APPENDIX E
AIR MODELING PROTOCOL

Air quality analyses are performed to determine whether emissions from construction and operation of a proposed new source, in conjunction with other applicable emissions increases and decreases from existing sources (i.e., modeled existing source impacts plus measured background), will cause or contribute to a violation of any applicable national ambient air quality standards (NAAQS) or Prevention of Significant Deterioration (PSD) increments.

E.1 FUTUREGEN PROJECT DESIGN CASES

The Alliance in consultation with DOE developed an initial conceptual design for the generation of electricity from coal with capture and sequestration of CO_2. To provide bounding conditions for the EIS analysis, a range of outputs were developed based on the four technology cases: Cases 1, 2, 3A and 3B. These cases share many components and processes in common (such as coal receiving and storage, oxygen supply, gas cleanup, and power generation), with the primary difference being the type of gasifier technology used (FG Alliance, 2007). Cases 1, 2, and 3A are stand-alone alternatives that are capable of meeting the design requirements of the project. The Alliance is considering a design in which an optional case, Case 3B, is coupled with either Case 1, 2, or 3A. Case 3B is a smaller, side-stream power train that would enable more research and development (R&D) activities than the main train of the power plant (Cases 1, 2, and 3A). Case 3A is similar to Case 1, except the gasifier output is greater.

One goal of the FutureGen Project is to demonstrate gasification technology over a range of different coal types. Therefore, the facility would be designed to use bituminous, sub-bituminous, and ***possibly*** lignite coals. For developing the performance boundary, the Alliance assumed for each technology design case the most stringent operating condition using three coal types: Powder River Basin (PRB) sub-bituminous, Illinois Basin (Illinois) bituminous, and Northern Appalachia Pittsburgh (Pittsburg) bituminous. To provide a conservative assessment of impacts, the Alliance's assumptions and quantities for air emissions represent the upper bound of the range of possible impacts. The upper bound for air emissions was derived by assuming facility operations would result in the highest emission rate for individual pollutants (e.g., nitrogen dioxide [NO_2]) selected from among Cases 1, 2, and 3A plus Case 3B, including any unplanned restart emissions as a result of plant upset. Therefore, while used to develop the performance boundary, the aggregate upper bound is worse than any single technology case under consideration. Table E-1 provides a summary of the air emissions for each technology design case.

Plant upset is a serious malfunction of any part of the IGCC process train and usually results in a sudden shutdown of the combined-cycle unit's gas turbine and other plant components.

Table E-1. Stack Emissions for Each Technology Case Per Coal Type [1]

	Case 1			Case 2			Case 3A			Case 3B		
	Pittsburgh	**Illinois**	**PRB**	**Pittsburgh**	**Illinois**	**PRB**	**Pittsburgh**	**Illinois**	**PRB**	**Pittsburgh**	**Illinois**	**PRB**
Coal Data												
Sulfur (wt% dry)	2.3	3.1	0.3	2.3	3.1	0.3	2.3	3.1	0.3	2.3	3.1	0.3
mass Sulfur (lb/hr)	5204.4	7761.8	897.9	4939.1	7630.0	1129.9	4826.5	7453.3	1095.2	2260.7	3492.4	493.1
mass SO_2 (lb/hr)	10408.8	15523.7	1795.9	9878.2	15260.1	2259.9	9653.0	14906.5	2190.4	4521.4	6984.8	986.3
Coal Input (lb/hr)	224745	248370	281167	213287	244153	353809	208425	238577	342790	97625	111791	154349
Coal HHV (Btu/lb)	13001	11505	8567	13001	11505	8567	13001	11505	8567	13001	11505	8567
Coal Input (MMBtu/hr)	2922	2857	2409	2773	2809	3031	2710	2745	2937	1269	1286	1322
Emission Rates (lb/MMBtu)												
SO_X	0.0003	0.0004	0.0001	0.0005	0.0008	0.0001	0.0005	0.0008	0.0001	0.0066	0.0099	0.0014
NO_X	0.0448	0.0438	0.0383	0.0447	0.0438	0.0409	0.0499	0.0492	0.0448	0.0496	0.0476	0.0499
PM_{10}	0.0063	0.0065	0.0075	0.0067	0.0068	0.006	0.0069	0.0069	0.0062	0.007	0.0084	0.0044
CO	0.0454	0.0445	0.0389	0.0453	0.0445	0.0415	0.0506	0.0499	0.0454	0.0201	0.0193	0.0203
VOC	0.0015	0.0014	0.0012	0.0015	0.0014	0.0013	0.0016	0.0016	0.0015	0.0028	0.0027	0.0028
Hg	0.7153	0.5386	0.5799	0.7153	0.5386	0.5799	0.7153	0.5386	0.5799	0.7153	0.5386	0.5799

