

# **ATTACHMENT A**



<b>Opacity Violations (20 percent limit) per Unit per Quarter</b>			
Unit	1	2	Total
Q3 2006	446	689	1,135
Q4 2006	132	248	380
Q1 2007	287	196	483
Q2 2007	361	451	812
Q3 2007	418	425	843
Q4 2007	666	159	825
Q1 2008	255	503	758
Q2 2008	47	591	638
Q3 2008	881	214	1,095
Q4 2008	329	298	627
Q1 2009	247	433	680
Q2 2009	412	591	1003
Q3 2009	481	321	802
Q4 2009	531	746	1,277
Q1 2010	542	273	815
Q2 2010	418	89	507
Q3 2010	0	344	344
Q4 2010	77	121	198
<b>Total</b>	<b>6,530</b>	<b>6,692</b>	<b>13,222</b>



# **ATTACHMENT B**



<b>Opacity Violations (30 percent limit) per Unit per Quarter</b>			
Unit	1	2	Total
Q3 2006	60	75	135
Q4 2006	0	214	214
Q1 2007	308	61	369
Q2 2007	261	146	407
Q3 2007	359	514	873
Q4 2007	361	177	538
Q1 2008	211	304	515
Q2 2008	181	289	470
Q3 2008	213	171	384
Q4 2008	534	140	674
Q1 2009	0	392	392
Q2 2009	130	318	448
Q3 2009	392	103	495
Q4 2009	199	276	475
Q1 2010	133	122	255
Q2 2010	143	124	267
Q3 2010	18	121	139
Q4 2010	195	400	595
<b>Total</b>	<b>3,698</b>	<b>3,947</b>	<b>7,645</b>





**ATTACHMENT C**  
**(See Enclosed Compact Disc)**



# **ATTACHMENT D**



**Violations of Particulate Matter Emission Limit (0.3 lb/MMBtu over 2 hour average)**

UNIT ID	OP DATE	OP HOUR	OP TIME	HEAT INPUT	Startup PM (lb/hr)	PM Limit at 0.3 lb/MMBtu (Previous Hour)	PM Limit at 0.3lb/MMBtu (Following Hour)	PM Violation (Previous Hour)?	PM Violation (Following Hour)?
1	1/4/2008	0	0.02	25.98	49.44676307	476.172	3.897	NO	YES
1	1/6/2008	8	1	1077.8	1087.891517	317.19	374.265	YES	YES
1	2/8/2008	5	0.1	592.11	1155.730878	985.2015	88.8165	YES	YES
1	2/8/2008	12	1	1094.2	681.4723066	330.51	241.2564	YES	YES
1	2/8/2008	13	0.48	514.176	165.1405945	241.2564	77.1264	NO	YES
1	2/8/2008	19	1	1130.4	404.5494284	339.24	345.21	YES	YES
1	2/8/2008	20	1	1171	1420.918305	345.21	358.395	YES	YES
1	5/2/2008	3	1	242.2	123.0257042	66.27	120.15	YES	YES
1	5/2/2008	4	1	558.8	1037.774021	120.15	165.48	YES	YES
1	5/2/2008	5	1	544.4	1012.654382	165.48	117.98475	YES	YES
1	5/2/2008	6	0.35	242.165	470.3652491	117.98475	36.32475	YES	YES
1	5/2/2008	8	0.92	307.648	341.3607681	46.1472	63.8817	YES	YES
1	5/2/2008	11	1	272.2	177.804677	69.27	100.89	YES	YES
1	5/2/2008	12	1	400.4	472.1281636	100.89	127.14	YES	YES
1	5/2/2008	13	1	447.2	651.9000413	127.14	293.175	YES	YES
1	8/27/2008	19	1	322.7	172.3604014	83.895	87.375	YES	YES
1	8/27/2008	20	1	259.8	169.9688795	87.375	97.65	YES	YES
1	8/27/2008	21	1	391.2	449.6061214	97.65	144.36	YES	YES
1	8/27/2008	22	1	571.2	930.4728507	144.36	296.79	YES	YES
1	9/1/2008	21	1	355.4	584.8781953	95.655	135.915	YES	YES
1	9/1/2008	22	1	550.7	1063.360254	135.915	315.9	YES	YES
1	9/27/2008	11	0.02	127.562	277.3182231	967.9593	19.1343	NO	YES
1	9/27/2008	15	1	300.3	151.9300759	84.42	124.35	YES	YES
1	9/27/2008	16	1	528.7	836.7424953	124.35	360.135	YES	YES
1	10/10/2008	6	0.08	281.864	640.2002914	871.4346	42.2796	NO	YES
1	10/10/2008	20	1	282.2	89.26696623	80.76	104.82	YES	NO
1	10/10/2008	21	1	416.6	550.1850146	104.82	157.995	YES	YES
1	10/10/2008	22	1	636.7	1038.64914	157.995	516.345	YES	YES
1	10/25/2008	10	1	472.1	715.1668664	113.355	179.88	YES	YES
1	10/25/2008	11	1	727.1	1248.853696	179.88	387.225	YES	YES
1	10/30/2008	19	1	470.7	433.813887	122.595	231.33	YES	YES
1	12/11/2008	17	1	305.8	111.2891616	81.885	63.3	YES	YES
1	12/12/2008	13	1	360.2	241.1467438	86.52	114.99	YES	YES
1	12/12/2008	14	1	406.4	306.3182594	114.99	125.295	YES	YES
1	12/12/2008	15	1	428.9	342.8482895	125.295	132.12	YES	YES
1	12/12/2008	16	1	451.9	400.8594338	132.12	146.95455	YES	YES
1	12/12/2008	17	0.83	527.797	557.7455974	146.95455	79.16955	YES	YES
1	12/13/2008	0	1	380.8	227.0687256	102.975	121.83	YES	YES
1	12/13/2008	1	1	431.4	324.6439556	121.83	125.19	YES	YES
1	12/13/2008	2	1	403.2	260.0792511	125.19	124.605	YES	YES
1	12/13/2008	3	1	427.5	317.1194976	124.605	111.6315	YES	YES

