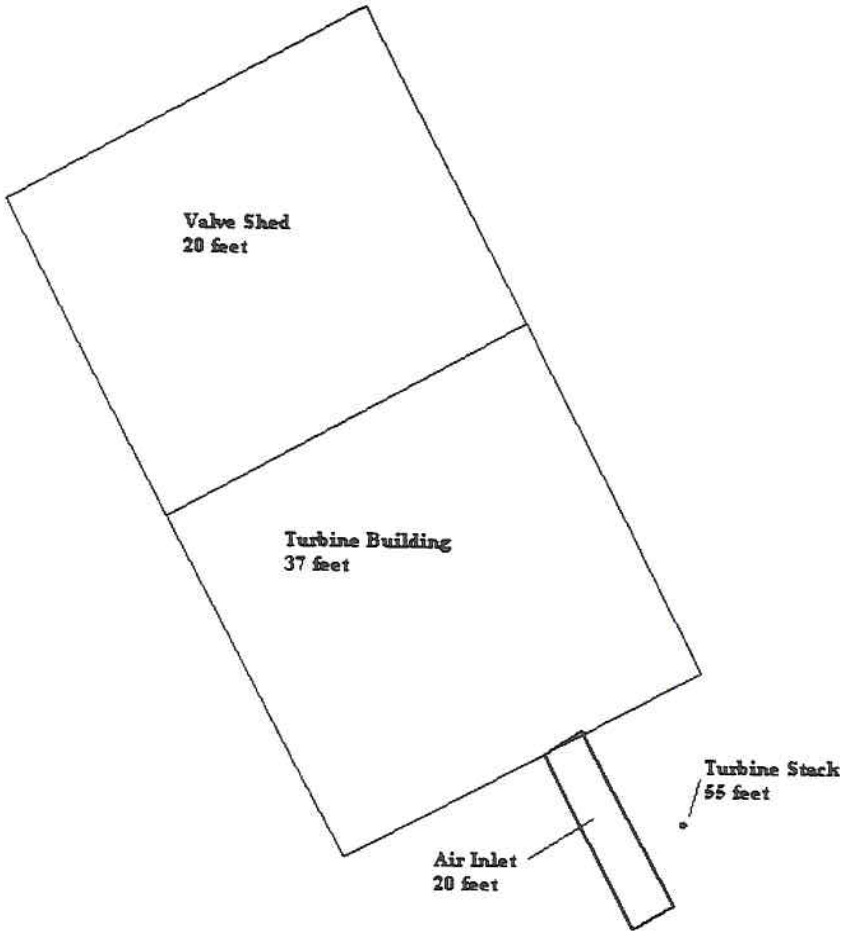
APPENDIX E

Dispersion Modeling Files and Air Quality Protocol

Schematic Diagram for BPIP-Prime Analysis



BPIP-Prime Input:

```
'C:\TGP NH AERMOD\Final AERMOD 2\SOLAR00.BST BEESTWin BPIP-Prime Files
12/4/2007 9:56:16 PM'
'P'
'METERS'      1.0
'UTMY'        0
 3
'TURBBLDG'     1            58.83
 4            11.2776
307116.27     4739288.91
307108.45     4739303.57
307124.05     4739311.89
307131.87     4739297.23
'INLET'        2            58.83
 4            6.096
307124.96     4739293.54
307126.59     4739294.41
307130.58     4739287.07
307128.85     4739286.15
 4            6.096
307125.08     4739293.53
307126.71     4739294.34
307130.69     4739287.07
307128.96     4739286.15
'VALVESHD'     1            58.83
 4            6.096
307108.45     4739303.57
307101.28     4739317.01
307116.87     4739325.34
307124.05     4739311.89
 6
'100%_40F'     58.8264       16.764       307131.12     4739290.31
'75%_40F '     58.8264       16.764       307131.12     4739290.31
'50%_40F '     58.8264       16.764       307131.12     4739290.31
'100%_0F '     58.8264       16.764       307131.12     4739290.31
'75%_0F  '     58.8264       16.764       307131.12     4739290.31
'50%_0F  '     58.8264       16.764       307131.12     4739290.31
```

BPIP-Prime Output:

SO BUILDHGT	100%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDWID	100%_40F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	100%_40F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	100%_40F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDWID	100%_40F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	100%_40F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	100%_40F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDLEN	100%_40F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	100%_40F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	100%_40F	22.02	19.91	17.20	18.93	21.28	22.98
SO BUILDLEN	100%_40F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	100%_40F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	100%_40F	22.02	19.91	17.20	18.93	21.28	22.98
SO XBADJ	100%_40F	-3.96	-6.39	-8.64	-10.62	-12.28	-13.56
SO XBADJ	100%_40F	-16.77	-20.02	-22.67	-24.63	-25.84	-26.26
SO XBADJ	100%_40F	-25.89	-24.73	-22.82	-22.70	-22.48	-21.58
SO XBADJ	100%_40F	-20.02	-17.86	-15.15	-11.99	-8.46	-4.67
SO XBADJ	100%_40F	-3.07	-1.94	-0.75	0.46	1.66	2.81
SO XBADJ	100%_40F	3.87	4.82	5.62	3.76	1.20	-1.40
SO YBADJ	100%_40F	12.55	13.75	14.54	14.88	14.77	14.22
SO YBADJ	100%_40F	13.23	11.84	10.09	8.03	5.73	3.26
SO YBADJ	100%_40F	0.68	-1.91	-4.45	-6.85	-9.04	-10.96
SO YBADJ	100%_40F	-12.55	-13.75	-14.54	-14.88	-14.77	-14.22
SO YBADJ	100%_40F	-13.23	-11.84	-10.09	-8.03	-5.73	-3.26
SO YBADJ	100%_40F	-0.68	1.91	4.45	6.85	9.04	10.96
SO BUILDHGT	75%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDWID	75%_40F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	75%_40F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	75%_40F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDWID	75%_40F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	75%_40F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	75%_40F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDLEN	75%_40F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	75%_40F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	75%_40F	22.02	19.91	17.20	18.93	21.28	22.98
SO BUILDLEN	75%_40F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	75%_40F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	75%_40F	22.02	19.91	17.20	18.93	21.28	22.98
SO XBADJ	75%_40F	-3.96	-6.39	-8.64	-10.62	-12.28	-13.56
SO XBADJ	75%_40F	-16.77	-20.02	-22.67	-24.63	-25.84	-26.26
SO XBADJ	75%_40F	-25.89	-24.73	-22.82	-22.70	-22.48	-21.58
SO XBADJ	75%_40F	-20.02	-17.86	-15.15	-11.99	-8.46	-4.67
SO XBADJ	75%_40F	-3.07	-1.94	-0.75	0.46	1.66	2.81
SO XBADJ	75%_40F	3.87	4.82	5.62	3.76	1.20	-1.40