Table E-1. Stack Emissions for Each Technology Case Per Coal Type [1]

	Case 1			**Case 2**			**Case 3A**			**Case 3B**		
	Pittsburgh	**Illinois**	**PRB**	**Pittsburgh**	**Illinois**	**PRB**	**Pittsburgh**	**Illinois**	**PRB**	**Pittsburgh**	**Illinois**	**PRB**
Emission Rates (lb/hr)												
SO_X	0.9	1.1	0.2	1.4	2.25	0.3	1.4	2.2	0.3	8.4	12.7	1.9
NO_X	130.9	125.2	92.3	124.0	123.0	124.0	135.2	135.0	131.6	63.0	61.2	66.0
PM_{10}	18.4	18.6	18.1	18.6	19.1	18.2	18.7	18.9	18.2	8.9	10.8	5.8
CO	132.7	127.2	93.7	125.6	125.0	125.8	137.1	137.0	133.3	25.5	24.8	26.8
VOC	4.38	4.0	2.9	4.2	3.9	3.9	4.3	4.39	4.41	3.6	3.5	3.7
Hg	0.00209	0.00154	0.00140	0.00198	0.00151	0.00176	0.00194	0.00148	0.00170	0.00091	0.00069	0.00077
Emission Rates (tons/yr)												
SO_X	3.3	4.3	0.9	5.2	8.37	1.1	5.0	8.2	1.1	31.2	47.4	6.9
NO_X	487.3	466.0	343.5	461.5	458.1	461.5	503.4	502.8	489.8	234.4	227.9	245.7
PM_{10}	68.5	69.1	67.3	69.2	71.1	67.7	69.6	70.5	67.8	33.1	40.2	21.7
CO	493.9	473.4	348.8	467.7	465.4	468.3	510.5	509.9	496.4	95.0	92.4	99.9
VOC	16.3	14.9	10.8	15.5	14.6	14.7	16.1	16.4	16.4	13.2	12.9	13.8
Hg	0.0078	0.0057	0.0052	0.0074	0.0056	0.0065	0.0072	0.0055	0.0063	0.0034	0.0026	0.0029

[1] Based on maximum operation load of 85 percent (i.e., 7446 hours per year).
Source: FG Alliance, 2007.

E.2 MODELED EMISSIONS RATES AND ASSUMPTIONS

The proposed FutureGen Project's estimated maximum annual air emissions (see Table E-2) represent an upper bound for assessing potential impacts for this EIS. The estimates are based on performance data from numerous manufacturer vendors and are not representative of a complete coal-to-product integrated design. ***However, a power plant built with these conceptual designs, under normal steady-state operations, could meet the specified FutureGen Project Performance Targets (see Section 2.5.6).*** Because the FutureGen Project would serve as a research and development (R&D) platform, DOE and the Alliance estimate that the power plant availability would be 85 percent. Full-scale testing, research, and operation would be conducted for a period of four years (i.e., the R&D period); however operation of the plant for commercial use could continue for decades.

Table E-2. FutureGen Project's Estimated Maximum Air Emissions (tons per year)

Air Pollutant	Maximum Emissions of Case 1, 2, or 3A [1]	Maximum Emissions of Case 3B [2]	Maximum Unplanned Restart Emissions	FutureGen Project's Estimated Maximum Air Emissions [3]
Sulfur Oxides (SO_X)	8.37	47.40	487[5]	543
Nitrogen Oxides (NO_X) [4]	503.4	245.7	9	758
Particulate Matter ($PM_{10}/PM_{2.5}$)	71	40	0	111
Carbon Monoxide (CO)	510	100	1	611
Volatile Organic Compounds (VOCs)	16	14	0	30
Mercury (Hg)	0.008	0.003	0	0.011