UNIT ID	OP DATE	OP HOUR	OP TIME	HEAT INPUT	Startup PM (lb/hr)	PM Limit at 0.3 lb/MMBtu (Previous Hour)	PM Limit at 0.3lb/MMBtu (Following Hour)	PM Violation (Previous Hour)?	PM Violation (Following Hour)?
1	12/13/2008	4	0.85	316.71	235.4063105	111.6315	47.5065	YES	YES
1	12/13/2008	10	1	404.8	306.9250705	109.395	117.45	YES	YES
1	12/13/2008	11	1	378.2	291.9975167	117.45	120.165	YES	YES
1	12/13/2008	12	1	422.9	340.7851317	120.165	141.36	YES	YES
1	12/13/2008	13	1	519.5	488.8470479	141.36	254.19	YES	YES
1	12/13/2008	16	0.6	777.78	896.1629521	309.987	116.667	YES	YES
1	12/15/2008	16	1	438.6	262.142409	103.98	151.29	YES	YES
1	12/15/2008	17	1	570	547.343641	151.29	183.12	YES	YES
1	12/15/2008	18	1	650.8	688.1238236	183.12	450.36	YES	YES
1	5/9/2009	19	1	49.5	12.35876531	47.88	11.175	NO	YES
1	5/9/2009	20	1	25	12.51721102	11.175	7.47	YES	YES
1	5/9/2009	21	1	24.8	12.51721102	7.47	7.44	YES	YES
1	5/9/2009	22	1	24.8	12.51721102	7.44	7.47	YES	YES
1	5/9/2009	23	1	25	12.51721102	7.47	7.4166	YES	YES
1	5/10/2009	0	0.97	24.444	12.29538703	7.4166	3.6666	YES	YES
1	5/10/2009	2	0.53	40.598	6.802074294	6.0897	39.8097	YES	NO
1	5/10/2009	10	1	446.3	193.1453195	100.41	145.305	YES	YES
1	5/10/2009	11	1	522.4	506.075595	145.305	228.48	YES	YES
1	5/10/2009	12	1	1000.8	1271.051479	228.48	400.395	YES	YES
1	7/7/2009	11	0.02	127.986	256.5592369	972.3879	19.1979	NO	YES
1	7/8/2009	21	1	285.7	208.329266	81.57	112.005	YES	YES
1	7/8/2009	22	1	461	627.9805569	112.005	287.145	YES	YES
1	7/9/2009	7	0.53	739.933	1395.998949	110.98995	153.93495	YES	YES
1	7/9/2009	9	1	338.7	331.6974348	93.75	167.655	YES	YES
1	7/9/2009	10	1	779	1430.704975	167.655	581.43	YES	YES
1	7/20/2009	6	0.58	519.68	1147.363872	865.317	77.952	YES	YES
1	7/20/2009	10	1	410.1	562.1398631	105.135	138.645	YES	YES
1	7/20/2009	11	1	514.2	962.3382217	138.645	257.265	YES	YES
1	7/20/2009	19	1	1012.4	1624.236712	196.62	642.6	YES	YES
1	8/9/2009	6	1	421	307.7913485	101.79	137.832	YES	YES
1	8/9/2009	7	0.9	497.88	573.2273389	137.832	74.682	YES	YES
1	8/9/2009	9	0.5	150.65	118.0320806	22.5975	81.9675	YES	YES
1	8/9/2009	10	1	395.8	335.9374601	81.9675	141.45	YES	YES
1	8/9/2009	11	1	547.2	657.499218	141.45	485.175	YES	YES
1	8/10/2009	8	0.12	312.564	528.4387041	766.1346	46.8846	NO	YES
1	8/13/2009	6	1	551.1	611.9509408	132.36	226.935	YES	YES
1	8/13/2009	7	1	961.8	1303.649197	226.935	643.935	YES	YES
1	10/14/2009	20	1	619.3	803.362185	142.74	444.915	YES	YES
1	3/19/2010	22	0.65	853.97	1561.300409	583.2405	128.0955	YES	YES
1	3/28/2010	2	1	470.9	308.3548099	129.51	157.275	YES	YES
1	3/28/2010	3	1	577.6	560.5390409	157.275	160.5	YES	YES
1	3/28/2010	4	1	492.4	452.0314835	160.5	155.58	YES	YES