SO YBADJ	75%_40F	12.55	13.75	14.54	14.88	14.77	14.22
SO YBADJ	75%_40F	13.23	11.84	10.09	8.03	5.73	3.26
SO YBADJ	75%_40F	0.68	-1.91	-4.45	-6.85	-9.04	-10.96
SO YBADJ	75%_40F	-12.55	-13.75	-14.54	-14.88	-14.77	-14.22
SO YBADJ	75%_40F	-13.23	-11.84	-10.09	-8.03	-5.73	-3.26
SO YBADJ	75%_40F	-0.68	1.91	4.45	6.85	9.04	10.96
SO BUILDHGT	50%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_40F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDWID	50%_40F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	50%_40F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	50%_40F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDWID	50%_40F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	50%_40F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	50%_40F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDLEN	50%_40F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	50%_40F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	50%_40F	22.02	19.91	17.20	18.93	21.28	22.98
SO BUILDLEN	50%_40F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	50%_40F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	50%_40F	22.02	19.91	17.20	18.93	21.28	22.98
SO XBADJ	50%_40F	-3.96	-6.39	-8.64	-10.62	-12.28	-13.56
SO XBADJ	50%_40F	-16.77	-20.02	-22.67	-24.63	-25.84	-26.26
SO XBADJ	50%_40F	-25.89	-24.73	-22.82	-22.70	-22.48	-21.58
SO XBADJ	50%_40F	-20.02	-17.86	-15.15	-11.99	-8.46	-4.67
SO XBADJ	50%_40F	-3.07	-1.94	-0.75	0.46	1.66	2.81
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SO YBADJ	50%_40F	12.55	13.75	14.54	14.88	14.77	14.22
SO YBADJ	50%_40F	13.23	11.84	10.09	8.03	5.73	3.26
SO YBADJ	50%_40F	0.68	-1.91	-4.45	-6.85	-9.04	-10.96
SO YBADJ	50%_40F	-12.55	-13.75	-14.54	-14.88	-14.77	-14.22
SO YBADJ	50%_40F	-13.23	-11.84	-10.09	-8.03	-5.73	-3.26
SO YBADJ	50%_40F	-0.68	1.91	4.45	6.85	9.04	10.96
SO BUILDHGT	100%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	100%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDWID	100%_0F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	100%_0F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	100%_0F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDWID	100%_0F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	100%_0F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	100%_0F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDLEN	100%_0F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	100%_0F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	100%_0F	22.02	19.91	17.20	18.93	21.28	22.98
SO BUILDLEN	100%_0F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	100%_0F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	100%_0F	22.02	19.91	17.20	18.93	21.28	22.98
SO XBADJ	100%_0F	-3.96	-6.39	-8.64	-10.62	-12.28	-13.56
SO XBADJ	100%_0F	-16.77	-20.02	-22.67	-24.63	-25.84	-26.26
SO XBADJ	100%_0F	-25.89	-24.73	-22.82	-22.70	-22.48	-21.58