[1] Cases 1, 2, or 3A represent the main train of the power plant.
[2] Case 3B represents a smaller, side-steam power train.
[3] Equal the sum of the maximum emissions of Case 1, 2, or 3A plus maximum emissions of Case 3B plus the maximum unplanned restart emissions. Based on maximum operating load of 100 percent and 85 percent plant availability.
[4] NO_x emissions from coal combustion are primarily nitric oxide (NO); however, for the purpose of the air dispersion modeling it was assumed that all NO_x emissions are nitrogen dioxide (NO_2). One of the technologies being considered for the FutureGen Project is post-combustion selective catalytic reduction (SCR), which would reduce the annual NO_2 emissions in this base case to 249 tons per year.
[5] SO_x emissions from coal combustion systems are predominantly in the form of sulfur dioxide (SO_2). SO_2 emissions would be higher during restarts since the syngas flow to the flare would not have been processed for sulfur recovery.
Source FG Alliance, 2007.

The proposed FutureGen Project's estimated maximum air emissions include emissions from steady-state, planned startups, and unplanned restarts conditions. Steady-state is the normal operating condition of the proposed power plant, when the system is operating properly. The maximum steady-state air emissions are the maximum air emissions of the Cases 1, 2, and 3A (i.e., the main train of the power plant) plus the maximum air emissions for Case 3B (i.e., the smaller, side-steam power train).

During unplanned restarts, there are intermittent increases of emissions due to the need to flare process gases for a short period of time. Although unplanned restart events cannot be predicted, the Alliance has conceptually categorized these emissions by unit operations that would likely cause the event and they include: the air separation unit trip; the gasifier trip, the acid gas removal system trip, the claus unit trip, and the power island trip. Table E-3 provides the number of unplanned restarts associated with these five events that would be likely for the first through the fourth year of operations, as well as DOE estimated restarts for the years after the R&D period.

Table E-3. Potential Unplanned Restart Events Per Year During the R&D Operations Phase

Affected Units	Year One	Year Two	Year Three	Year Four	Year Five and beyond
Air Separation Unit	6	4	3	3	1
Gasifier (including coal prep)	8	2	2	1	0
Acid Gas Removal system (including shift unit & CO_2 compressor)	7	6	5	5	1
Claus Unit	1	0	0	0	0
Power Island	7	6	4	4	1
Total each year	**29**	**18**	**14**	**13**	**3**

Source: FG Alliance, 2006e.

The Alliance estimates that the first year of the R&D period would have the most unplanned restarts; therefore, the first year served as the upper-bound for modeling analysis. During the fifth year, it is assumed that the R&D period would come to an end and normal operations would begin.

To estimate air quality impacts associated with unplanned restarts emissions, DOE developed a “worst case” profile based on the occurrence of a single plant upset mode following prolonged steady state operations with an immediate return to steady-state emissions. The steady-state and unplanned restart emissions used for the air dispersion modeling analysis are provided in Table E-4. The modeled emissions rates are the same for each of the four proposed power plant sites. Variances in actual emissions resulting from ambient operating conditions at each proposed site were not factored into the emission estimate. Unplanned restarts air emissions during plant upset tend to be very high compared to those during steady-state operation because of the mass emissions rates occurring instantaneously during a short period (i.e., minutes or hours). Assumptions used for the duration of plant upset events are provided in Table E-5. The modeled scenario (Year One) is likely overly conservative in that a given plant upset event may require some time where the facility would be completely or partially idled. In the case where the facility was idled, there would be some period (pre-restart) when facility emissions would be less than steady state and the impact to air quality would likely be lower than the modeled scenario.

Table E-4. Estimates of Modeled Air Emissions Rates

Pollutant	Total Annual[1]	Steady State[2]	Unplanned Restarts[3, 4]	Total Annual[1]	Steady State[2]	Unplanned Restarts[3, 4]
	tons per year			grams per second[5]		
SO_2	543	55.77	487.30	18.38	1.89	2,792.74
NO_2	758	749.06	8.79	25.65	25.35	50.66
PM_{10}	111	111	0	3.77	3.77	0
CO	611	610.4	0.93	20.69	20.66	20.66
Hg	0.011	0.011	0	0.00038	0.00038	0