UNIT ID	OP DATE	OP HOUR	OP TIME	HEAT INPUT	Startup PM (lb/hr)	PM Limit at 0.3 lb/MMBtu (Previous Hour)	PM Limit at 0.3lb/MMBtu (Following Hour)	PM Violation (Previous Hour)?	PM Violation (Following Hour)?
1	3/28/2010	5	1	544.8	578.3736164	155.58	253.65	YES	YES
1	3/28/2010	6	1	1146.2	1585.943793	253.65	677.115	YES	YES
1	4/13/2010	1	0.63	766.017	1290.689266	569.58255	114.90255	YES	YES
1	4/15/2010	11	1	729	843.5688665	171.015	353.745	YES	YES
1	5/31/2010	2	0.88	331.848	247.7396745	49.7772	113.2272	YES	YES
1	5/31/2010	5	1	524.1	560.7769858	142.5	201.45	YES	YES
1	5/31/2010	6	1	818.9	1377.321407	201.45	289.185	YES	YES
1	10/2/2010	11	1	451.2	359.1017944	130.02	161.355	YES	YES
1	10/2/2010	12	1	624.5	1090.012786	161.355	221.31	YES	YES
1	10/2/2010	13	1	850.9	1615.252108	221.31	529.065	YES	YES
1	10/16/2010	9	1	455.5	586.4231138	128.025	96.6225	YES	YES
1	10/16/2010	10	0.5	188.65	143.3897073	96.6225	87.0225	YES	YES
1	10/16/2010	12	1	494.4	528.0631892	132.885	264.225	YES	YES
1	5/2/2011	10	0.27	261.468	429.3769864	39.2202	70.3152	YES	YES
1	5/2/2011	19	1	451.4	498.762156	111.6	147.645	YES	YES
1	5/2/2011	20	1	532.9	1403.672397	147.645	147.471	YES	YES
1	5/2/2011	21	0.8	450.24	1161.952749	147.471	67.536	YES	YES
1	5/3/2011	5	0.2	17.78	2.830729078	2.667	46.887	YES	NO
1	5/3/2011	9	1	517.9	437.0707234	127.965	160.095	YES	YES
1	5/3/2011	10	1	549.4	867.833844	160.095	179.76	YES	YES
1	5/3/2011	11	1	649	1262.289787	179.76	214.425	YES	YES
1	5/3/2011	12	1	780.5	1419.518326	214.425	410.61	YES	YES
1	5/4/2011	8	0.93	287.37	61.95142894	43.1055	94.9005	YES	NO
1	5/4/2011	10	1	516.6	625.2219007	129.285	157.89	YES	YES
1	5/4/2011	11	1	536	708.2976454	157.89	332.175	YES	YES
1	5/8/2011	10	1	479	487.2238582	119.31	240.435	YES	YES
2	1/8/2008	23	0.28	644.98	1648.445405	745.392	96.747	YES	YES
2	1/10/2008	19	1	1265.6	429.5725914	378.165	381.045	YES	YES
2	1/10/2008	20	1	1274.7	1234.99687	381.045	408.87	YES	YES
2	1/17/2008	13	1	1222.3	924.7391853	360.3	433.2	YES	YES
2	3/27/2008	6	1	1144	386.992661	337.395	343.335	YES	YES
2	3/27/2008	7	1	1144.9	430.171964	343.335	342.075	YES	YES
2	3/27/2008	8	1	1135.6	537.0149492	342.075	524.58	YES	YES
2	4/16/2008	23	0.65	335.985	503.4162338	335.05275	50.39775	YES	YES
2	4/25/2008	19	1	466.7	144.6493201	120.345	146.895	YES	NO
2	4/25/2008	20	1	512.6	390.1871648	146.895	237.675	YES	YES
2	4/25/2008	21	1	1071.9	1258.083085	237.675	320.43	YES	YES
2	4/25/2008	22	1	1064.3	1446.334071	320.43	331.995	YES	YES
2	5/3/2008	7	1	534.2	584.5392299	137.82	198.525	YES	YES
2	5/3/2008	8	1	789.3	1248.717236	198.525	253.035	YES	YES
2	5/3/2008	9	1	897.6	1498.116468	253.035	320.46	YES	YES
2	5/26/2008	6	1	375.8	353.1330412	58.55025	134.265	YES	YES