SO XBADJ	100%_0F	-20.02	-17.86	-15.15	-11.99	-8.46	-4.67
SO XBADJ	100%_0F	-3.07	-1.94	-0.75	0.46	1.66	2.81
SO XBADJ	100%_0F	3.87	4.82	5.62	3.76	1.20	-1.40
SO YBADJ	100%_0F	12.55	13.75	14.54	14.88	14.77	14.22
SO YBADJ	100%_0F	13.23	11.84	10.09	8.03	5.73	3.26
SO YBADJ	100%_0F	0.68	-1.91	-4.45	-6.85	-9.04	-10.96
SO YBADJ	100%_0F	-12.55	-13.75	-14.54	-14.88	-14.77	-14.22
SO YBADJ	100%_0F	-13.23	-11.84	-10.09	-8.03	-5.73	-3.26
SO YBADJ	100%_0F	-0.68	1.91	4.45	6.85	9.04	10.96
SO BUILDHGT	75%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	75%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDWID	75%_0F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	75%_0F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	75%_0F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDWID	75%_0F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	75%_0F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	75%_0F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDLEN	75%_0F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	75%_0F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	75%_0F	22.02	19.91	17.20	18.93	21.28	22.98
SO BUILDLEN	75%_0F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	75%_0F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	75%_0F	22.02	19.91	17.20	18.93	21.28	22.98
SO XBADJ	75%_0F	-3.96	-6.39	-8.64	-10.62	-12.28	-13.56
SO XBADJ	75%_0F	-16.77	-20.02	-22.67	-24.63	-25.84	-26.26
SO XBADJ	75%_0F	-25.89	-24.73	-22.82	-22.70	-22.48	-21.58
SO XBADJ	75%_0F	-20.02	-17.86	-15.15	-11.99	-8.46	-4.67
SO XBADJ	75%_0F	-3.07	-1.94	-0.75	0.46	1.66	2.81
SO XBADJ	75%_0F	3.87	4.82	5.62	3.76	1.20	-1.40
SO YBADJ	75%_0F	12.55	13.75	14.54	14.88	14.77	14.22
SO YBADJ	75%_0F	13.23	11.84	10.09	8.03	5.73	3.26
SO YBADJ	75%_0F	0.68	-1.91	-4.45	-6.85	-9.04	-10.96
SO YBADJ	75%_0F	-12.55	-13.75	-14.54	-14.88	-14.77	-14.22
SO YBADJ	75%_0F	-13.23	-11.84	-10.09	-8.03	-5.73	-3.26
SO YBADJ	75%_0F	-0.68	1.91	4.45	6.85	9.04	10.96
SO BUILDHGT	50%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDHGT	50%_0F	11.28	11.28	11.28	11.28	11.28	11.28
SO BUILDWID	50%_0F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	50%_0F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	50%_0F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDWID	50%_0F	24.17	24.18	23.45	22.02	19.91	17.20
SO BUILDWID	50%_0F	18.93	21.28	22.98	23.98	24.26	23.79
SO BUILDWID	50%_0F	22.60	20.73	18.23	19.84	21.96	23.42
SO BUILDLEN	50%_0F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	50%_0F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	50%_0F	22.02	19.91	17.20	18.93	21.28	22.98
SO BUILDLEN	50%_0F	23.98	24.26	23.79	22.60	20.73	18.23
SO BUILDLEN	50%_0F	19.84	21.96	23.42	24.17	24.18	23.45
SO BUILDLEN	50%_0F	22.02	19.91	17.20	18.93	21.28	22.98

SO XBADJ	50%_0F	-3.96	-6.39	-8.64	-10.62	-12.28	-13.56
SO XBADJ	50%_0F	-16.77	-20.02	-22.67	-24.63	-25.84	-26.26
SO XBADJ	50%_0F	-25.89	-24.73	-22.82	-22.70	-22.48	-21.58
SO XBADJ	50%_0F	-20.02	-17.86	-15.15	-11.99	-8.46	-4.67
SO XBADJ	50%_0F	-3.07	-1.94	-0.75	0.46	1.66	2.81
SO XBADJ	50%_0F	3.87	4.82	5.62	3.76	1.20	-1.40
SO YBADJ	50%_0F	12.55	13.75	14.54	14.88	14.77	14.22
SO YBADJ	50%_0F	13.23	11.84	10.09	8.03	5.73	3.26
SO YBADJ	50%_0F	0.68	-1.91	-4.45	-6.85	-9.04	-10.96
SO YBADJ	50%_0F	-12.55	-13.75	-14.54	-14.88	-14.77	-14.22
SO YBADJ	50%_0F	-13.23	-11.84	-10.09	-8.03	-5.73	-3.26
SO YBADJ	50%_0F	-0.68	1.91	4.45	6.85	9.04	10.96

