required for the El Centro Unit 3 Repowering project, the ICAPCD agrees with this estimates based on the following considerations:

NOX

Project Emissions:	41.31 Tons
Emission Reductions from Unit 3 Boiler:	51.82 Tons
Difference:	10.51 Accredit
Required Credits based on 1 to1 ratio:	Non Required
Proposed Offsets:	Non Required

The 10.51 tons are accredit to the IID NOX ERCs.

ROC

Project Emissions:	7.35 Tons
Emission Reductions from Unit 3 Boiler:	1.74 Tons
Difference:	5.61 Tons Required to Offset
Required Credits based on 1 to 1 ratio:	5.61 Tons
Proposed Offsets:	11.22 Tons (11.22 Interpollutant of NOX)

The ICAPCD proposes that IID secures the required credits of 5.61 Tons for ROC in the form of 11.22 tons of NOX credits (5.61 tons x 2), based on an inter-pollutant ratio of 2:1.

PM10

Project Emissions:	20.75 Tons
Emission Reductions from Unit 3 Boiler:	2.41 Tons
Difference:	18.34 Tons Required to Offset
Required Credits based on 1 to 1 ratio:	18.34 Tons (4.81 + 13.53)Tons
Proposed Offsets:	43.45 Tons (9.62 non-traditional PM10 + 33.83 Interpollutant of SOX)

The ICAPCD proposes the IID secures the required credits of 18.34 Tons of PM10 in the form of 9.62 tons of PM10 credits (4.81 tons x 2), based on non-traditional PM10 credits at a ratio of 2:1; and in the form of 33.83 tons of PM10 credits (13.53 x 2.5), based on an inter-pollutant ratio of 2.5:1.

SOX

Project Emissions:	8.51 Tons
Emission Reductions from Unit 3 Boiler:	0.5 Tons
Difference:	8.01 Tons Required to Offset
Required Credits based on 1 to1 ratio:	8.01 Tons
Proposed Offsets:	8.01 Tons

This credits are secured in the banked IID SOX ERCs.

The following tables summarizes the emissions offset package that the ICAPCD proposes at this time in order for IID to submit the proposed package to CEC. The tables include the previously submitted proposed package for Niland Peaker project (Table 1) and the current El Centro Unit 3 Repowering project (Table 2).

IID Credits Available in the ICAPCD ERC Bank (Tons) and Proposed Offset Package for Niland Peaker Project accepted by ICAPCD

This list does not include proposed credits being purchased from Border Valley Press

Table 1

	NOX	ROC	PM10 (Comb.)	PM10 (Non Traditional)	SOX
BANKED CREDITS	**77.47**	**1.28**	**9.27**	**15.4**	**52.08**
Niland Project Emissions	(19.39)	(4.26)	(10.13)		
Required Credits based on 1.2:1 ratio	(23.27)	(5.11)	(12.16)		
Sources of Credits (Banked IID credits for same type of pollutant)	23.27	1.28	9.27		
Extra Credits Required	0	3.83	2.89		
Sources of Credits (Proposed interpollutant trade)	7.66[a]	3.83[a]	2.89[2]	5.78[2]	
FINAL BALANCE	**46.54**	**0**	**0**	**9.62**	**52.08**

Notes:

a 7.66 tons of NOX credits for 3.83 tons of ROC credits based on an inter-pollutant ratio of 2:1

2 5.78 tons of PM10 non-traditional credits for 2.89 tons of PM10 combustion credits at a ratio of 2:1

IID Credits Available in the ICAPCD ERC Bank (Tons) and Proposed Offset Package for ECGS Unit 3 Repowering Project accepted by ICAPCD

This list does not include proposed credits being purchased from Border Valley Press and has deducted credits already assigned to Niland Peaker Project.

Table 2

	NOX	**ROC**	**PM10 (Comb.)**	**PM10 (Non Traditional)**	**SOX**
BANKED CREDITS	**46.54**	**0**	**0**	**9.62**	**52.08**
Emission Reductions from Unit 3 Boiler	51.82	1.74	2.41		0.5
Unit 3 Repowering Project Emissions	(41.31)	(7.35)	(20.75)		(8.51)
Balance	57.05	(5.61)	(18.34)	9.62	44.07
Sources of Credits (Banked IID credits & Emission Reductions for same type of pollutants)	57.05	0	0	9.62	44.07
Extra Credits Required	0	5.61	18.34	0	0
Sources of Credits (Proposed interpollutant trade)	11.22[a]	5.61[a]	18.34[b,2] (4.81 + 13.53)	9.62[b] (4.81)	33.83[2] (13.53)
FINAL BALANCE	**45.83**	**0**	**0**	**0**	**10.24**

Notes:

[a] 11.22 tons of NOX credits for 5.61 tons of ROC credits based on an inter-pollutant ratio of 2:1

[b] 9.62 tons of PM10 non-traditional credits for 4.81 tons of PM10 combustion credits at a ratio of 2:1

[2] 33.83 tons of SOX credits for 13.53 tons of PM10 combustion credits at a ratio of 2.5:1

These credits are available and banked at this time. The estimated credits that IID plans to purchase from Border Valley Pressing have not been credited, accounted for or banked as of this time.

I hope this letter satisfies IID's request. If you have any questions regarding this letter please contact me or Jesus A. Ramirez, APC Engineer at (760) 482-4606.

Thank you for your cooperation.

Sincerely,

Brad Poiriez
APC Senior Manager
ICAPCD

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