UNIT ID	OP DATE	OP HOUR	OP TIME	HEAT INPUT	Startup PM (lb/hr)	PM Limit at 0.3 lb/MMBtu (Previous Hour)	PM Limit at 0.3lb/MMBtu (Following Hour)	PM Violation (Previous Hour)?	PM Violation (Following Hour)?
2	5/26/2008	7	1	519.3	755.2384536	134.265	173.775	YES	YES
2	5/26/2008	8	1	639.2	1194.425182	173.775	225.195	YES	YES
2	5/26/2008	9	1	862.1	1650.509726	225.195	558.885	YES	YES
2	8/29/2008	2	1	524	501.6831649	137.13	226.575	YES	YES
2	8/29/2008	3	1	986.5	1304.503358	226.575	435.3	YES	YES
2	9/29/2008	15	0.1	7.03	1.5260799	1.0545	21.207	YES	NO
2	10/2/2008	1	1	583.8	739.5477642	122.865	292.86	YES	YES
2	10/6/2008	21	0.02	0.51	0.48632733	0.0765	52.7115	YES	NO
2	10/6/2008	23	1	473.2	387.2606519	123.615	398.76	YES	NO
2	12/31/2008	12	0.07	0.07	1.590965417	0.0105	38.2155	YES	NO
2	12/31/2008	23	1	408.6	445.0604663	104.505	140.4	YES	YES
2	1/1/2009	0	1	527.4	611.2901774	140.4	175.665	YES	YES
2	1/1/2009	1	1	643.7	802.6584674	175.665	443.655	YES	YES
2	1/12/2009	5	0.45	469.71	765.5962471	514.0965	70.4565	YES	YES
2	1/13/2009	16	1	469.7	262.7588978	119.295	324.66	YES	NO
2	2/27/2009	7	0.22	685.41	1253.68751	627.6465	102.8115	YES	YES
2	3/2/2009	7	1	435.1	192.965992	111.375	159.615	YES	YES
2	3/2/2009	8	1	629	749.5914626	159.615	253.35	YES	YES
2	3/2/2009	9	1	1060	1537.925855	253.35	542.07	YES	YES
2	3/9/2009	21	0.18	409.59	843.5517444	415.9335	61.4385	YES	YES
2	3/10/2009	1	1	327.9	205.6030319	101.04	273.21	YES	NO
2	3/15/2009	23	1	485.1	425.6000531	129.63	166.545	YES	YES
2	3/16/2009	0	1	625.2	1079.016084	166.545	235.485	YES	YES
2	4/20/2009	1	0.28	774.592	1395.785889	608.7138	116.1888	YES	YES
2	4/21/2009	12	1	610.6	640.0342333	145.17	343.17	YES	YES
2	8/16/2009	1	0.82	371.214	673.7451555	101.8221	65.6151	YES	YES
2	8/16/2009	6	1	405.2	216.1402002	89.7	104.88	YES	YES
2	8/16/2009	8	1	700.5	1267.91995	149.175	534.66	YES	YES
2	10/6/2009	17	0.75	225.075	115.3577049	33.76125	96.74625	YES	YES
2	10/6/2009	18	1	419.9	293.4895672	96.74625	123.84	YES	YES
2	10/6/2009	19	1	405.7	245.299305	123.84	194.7741	YES	YES
2	10/6/2009	22	0.17	44.319	7.176001085	6.64785	65.77785	YES	NO
2	10/6/2009	23	1	394.2	109.2433389	65.77785	142.695	YES	NO
2	10/7/2009	0	1	557.1	632.9954	142.695	284.25	YES	YES
2	12/4/2009	8	1	409	111.8623986	73.752	119.655	YES	NO
2	12/4/2009	9	1	388.7	134.1059304	119.655	116.85	YES	YES
2	12/4/2009	10	1	390.3	195.6786051	116.85	170.79	YES	YES
2	12/4/2009	11	1	748.3	1308.983486	170.79	617.385	YES	YES
2	12/22/2009	10	1	522.4	322.8535799	134.37	242.58	YES	YES
2	1/17/2010	23	1	525.4	507.253857	130.665	153.825	YES	YES
2	1/18/2010	0	1	500.1	566.693733	153.825	150.33	YES	YES
2	1/18/2010	1	1	502.1	591.8801211	150.33	154.575	YES	YES



UNIT ID	OP DATE	OP HOUR	OP TIME	HEAT INPUT	Startup PM (lb/hr)	PM Limit at 0.3 lb/MMBtu (Previous Hour)	PM Limit at 0.3lb/MMBtu (Following Hour)	PM Violation (Previous Hour)?	PM Violation (Following Hour)?
2	1/18/2010	2	1	528.4	650.8162693	154.575	307.095	YES	YES
2	3/18/2010	20	1	503.5	744.8257827	138.195	223.44	YES	YES
2	5/21/2010	4	1	488.7	318.3189009	133.62	163.68	YES	YES
2	5/21/2010	5	1	602.5	741.9202953	163.68	228.945	YES	YES
2	5/21/2010	6	1	923.8	1308.864052	228.945	405.585	YES	YES
2	7/17/2010	15	1	389.5	344.391754	97.875	175.23	YES	YES
2	7/17/2010	16	1	778.7	1258.213436	175.23	250.11	YES	YES
2	7/17/2010	17	1	888.7	1484.91856	250.11	295.08	YES	YES
2	10/2/2010	22	1	678.2	1112.793565	159.54	340.11	YES	YES
2	10/24/2010	1	1	500.8	622.055811	130.11	161.43	YES	YES
2	10/24/2010	2	1	575.4	935.0426046	161.43	292.095	YES	YES
2	10/27/2010	16	1	606.7	666.1670698	147.63	323.967	YES	YES
2	10/27/2010	21	1	625.1	683.5794088	153.075	333.96	YES	YES
2	11/3/2010	15	1	545.8	613.9789181	120.15	289.995	YES	YES
2	2/10/2011	5	1	371	213.1409906	102.66	126.855	YES	YES
2	2/10/2011	6	1	474.7	330.0885202	126.855	148.89	YES	YES
2	2/10/2011	7	1	517.9	522.4754422	148.89	224.745	YES	YES
2	2/10/2011	8	1	980.4	1203.900696	224.745	602.475	YES	YES
2	2/16/2011	12	1	393.6	101.2996207	79.1055	117.33	YES	NO
2	2/16/2011	14	1	380.4	116.2886703	115.35	109.41	YES	YES
2	2/16/2011	16	1	672.8	736.2752921	153.27	364.335	YES	YES
2	4/3/2011	3	1	488.5	360.5786313	129	239.58	YES	YES
2	4/11/2011	7	1	400.2	411.5025833	114.975	127.05	YES	YES
2	4/11/2011	8	1	446.8	688.3177193	127.05	167.37	YES	YES
2	6/4/2011	2	0.43	117.519	340.033821	226.08285	17.62785	YES	YES
2	6/6/2011	20	1	499	549.1192461	132.87	157.77	YES	YES
2	6/6/2011	21	1	552.8	1318.518217	157.77	113.559	YES	YES
2	6/6/2011	22	0.35	204.26	436.4326899	113.559	30.639	YES	YES
2	6/7/2011	17	1	621.9	1241.187951	153.75	335.115	YES	YES
Subtotals								189	181
Total Violations									<b>370</b>