Detailed AERMOD Results
Summary

TGP - Concord Compressor Expansion - Solar Turbine 100%, 75%, 50% Loads at 0F and 40F						
AERMOD Refined Model Results - 55 ft Stack Ht						
Emissions g/s)						
	100%, 40F	75%, 40F	50%, 40F	100%, 0F	75%, 0F	50%, 0F
NOx *	0.67	0.56	0.47	0.7	0.61	0.51
SO2	0.02	0.02	0.02	0.03	0.02	0.02
PM10	0.05	0.04	0.03	0.05	0.04	0.04
CO	0.86	0.69	0.57	0.86	0.74	0.62
Unit Impacts (ug/m3) - 2000						
	100%, 40F	75%, 40F	50%, 40F	100%, 0F	75%, 0F	50%, 0F
1-hr	16.64	18.68	19.48	16.48	18.2	19.04
1-hr HSH	16.49	18.54	19.35	16.28	16.9	18.91
3-hr	14.85	16.7	17.86	14.71	15.72	17.46
3-hr HSH	9.54	10.78	11.95	9.42	10.37	11.52
8-hr	8.48	9.08	9.62	8.39	8.82	9.39
8-hr HSH	8.36	9.02	9.59	8.29	8.72	9.34
24-hr	6.68	7.27	7.8	6.62	7.04	7.6
24-hr HSH	5.69	6.18	6.65	5.65	5.98	6.45
Annual	0.9	1.01	1.11	0.9	0.97	1.08
Unit Impacts (ug/m3) - 2001						
	100%, 40F	75%, 40F	50%, 40F	100%, 0F	75%, 0F	50%, 0F
1-hr	14.7	16.08	18.5	14.56	15.49	16.8
1-hr HSH	14.12	15.44	16.65	13.99	14.88	16.14
3-hr	10.37	11.55	12.86	10.33	11.05	12.09
3-hr HSH	8.93	9.62	10.29	8.91	9.38	10.06
8-hr	8.74	9.39	10.02	8.63	9.08	9.7
8-hr HSH	6.65	7.2	7.67	6.61	6.99	7.5
24-hr	4.69	5.62	6.3	4.65	5.14	6.03
24-hr HSH	4.58	5	5.39	4.55	4.82	5.22
Annual	0.57	0.64	0.71	0.57	0.61	0.69
Unit Impacts (ug/m3) - 2002						
	100%, 40F	75%, 40F	50%, 40F	100%, 0F	75%, 0F	50%, 0F
1-hr	14.43	16.75	18.74	14.27	14.95	17.24
1-hr HSH	11.52	12.71	14.07	11.49	11.97	13.1
3-hr	11.46	12.31	12.97	11.4	11.91	12.69
3-hr HSH	8.87	9.48	10.06	8.79	9.25	9.86
8-hr	8.08	8.77	9.35	8.04	8.46	9.11
8-hr HSH	6.8	7.43	7.94	6.76	7.16	7.74
24-hr	5.81	6.36	6.8	5.78	6.12	6.62
24-hr HSH	5.46	5.95	6.33	5.42	5.75	6.2
Annual	0.65	0.73	0.8	0.65	0.7	0.78
Unit Impacts (ug/m3) - 2003						
	100%, 40F	75%, 40F	50%, 40F	100%, 0F	75%, 0F	50%, 0F
1-hr	17.35	20.66	22.26	17.12	18.21	21.51
1-hr HSH	12.45	13.99	15.84	12.42	13.18	14.73
3-hr	9.23	10.88	12.33	9.15	9.88	11.57
3-hr HSH	8.85	9.49	10.73	8.78	9.22	10.03
8-hr	7.1	8.25	9.48	7.07	7.46	8.8
8-hr HSH	6.96	7.6	8.49	6.93	7.31	8.26
24-hr	5	5.52	6.42	4.97	5.26	5.97
24-hr HSH	4.36	4.73	5.36	4.34	4.59	5.24
Annual	0.66	0.73	0.81	0.66	0.7	0.78
Unit Impacts (ug/m3) - 2004						
	100%, 40F	75%, 40F	50%, 40F	100%, 0F	75%, 0F	50%, 0F
1-hr	13.08	15.32	16.63	13	14.49	16.19
1-hr HSH	11.44	12.34	13.67	11.39	11.97	12.85
3-hr	9.94	10.82	11.57	9.84	10.43	11.27
3-hr HSH	9.71	10.37	10.97	9.63	10.11	10.77
8-hr	8.01	8.68	9.48	7.95	8.42	9.28
8-hr HSH	7.77	8.36	9.33	7.71	8.1	9.1
24-hr	6.48	7.03	7.58	6.43	6.81	7.34
24-hr HSH	5.46	5.94	6.38	5.43	5.34	6.2
Annual	0.8	0.89	0.98	0.79	0.86	0.95
Unit Impacts (ug/m3) - 2000-2004						
	100%, 40F	75%, 40F	50%, 40F	100%, 0F	75%, 0F	50%, 0F
1-hr	17.35	20.66	22.26	17.12	18.21	2 . 51

TETRA TECH EC, INC.

September 7, 2007

Mr. James Black
New Hampshire Department of Environmental Services
Air Resources Division
29 Hazen Drive
Concord, NH 03302-0095

Subject: Air Quality Modeling Protocol for the Concord Compressor Expansion Project
A Proposed Natural Gas Compressor Station in Hillsborough County, NH

Dear Jim:

The Tennessee Gas Pipeline Company (TGP) is proposing to construct a new natural gas compressor station in Hillsborough County, NH. The station is to be located off Mammoth Road north of North Pelham, NH. The facility will consist primarily of a 5865 horsepower (at 60°F) natural gas fired combustion turbine which will include a SoLoNOx combustion system to control emissions of NO_x. As described in the attached Air Quality Modeling Protocol (Protocol), annual potential emissions for criteria pollutants will be below major source thresholds and therefore Prevention of Significant Deterioration (PSD) and Non-attainment New Source Review (NNSR) requirements will not apply. Per our discussion, an air quality dispersion modeling analysis will be conducted to demonstrate compliance with ambient air quality standards. This Protocol describes modeling methodology that will used to demonstrate compliance.

Please call Mr. Ravindra Kura of TGP at (713) 420-4932, or me at (617) 306-2863 if you have any questions or you would like to discuss these issues.

Sincerely,

Tetra Tech EC, Inc

Ted W. Guertin

Ted W. Guertin
Senior Consultant

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AIR QUALITY MODELING PROTOCOL

CONCORD COMPRESSOR EXPANSION
PROPOSED NATURAL GAS FIRED COMPRESSOR STATION
HILLSBOROUGH COUNTY, NEW HAMPSHIRE

TENNESSEE GAS PIPELINE COMPANY

Project and Site Description

The proposed Tennessee Gas Pipeline Company (TGP) natural gas compressor station is to be located north of North Pelham, in Hillsborough County, New Hampshire. While the entire site is located in Hillsborough County, the northern site property line abuts Rockingham County. Access to the site is off Mammoth Road, which connects to State Route 111 (see Figure 1).

As shown in Figure 2, the project site is located north of an industrial park, and south of a residential community. The topography in the site vicinity is hilly. The current compressor station site elevation ranges from approximately 194 feet to 220 feet above mean sea level (msl) with final grade of the site at approximately 212 feet above msl. Terrain rises nearly 300 feet above this level with one mile southwest of the facility. Significant terrain elevations exist further out in nearly all directions.

The facility will consist primarily of a 5865 horsepower (at 60°F) natural gas fired Solar combustion turbine, but will also include small gas fired boilers likely totaling less than 10 MMBtu/hr heat input, small fuel storage tanks, and potentially an emergency generator. The turbine will include a $SoLoNO_x$ combustion system to control emissions of NO_x. Since the project design is in the process of being finalized, some changes to the project design configuration are possible. Any changes will be assessed for air quality impacts, and the compliance demonstration will be presented to the New Hampshire Department of Environmental Services (NHDES).