# **ATTACHMENT E**



**AERMOD Modeling of SO2 Impacts of the  
Luminant Big Brown Coal Plant**

Final Report

June 2011

Prepared for

**Sierra Club**  
San Francisco, California

Prepared by  
Mr. Khanh T. Tran  
Principal

**AMI Environmental**  
206 Black Eagle Ave  
Henderson, NV 89002  
Tel. (714)679-7363

## Table of Contents

	Page
I. Introduction	3
II. Modeling Methodologies	3
III. Modeling Results	6
IV. Conclusions	7
V. References	7
Appendix A - Summary of AERMOD Modeling Results	9

## I. INTRODUCTION

This document presents the methodologies and results of an application of the AERMOD model to predict the air quality impacts of sulfur dioxide (SO<sub>2</sub>) emitted by the Big Brown Steam Station. Big Brown is a coal-fired power plant operated by Luminant near Fairfield, in Freestone County, Texas (Figure 1). It consists of two coal-fired boilers with a total electric generating capacity of 1,187 MW (gross). SO<sub>2</sub> impacts predicted by the AERMOD model will be compared against the 1-hour SO<sub>2</sub> ambient air quality standard (AAQS) of 75 ppb (or 196 ug/m<sup>3</sup>) which has been promulgated in June 2010 by the U.S. Environmental Protection Agency (EPA).



**Figure 1. Luminant Big Brown Coal Plant**

## II. MODELING METHODOLOGIES

This section documents the methodologies and assumptions used in the generation of modeling inputs such as source emissions, stack parameters, receptors and meteorological data.

### A. Model Version

The version 11103 of the AERMOD model has been used in the modeling study. It is currently the latest version of the model that has been approved by the US Environmental Protection Agency (USEPA, 2011). It predicts the 1-hour SO<sub>2</sub> concentrations that can be compared against the 1-hour AAQS which is attained when the 3-year average of the 99<sup>th</sup>

percentile of the daily maximum 1-hour concentrations does not exceed 75 ppb (or 196 ug/m<sup>3</sup>) at each monitor within an area (USEPA, 2010a; 2010b).

## **B. Source Emissions**

Coal-fired boilers at the plant are major sources of SO<sub>2</sub>. The US EPA Clean Air Market database shows that, from 2003 to 2010, the year 2006 has the highest emission total of 96,221.3 tons per year (tpy).

<http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard>

Emissions by boiler are as follows: 49,777.2 tpy for Unit 1 and 46,444.1 tpy for Unit 2. These emissions have been converted to grams per second (g/s) in Table 1 as required by the AERMOD model by assuming that the boilers operate continuously, i.e. 8760 hours per year. U.S. EPA's guidance on modeling 1-hour SO<sub>2</sub> impacts and the Modeling Guideline require using the maximum 1-hour emission rate. There are no 1-hour limits in the permit for the coal-fired boilers. Therefore, the maximum theoretical emissions during a 1-hour period should be used. The emission rates used for this model are lower than the 1-hour maximum theoretical emissions and, hence, the modeled impacts are underestimated. The purpose of this modeling is to show that even when using emission rates lower than the 1-hour maximum, the facility causes violations of the NAAQS. Using the 1-hour maximum, as required by U.S. EPA and the Modeling Guidelines, should result in even higher modeled concentrations.

## **C. Stack Parameters**

Stack parameters (stack height, diameter, temperature and exit velocity) for the boilers are shown in Table 1. They have been obtained from CENRAP point source data used in a previous photochemical modeling study (AMI, 2010).

**Table 1. Plant SO<sub>2</sub> Emissions & Stack Parameters**

<b>Stack</b>	<b>SO<sub>2</sub> (g/s)</b>	<b>Height (m)</b>	<b>Diameter (m)</b>	<b>Temperature (K)</b>	<b>Velocity (m/s)</b>
Stack 1	1,431.9468	122	6.77	459	23.7
Stack 2	1,336.0631	122	6.77	459	23.7

## **D. Receptors**

The AERMOD modeling uses a grid of discrete receptors that are located within a radius of 50 km around the plant. The receptor grid has varying resolutions: 50 m on the plant boundaries, 100 m within the first 5 km, 250 m between 5 km and 10 km, 500 m between 10 km and 20 km, and 1000 m between 20 km and 50 km. Receptors located on-site have



been removed from consideration and a total of 33,380 receptors have been used in the AERMOD modeling. The preprocessor AERMAP has been employed to obtain terrain elevations at these receptors using the NED data.

**E. Meteorological Data**

The AERMOD modeling uses a 5-year meteorological dataset that has been processed and recommended by TCEQ. It is comprised of surface observations at Waco (Station No. 13959) and upper-air data from the Longview site (Station No. 03951). Meteorological data processed by TCEQ for the years 1987 through 1991 have been used in the AERMOD modeling. The pre-processed data from TCEQ was used here to be consistent with TCEQ practices, even though the TCEQ practices are, themselves, inconsistent with best modeling practices.