Project Emissions

Preliminary potential annual emissions from the proposed compressor station are summarized and compared to major source thresholds in Table 1. These potential emissions do not yet include the minor sources at the site described above but, when added in, these minor sources will not change the conclusions made in the following section regarding major source applicability. Emission calculations are provided in Attachment A.

Table 1: Maximum Potential Annual Emissions for the Tennessee Gas Pipeline Company Concord Compressor Expansion (Tons per Year)

Pollutant	Annual Potential to Emit	Major Source Threshold
NO_x	23.2	50
VOC	8.3	50
CO	31.2	250
PM_{10}	1.6	250
SO_2	0.8	250
HAPS	0.8	25

Major Source Regulatory Applicability

The federal PSD program is administered by NHDES under delegation of authority by the EPA. The PSD permit program applies to major sources in attainment areas. Rockingham County is designated as unclassified or attainment for all criteria pollutants except ozone (NO_x, SO_2, PM_{10}/$PM_{2.5}$/, CO, and lead). For ozone, the site is located in a portion of Hillsborough County that is classified as moderate non-attainment.

Under PSD, a new project is considered a major stationary source subject to PSD review if the potential to emit is 250 tons per year (tpy) for any one of the criteria pollutants listed above, or 100 tpy if it is one of the 28 source categories listed in 40 CFR 52.21. Neither combustion turbines nor compressor stations are among the 28 listed source categories so the Project is not subject to PSD because the annual potential emissions are well under 250 tpy for all pollutants.

In areas designated non-attainment for ozone, a new major source of either NO_x or VOC must meet the Non-attainment New Source Review (NNSR) requirements. The major source thresholds for NO_x and VOC in moderate non-attainment areas are 100 tpy and 50 tpy, respectively. However, New Hampshire, as most of the Ozone Transport Region states, is maintaining the lower threshold for NOx of 50 tpy that was based on the prior 1-hour ozone non-attainment classification of serious. As shown in Table 1, potential emissions are well below these thresholds. Therefore, Non-attainment New Source Review does not apply to the Project.

Air Quality Dispersion Modeling Analysis

This section describes the procedures that will be used for conducting the air quality modeling analysis, including the models which will be employed, the model input options used, and the supporting data. The purpose of the air quality impact analysis is to assess the Project's predicted ground level pollutant concentrations against applicable state and federal ambient air quality standards, significance levels, and state guideline concentrations.

Model Selection

In accordance with NHDES guidance, the refined modeling will be conducted using the EPA AERMOD modeling system (dated 07026). The analysis will be conducted in accordance with the AERMOD and AERMET users guides, EPA's *Guideline on Air Quality Models (revised) (40 CFR 51 Appendix W)* and NHDES's *Guidance and Procedure for Performing Air Quality Impact Modeling in New Hampshire*. The AERMOD model system will be used to evaluate potential impact concentrations from Project emission sources at receptor locations representative of all terrain (simple, intermediate, and complex) surrounding the facility.

Land Use

A land use determination was made following the classification technique suggested by Auer (Auer 1978). The classification determination was conducted by assessing land use categories within a 3-km radius of the proposed site. Visual inspection of USGS topographic maps and aerial photos indicates that the majority of land use is characterized as rural. Therefore, rural dispersion coefficients will be used for the air quality modeling.

Background Air Quality

The NHDES collects air quality data (ambient pollutant concentrations) at numerous monitoring stations throughout the state. The highest values measured over the most recent 3 years (2004-2006) are summarized by the NHDES in their table "NH Background Air Quality Data" (http://www.des.state.nh.us/ard/pdf/BackgroundData.pdf). Data from one of the monitoring sites in Nashua are proposed for this compliance demonstration because at approximately 7 miles, Nashua is the closest NHDES monitoring site and it would provide conservative data since Nashua is more urban than the site area. If any pollutants for which background data are needed are not measured in Nashua, data from Manchester (approximately 16 miles away) would be used.

Building Dimensions and GEP Stack Height Analysis

A Good Engineering Practice (GEP) Analysis will be performed in accordance with NHDES guidelines. EPA's Building Profile Input Program (BPIP-Prime) will be used to define the height and projected width of the "controlling" structures (as a function of flow vector) for each of the non-GEP stacks. The BPIP results will be used in conjunction with the AERMOD dispersion model to evaluate the wind direction specific building downwash effects for each stack. A schematic diagram describing the facility stacks and building structures with the potential to influence plume dispersion will be provided along with BPIP input and output results in the air quality modeling analysis.

Meteorological Data

AERMOD contains a meteorological data processing algorithm called AERMET which combines surface and upper air weather observations with surface characteristics based on land use to develop local dispersion parameters. In order to simplify the AERMET analysis, NHDES

provides ready-to-use, preprocessed meteorological data files (in the form of .SFC and .PFL files) which are available on the NHDES web site. The files incorporate land use data centered on the meteorological monitoring sites (i.e., airport weather towers), so surface characteristic data processing by the applicant using AERMET is not necessary. Hillsborough County falls in the section of NH where NHDES recommends the use of meteorological data collected at the Concord, NH surface station. This surface data, which has been processed along with Gray, Maine upper air data for the years 2000-2004, will be used in the modeling analysis.

Receptors

Discrete receptors will be placed at 20 meter intervals along the compressor station fence line. In addition, a nested Cartesian grid is extended out from the fence line at the following receptor intervals and distances:

- At 50 meter intervals from the fence line to 500 meters;
- At 100 meter intervals from the 500 meters to 1000 meters;
- At 200 meter intervals from 1,000 to 2,000 meters;
- At 500 meter intervals from 2,000 to 5,000 meters;
- At 1,000 meter intervals from 5,000 to 10,000 meters; and
- At 2,000 meter intervals from 10,000 to 20,000 meters.

Terrain elevations at receptors will be obtained using BEE-Line Software's BEEST program and USGS digital terrain data. BEEST implements the AERMAP model which includes processing routines that extract USGS Digital Elevation Model (DEM) data (the four nearest points surrounding receptor) to determine receptor terrain elevations (by interpolation) for air quality model input.

After the significant impact area (SIA) is determined for the proposed compressor station on a pollutant specific basis, the receptor grid will be limited to a distance just beyond the SIA for interactive modeling with other background emission sources (if necessary) to determine NAAQS compliance.

Emission Source Parameters

The emission source that will be considered with dispersion modeling is the Solar turbine. Per NHDES guidance, the small heating boilers (less than 10 MMBtu/hr combined) and the emergency generator will not be evaluated in the modeling analysis.

Table 2 summarizes stack and exhaust characteristics for the compressor station turbine. Table 3 provides criteria pollutant emission rates and stack parameters for the turbine. Emission calculations are provided in Attachment A.

Table 2: Stack Characteristics for the Solar Turbine

Parameter	Solar Turbine
Base Elevation, msl (feet/meters)	212 / 64.6
Stack Height (feet/meters)	55 / 16.76
Inside Stack Diameter (feet/meters)	6 / 1.83
Number of Stacks	1
Predominant Land Use Type	Rural
Stack Location: UTM-E (m) UTM-N (m) Coordinates relative to NAD 27	 307108 4739144
Controlling Building Dimensions (m)	17.68 (L) x 16.61 (W) x 11.28 (H)

Table 3: Emissions and Stack Parameters for the Solar Turbine

Operating Load, %	100	75	50
Stack Exhaust Velocity, m/s	15.4	TBD	TBD
Stack Exhaust Temperature, °F/°K	867 / 737	TBD	TBD
NO_x, g/s	0.70	TBD	TBD
SO_2, g/s	0.03	TBD	TBD
PM, g/s	0.05	TBD	TBD
CO, g/s	0.86	TBD	TBD

TBD is To Be Determined. Part load emissions and stack parameters will be determined and evaluated. Part load data will be provided with the air permit application submittal.

Interactive Sources

Maximum predicted impact concentrations for the project will be compared with Significant Impact Levels (SILs) on a pollutant- and averaging period-specific basis. If impact concentrations exceed SILs, the NHDES will be contacted to determine if any other major emission sources in the region need to be considered in a cumulative modeling analysis with the project. Total model-predicted cumulative concentrations will be summed with background concentrations for the assessment of compliance with the ambient air quality standards.

Air Toxics

The project is exempt from New Hampshire's hazardous air pollutant regulations (Regulated Toxic Air Pollutants, Env-A 1400) since the turbine will be fired with natural gas (exemption Env-A 1402.01(b)(4)(b)).

Class I Areas

Since the project is a minor emission source, no Class I area modeling will be conducted.

Reporting

A detailed air quality impact assessment will be prepared as part of the air permit application. It will describe the methodology and results of the dispersion modeling analysis. The electronic computer files for the modeling analysis will also be provided to NHDES.