**F. Background Concentrations**

For comparing against the SO<sub>2</sub> 1-hour NAAQS, background concentrations at a monitoring station are added to the concentrations predicted by the AERMOD model. Maximum 1-hour SO<sub>2</sub> measurements in Dallas, Longview and Waco for 2006-2008 are shown in Table 2. The Longview measurements are the highest and exceed the NAAQS and, hence, they are not suitable as background. The Waco measurements are much lower than those in Dallas; they are more representative as background since Waco is a much smaller city and less polluted than Dallas, and there is less chance for a “double counting” for an existing source such as the Luminant plant. Thus, a background of 21 ug/m<sup>3</sup> is used in comparing modeled SO<sub>2</sub> impacts against the NAAQS.

**Table 2. Maximum Ambient 1-Hour SO<sub>2</sub> Concentrations in Dallas, Longview and Waco**

<b>Year</b>	<b>1-Hour SO<sub>2</sub> in Dallas</b>	<b>1-Hour SO<sub>2</sub> in Longview</b>	<b>1-Hour SO<sub>2</sub> in Waco</b>
2008	23 ppb (60 ug/m <sup>3</sup> )	96 ppb (251 ug/m <sup>3</sup> )	8 ppb (21 ug/m <sup>3</sup> )
2007	14 ppb (45 ug/m <sup>3</sup> )	168 ppb (440 ug/m <sup>3</sup> )	8 ppb (21 ug/m <sup>3</sup> )
2006	16 ppb (42 ug/m <sup>3</sup> )	111 ppb (291 ug/m <sup>3</sup> )	Not available

Source: US EPA AirData

<http://iaspub.epa.gov/airsdata/adaqs.monvals?geotype=st&geocode=TX&geoinfo=st~TX~Texas&pol=SO2&year=2008&fld=monid&fld=siteid&fld=address&fld=city&fld=county&fld=stabbr&fld=regn&rpp=25>

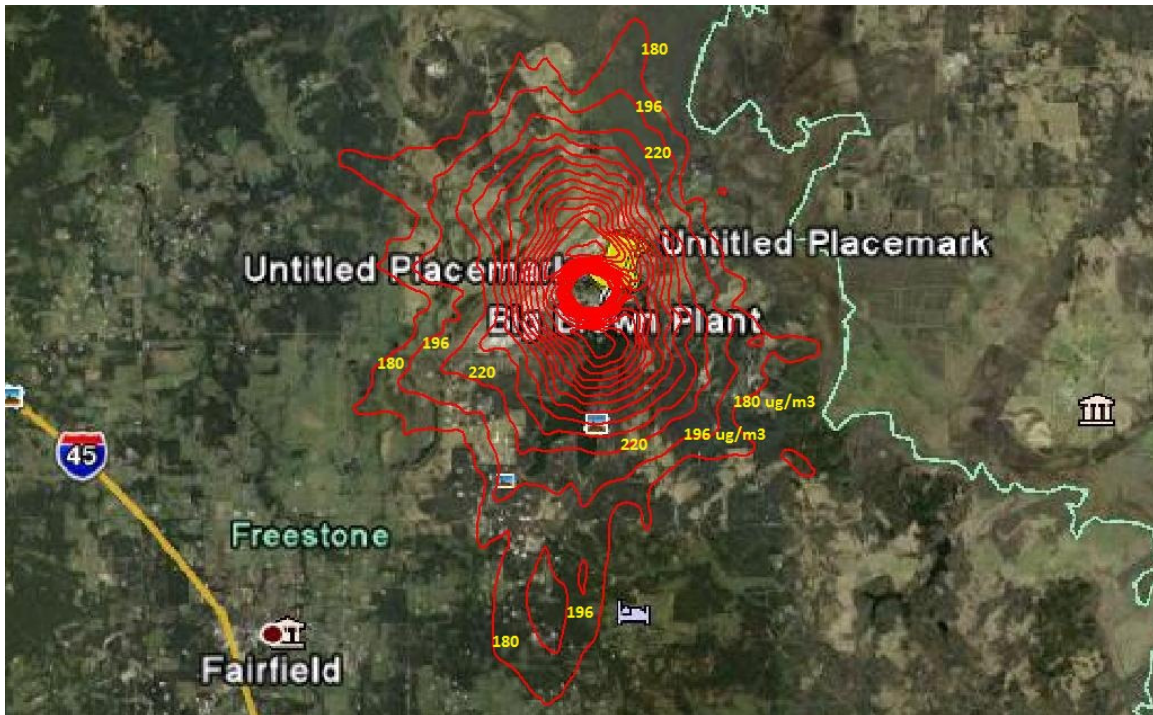
### III. MODELING RESULTS

In June 2010, US EPA has announced a new 1-hour AAQS which is attained when the 3-year average of the 99<sup>th</sup> percentile of the daily maximum 1-hour concentrations does not exceed 75 ppb (or 196 ug/m<sup>3</sup>) at each monitor within an area. Subsequently, US EPA has issued in August 2010 a modeling guidance for using the AERMOD model with 5-year of meteorological data (USEPA, 2010b). According to the US EPA, the 4<sup>th</sup> highest maximum daily 1-hour concentrations averaged over five years should be used in the NAAQS comparison.

Five runs of the AERMOD model have been performed. SO<sub>2</sub> modeling results are summarized in Appendix A and presented in Table 3. According to the US EPA recommendations, modeled impacts in Table 3 have been averaged over five years of modeled meteorological data. The AERMOD model has predicted a maximum 1-hour concentration of 507.6 ug/m<sup>3</sup> and a 4<sup>th</sup> highest (99<sup>th</sup> percentile) concentration of 496.1 ug/m<sup>3</sup> from the plant emissions alone. Both these concentrations largely exceed (by more than a factor of 2) the NAAQS of 196 ug/m<sup>3</sup>: 159% by the maximum 1-hour concentration and 153% by the 4<sup>th</sup> highest concentration. With the background of 21 ug/m<sup>3</sup>, the maximum total 1-hour concentration is 528.6 ug/m<sup>3</sup> which is 170% over the NAAQS, and the maximum total 4<sup>th</sup> highest concentration is 517.1 ug/m<sup>3</sup> which is 164% above the 1-hour NAAQS of 196 ug/m<sup>3</sup>. A plot of the contour of 196 ug/m<sup>3</sup> is shown in Figure 2. The area with concentrations exceeding 196 ug/m<sup>3</sup>, i.e. violating the 1-hr NAAQS, due to the plant emissions alone has a radius of about 5 miles around the plant. With the addition of the background of 21 ug/m<sup>3</sup>, the impact area represented by the 180 ug/m<sup>3</sup> contour reaches 10 miles in the south.

**Table 3. Predicted 1-Hour SO<sub>2</sub> Impacts by the Luminant Big Brown Plant (averaged over 5 years)**

<b>Pollutant</b>	<b>Project Conc. (ug/m<sup>3</sup>)</b>	<b>Background Conc. (ug/m<sup>3</sup>)</b>	<b>Total Conc. (ug/m<sup>3</sup>)</b>	<b>NAAQS (ug/m<sup>3</sup>)</b>	<b>NAAQS Exceed</b>	<b>Percent Over NAAQS</b>
1-hour SO <sub>2</sub> (max)	507.6	21	528.6	196	<b>YES</b>	<b>170%</b>
1-hour SO <sub>2</sub> (4 <sup>th</sup> highest)	496.1	21	517.1	196	<b>YES</b>	<b>164%</b>



**Figure 2. Area with 4<sup>th</sup> Highest 5-yr Averaged SO<sub>2</sub> Concentrations Exceeding the 1-Hour NAAQS of 196 ug/m<sup>3</sup> by Plant Emissions Alone**

#### **IV. CONCLUSIONS**

Air quality impacts of SO<sub>2</sub> emissions from the Luminant Big Brown facility have been analyzed with the AERMOD model. Using 2006 actual emissions, five years of meteorological data and the latest US EPA modeling guidance, the AERMOD model has predicted large exceedances (more than a factor of 2) of the recent 1-hour NAAQS of 196 ug/m<sup>3</sup>. The plant alone has also been shown to cause a large area with a radius of about 6 miles where the concentrations exceed this NAAQS. Thus, SO<sub>2</sub> impacts from the Big Brown coal plant are very adverse since its SO<sub>2</sub> emissions alone cause large exceedances of the 1-hour NAAQS and a large area of NAAQS violations. It should be noted that the predicted NAAQS exceedances are understated since annual-averaged emissions that are less than maximum hourly emissions have been used in the modeling

#### **V. REFERENCES**

AMI, 2010. Photochemical Modeling of Ozone, PM<sub>2.5</sub> and Visibility Impacts in Arkansas from Texas Existing and Planned Coal-Fired Power Plants. Report prepared for Sierra Club by AMI Environmental, September 2010.

U.S. EPA, 2011. Addendum to User's Guide of the AMS/EPA Regulatory Model AERMOD version 11103, March 2011. Available at:  
[http://www.epa.gov/ttn/scram/models/aermod/aermod\\_userguide.zip](http://www.epa.gov/ttn/scram/models/aermod/aermod_userguide.zip)

U.S. EPA, 2010a. *Guidance Concerning the Implementation of the 1-hour SO<sub>2</sub> NAAQS for the Prevention of Significant Deterioration Program*. Memorandum issued on August 23, 2010 from Stephen D. Page, Director of OAQPS. Available at  
<http://www.epa.gov/region07/air/nsr/nsrmemos/appwso2.pdf>

U.S. EPA, 2010b. *Applicability of Appendix W Modeling Guidance for the 1-hour SO<sub>2</sub> NAAQS*. Memorandum issued on August 23, 2010 from Tyler Fox, Leader of Air Quality Modeling Group, OAQPS. Available at  
<http://www.epa.gov/region07/air/nsr/nsrmemos/appwso2.pdf>

-

## **Appendix A**

### **Summary of AERMOD Modeling Results**

\*\*\* AERMOD - VERSION 11103 \*\*\* \*\*\* Big Brown - 1991 SO2 runs (AMI)  
 \*\*\* 06/02/11