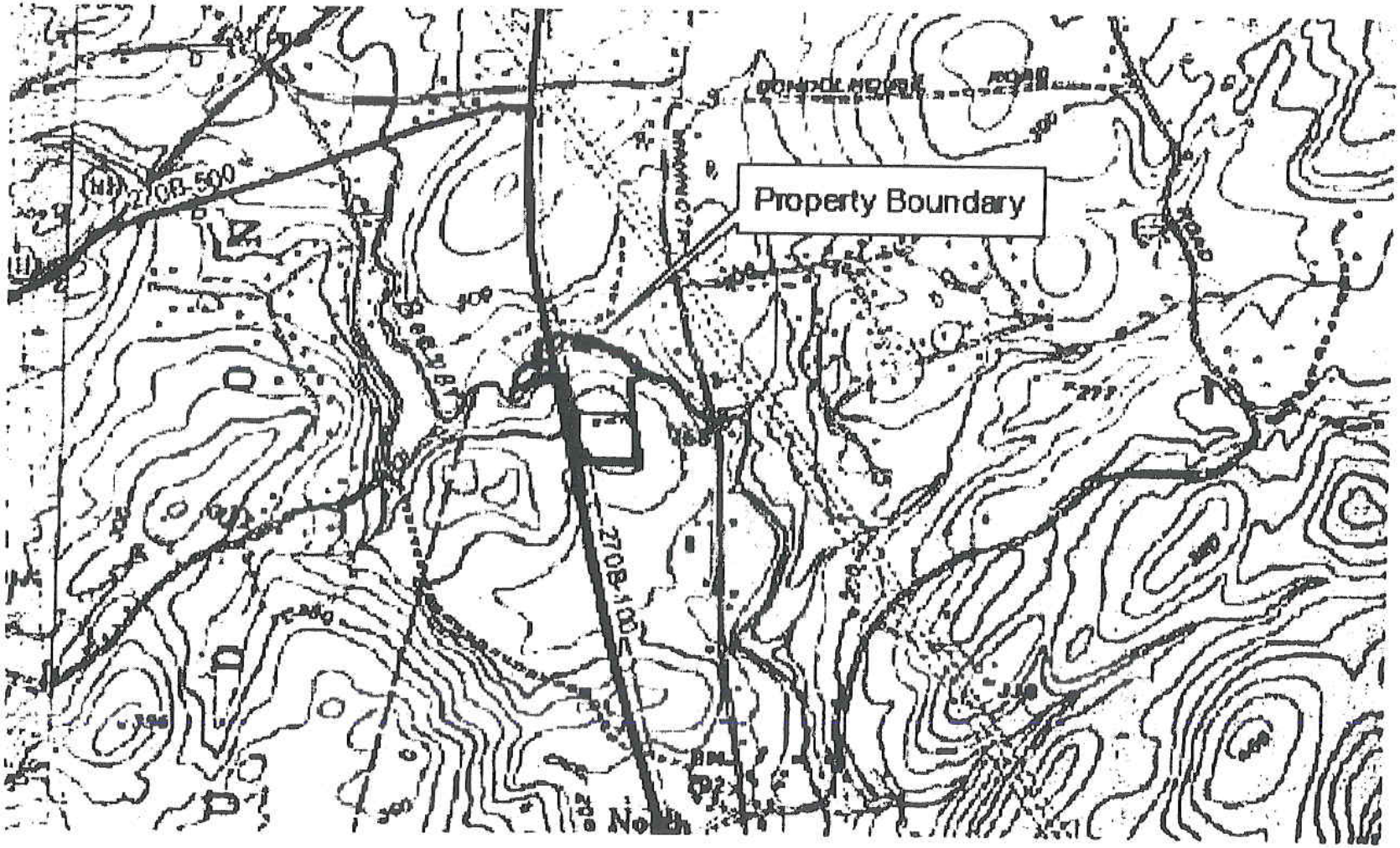

FIGURE 1: Tennessee Gas Pipeline Company – Concord Compressor Expansion, Hillsborough County, New Hampshire – General Location Map

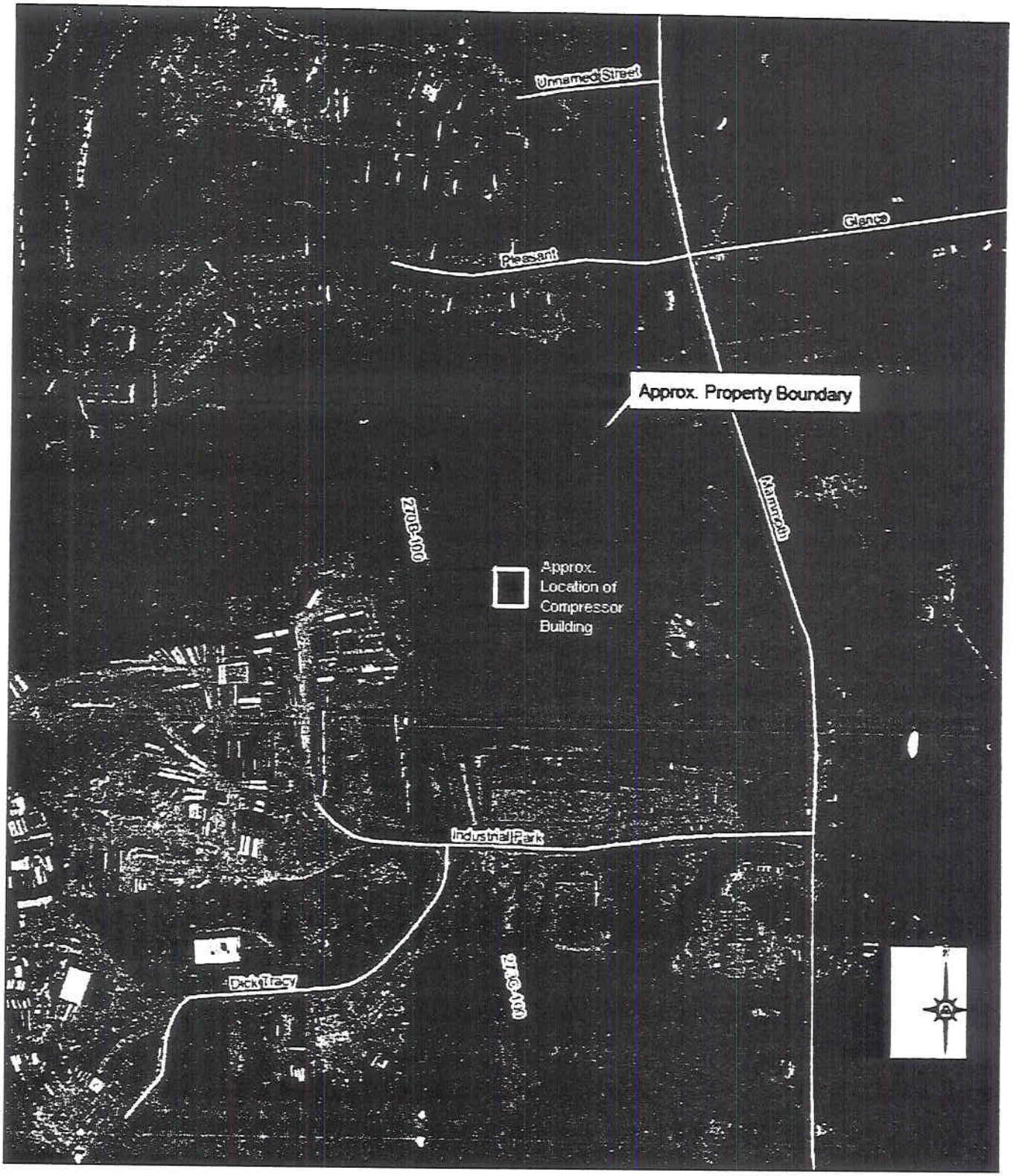

FIGURE 2: Tennessee Gas Pipeline Company – Concord Compressor Expansion, Hillsborough County, New Hampshire – Aerial View of Project Site Area