\*\*\*

\*\*\* 22:11:15

PAGE 4

\*\*MODELOPTs: RegDFAULT CONC

ELEV

MULTYR

\*\*\* THE SUMMARY OF MAXIMUM 1ST-HIGHEST MAX DAILY 1-HR RESULTS  
 AVERAGED OVER 5 YEARS \*\*\*

\*\* CONC OF SO2 IN MICROGRAMS/M\*\*3

\*\*

GROUP ID	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) OF TYPE GRID-ID	NETWORK
ALL	1ST HIGHEST VALUE IS 507.61542 AT ( 778950.00, 3525550.00, 97.97, 97.97, 0.00)	DC	
	2ND HIGHEST VALUE IS 506.91454 AT ( 778800.00, 3525600.00, 98.22, 98.22, 0.00)	DC	
	3RD HIGHEST VALUE IS 505.11206 AT ( 778450.00, 3525550.00, 97.51, 97.51, 0.00)	DC	
	4TH HIGHEST VALUE IS 504.34776 AT ( 778400.00, 3525500.00, 97.53, 97.53, 0.00)	DC	
	5TH HIGHEST VALUE IS 502.63979 AT ( 778400.00, 3525600.00, 97.77, 97.77, 0.00)	DC	
	6TH HIGHEST VALUE IS 502.33292 AT ( 778900.00, 3525500.00, 97.39, 97.39, 0.00)	DC	
	7TH HIGHEST VALUE IS 502.30230 AT ( 778300.00, 3525500.00, 98.18, 98.18, 0.00)	DC	
	8TH HIGHEST VALUE IS 502.12094 AT ( 778700.00, 3525500.00, 94.44, 94.44, 0.00)	DC	
	9TH HIGHEST VALUE IS 501.60334 AT ( 779000.00, 3525500.00, 97.76, 97.76, 0.00)	DC	
	10TH HIGHEST VALUE IS 501.52012 AT ( 778900.00, 3525600.00, 98.87, 98.87, 0.00)	DC	

\*\*\* AERMOD - VERSION 11103 \*\*\* \*\*\* Big Brown - 1991 SO2 runs (AMI)  
 \*\*\* 06/02/11

\*\*\* 22:11:15

PAGE 5

\*\*MODELOPTs: RegDFAULT CONC

ELEV

MULTYR

\*\*\* THE SUMMARY OF MAXIMUM 2ND-HIGHEST MAX DAILY 1-HR RESULTS  
 AVERAGED OVER 5 YEARS \*\*\*

\*\* CONC OF SO2 IN MICROGRAMS/M\*\*3 \*\*

GROUP ID	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) OF TYPE GRID-ID	NETWORK
ALL	1ST HIGHEST VALUE IS 502.13021	AT ( 778800.00, 3525600.00, 98.22, 98.22, 0.00)	DC
	2ND HIGHEST VALUE IS 500.41246	AT ( 778950.00, 3525550.00, 97.97, 97.97, 0.00)	DC
	3RD HIGHEST VALUE IS 499.48276	AT ( 778400.00, 3525500.00, 97.53, 97.53, 0.00)	DC
	4TH HIGHEST VALUE IS 498.96391	AT ( 778400.00, 3525600.00, 97.77, 97.77, 0.00)	DC
	5TH HIGHEST VALUE IS 498.56972	AT ( 778900.00, 3525500.00, 97.39, 97.39, 0.00)	DC
	6TH HIGHEST VALUE IS 498.01424	AT ( 778450.00, 3525550.00, 97.51, 97.51, 0.00)	DC
	7TH HIGHEST VALUE IS 497.48710	AT ( 779000.00, 3525600.00, 98.02, 98.02, 0.00)	DC
	8TH HIGHEST VALUE IS 497.04936	AT ( 778900.00, 3525600.00, 98.87, 98.87, 0.00)	DC
	9TH HIGHEST VALUE IS 496.61637	AT ( 779000.00, 3525500.00, 97.76, 97.76, 0.00)	DC
	10TH HIGHEST VALUE IS 495.99575	AT ( 779100.00, 3525500.00, 98.25, 98.25, 0.00)	DC

\*\*\* AERMOD - VERSION 11103 \*\*\* \*\*\* Big Brown - 1991 SO2 runs (AMI)  
 \*\*\* 06/02/11

\*\*\*

\*\*\* 22:11:15

\*\*MODELOPTs: RegDFAULT CONC

PAGE 6

ELEV

MULTYR

\*\*\* THE SUMMARY OF MAXIMUM 4TH-HIGHEST MAX DAILY 1-HR RESULTS  
 AVERAGED OVER 5 YEARS \*\*\*

\*\* CONC OF SO2 IN MICROGRAMS/M\*\*3

\*\*

GROUP ID	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) OF TYPE GRID-ID	NETWORK
ALL	1ST HIGHEST VALUE IS 496.08508	AT ( 778800.00, 3525600.00, 98.22, 98.22, 0.00)	DC
	2ND HIGHEST VALUE IS 493.85750	AT ( 778900.00, 3525600.00, 98.87, 98.87, 0.00)	DC
	3RD HIGHEST VALUE IS 492.49927	AT ( 779000.00, 3525500.00, 97.76, 97.76, 0.00)	DC
	4TH HIGHEST VALUE IS 492.35445	AT ( 778900.00, 3525500.00, 97.39, 97.39, 0.00)	DC
	5TH HIGHEST VALUE IS 492.32315	AT ( 778450.00, 3525550.00, 97.51, 97.51, 0.00)	DC
	6TH HIGHEST VALUE IS 492.26252	AT ( 779000.00, 3525600.00, 98.02, 98.02, 0.00)	DC
	7TH HIGHEST VALUE IS 490.53922	AT ( 778950.00, 3525550.00, 97.97, 97.97, 0.00)	DC
	8TH HIGHEST VALUE IS 489.92547	AT ( 778500.00, 3525600.00, 97.71, 97.71, 0.00)	DC
	9TH HIGHEST VALUE IS 488.90832	AT ( 778400.00, 3525500.00, 97.53, 97.53, 0.00)	DC
	10TH HIGHEST VALUE IS 488.65418	AT ( 778800.00, 3525700.00, 98.03, 98.03, 0.00)	DC