ATTACHMENT A

Emission Calculations

Potential Emissions Calculations - TGP Compressor Project (Annual TPY)

	Uncontrolled Case			
	8760 @ Normal	Corr. for 0-20 °F	Corr. for Startups/ Shutdowns	Total
NO_x	22.7	0.2	0.00	22.8
NH_3	0			0
CO	27.6	0.3	2.69	30.6
UHC	7.9	0.1	0.19	8.2
PM_{10}				
Combustion	1.2			1.2
Sulfates	0.5			0.5
Total	1.6			1.6
SO_2	0.8			0.8
HAP	0.8			0.8
Formaldehyde	0.7			0.7
CO_2	27,052			27,052

Based on 8760 hr/yr total operation, including 100 hr/yr at 0-20 °F and 250 startup/shutdown events/yr

Potential Emissions Calculations - Turbine without SCR or CO Catalyst- TGP Compressor Project

Emissions (per turbine) from the Proposed New Turbine (Centaur 50-6200LS):

Gas Characteristics:

LHV =	939.2	Btu/scf
HHV =	1,042.5	Btu/scf

1. Emissions from Normal Operation, Ambient T > 0 °F:

Pollutants	Vendor Guarantees (1)	Emission Factors (2) (lb/MMBtu, HHV)	Hourly Emissions (lb/hr) No Add-On Controls T = 0 °F	T = 60 °F	
			54.5	50.6	MMBtu/hr (LHV)
			60.5	56.1	MMBtu/hr (HHV)
NOx	25.00 ppmvd @ 15% O_2	0.092 lb/MMBtu (HHV)	5.57	5.17	
NH3	0	0 lb/MMBtu (HHV)	0	0	
CO	50.00 ppmvd @ 15% O_2	0.112 lb/MMBtu (HHV)	6.79	6.30	
UHC (3)	25.00 ppmvd @ 15% O_2	0.032 lb/MMBtu (HHV)	1.94	1.80	
PM_{10} (4)					
Filterable	N/A	0.0047 lb/MMBtu (HHV)	0.28	0.26	
Condensible		0.0019 lb/MMBtu (HHV)	0.11	0.11	
Total		0.0066 lb/MMBtu (HHV)	0.40	0.37	
SO_2 (4)	N/A	0.0034 lb/MMBtu (HHV)	0.21	0.19	
Total HAP (5)	N/A	0.00305 lb/MMBtu (HHV)	0.18	0.17	
Formaldehyde (5)	N/A	0.00288 lb/MMBtu (HHV)	0.17	0.16	
CO_2 (4)	N/A	110 lb/MMBtu (HHV)	6,658	6,176	

(1) From Solar Turbines Engine Performance Sheet - Centaur 50-6200LS

(2) ppmvd @ 15% O_2 converted to lb/MMBtu using F_d factor of 8,710 dscf/MMBtu (HHV) (EPA default)

(3) UHC is a conservative estimate for VOC; Solar suggests assuming VOC = 10-20% of UHC emissions (see PIL 168, included in Appendix B).

(4) Source for Emission Factor = AP-42, Table 3.1-2a, dated 4/00.

(5) Solar Turbines Product Information Literature 168 (included in Appendix B), 95% Upper Confidence of Data emission factors.

2. Emissions from Normal Operation, Ambient T = 0 to -20 °F:

Pollutants	Exhaust Concentrations (6)
NOx[4]	42 ppm
CO[4]	100 ppm
VOC (=UHC)[4]	50 ppm

(6) Solar Turbines Product Information Literature 167.

3. Emissions from Startup and Shutdown Events:

Pollutants	Emissions (7)
NOx	1.1 lb/event
CO	23 lb/event
VOC (=UHC)	1.9 lb/event

Event = 1 startup + 1 shutdown, total duration = 14 minutes

(7) Solar Turbines Product Information Literature 170.

Flowrate

Ambient temp.	60	°F
Heat input rate	56.15	MMBtu/hr, HHV

Excess O_2	15	%, dry basis
Dry Flowrate	28,874	dscfm
Assumed Moisture	8.7%	
Assumed wet MW	28	
Wet Flowrate	31,625	wscfm
	137,796	lb/hr

Total flow	**31,625**	**wet scfm**					
	84,633	**wet cfm @**	**953**	**°F**			
	60.82	m/s for ID =	36	in =		0.91	m

Parameters

F-factor	8,710	dscf/MMBtu (EPA default)
HHV	1,043	Btu/scf
R	0.73025	ft^3-atm/lb-mol °R

Flowrate

Ambient temp.	0	°F
Heat input rate	60.52	MMBtu/hr, HHV

Excess O_2	15	%, dry basis
Dry Flowrate	31,124	dscfm
Assumed Moisture	8.7%	
Assumed wet MW	28	
Wet Flowrate	34,090	wscfm
	148,535	lb/hr

Total flow	**34,090**	**wet scfm**					
	85,676	**wet cfm @**	**867**	**°F**			
	61.57	m/s for ID =	36	in =		0.91	m

Parameters

F-factor	8,710	dscf/MMBtu (EPA default)
HHV	1,043	Btu/scf
R	0.73025	ft^3-atm/lb-mol °R