[1] Emission rates used to model impacts for pollutants annual averaging periods.
[2] Steady-state emissions are expected during normal plant operating conditions. Also used to model impacts of criteria pollutants that have NAAQS for short-term averaging period (i.e., 1-hour, 3-hour, 8-hour, and 24-hour) during normal plant operating conditions.
[3] Maximum unplanned restart emissions based on Model Increment 2 because of the maximum mass emissions rate produced during that period of plant upset (see Table E-5). Also used to model impacts of criteria pollutants that have NAAQS for short-term averaging periods during plant upset conditions.
[4] Zero indicates no unplanned restart emissions.
[5] Grams per second converted from tons per year based on duration of plant upset as presented in Table E-5.
Source: FG Alliance, 2007.

Because design parameters for the proposed power plant are limited, surrogate data from similar existing or permitted units were used to fill data gaps. Table E-5 summarizes the input parameters that were used in the air dispersion modeling analysis.

Table E-5. Air Quality Modeling Basis for the Proposed FutureGen Power Plant Operations Impact Analysis

Parameter	Modeling Basis
1. Technology design cases	• Case 1 • Case 2 • Case 3A • Case 3B Case 1, 2, or 3A would be the main train for the power plant. Case 3B would be a smaller, side-steam power train, which is being considered as an option coupled with Case 1, 2, or 3A.

Table E-5. Air Quality Modeling Basis for the Proposed FutureGen Power Plant Operations Impact Analysis

Parameter	Modeling Basis
2. Stack input parameters	Modeling based on an exhaust stack located at the center of the site. The stack parameters are : • Stack 250 feet (76 m) (FG Alliance, 2006). • Stack velocity: 65 ft/sec (19.8 m/sec) (ECT, 2006). • Volumetric flow: 137,919.087 ft^3/hr (based on modeling of combined exhaust flows from Case I-3A plus Case 3B design using the ASPEN model). • Stack gas temperature: 300 °F (148.9 °C) (based on modeling of combined exhaust flows from Case I-3A plus Case 3B design using the ASPEN model). • Stack inside diameter: 27.4 feet (8.4 m) (calculated based on stack gas exit velocity and model output volumetric flow). • Ambient temperature: 59 °F (15.0 °C) (best engineering judgment). • Exhaust gas ambient temperatures (for SCREEN 3): Assume 20°F, 59°F, 70°F, and 95°F (-6.7°C, 15°C, 21°C, and 35.0°C).
3. Model used	AERMOD A detailed air dispersion analysis was performed using region-specific meteorological data.
4. Receptor grids	A Cartesian grid system was used with hypothetical fence-line receptors and approximate locations of sensitive receptors.
5. Meteorological data	AERMOD – Representative 5-year hourly surface and upper air meteorological data processed with AERMET, EPA's meteorological data processor.
6. Land type	Assessed from land-use data.
7. Terrain data	USGS 7.5-minute Digital Elevation Model (DEM) files.
8. Terrain elevation	Determined by AERMAP, EPA's terrain data preprocessor, with USGS DEM files.
9. Sensitive receptor	From sensitive receptor list provided by the Alliance for each site (FG Alliance, 2006).
10. Operating hours and fuel firing loads	Unplanned restarts and steady state hours based on an 85% plant availability, or 7446 hours per year. Modeling based on 100% base load.

Table E-5. Air Quality Modeling Basis for the Proposed FutureGen Power Plant Operations Impact Analysis

<table>
<tr><th>Parameter</th><th>Modeling Basis</th></tr>
<tr><td>11. Plant operation scenario</td><td>Power plant operation is assumed to produce normal emissions at a steady-state and suddenly ramping up to higher emissions because of unplanned restart (as a result of plant upset) for a short period and then dropping back down to steady-state emissions (see 12 below).
The unplanned restart emissions are developed based on the duration and emissions associated with trip of the gasifier or the acid gas removal (AGR) system. These two plant upset modes, assumed to have the same profile, result in the highest instantaneous emissions rates of all plant upset modes, and represent the longest duration, with the exception of one plant upset mode (air separation unit [ASU] trip). While the ASU trip would be significantly longer (70 hours of warming the gasifier with modest amounts of natural gas), the long duration of minimal plant emissions prior to restart is expected to have a reduced impact on ambient air quality compared to a plant upset mode following prolonged steady state emissions. Furthermore, based on the estimated frequency of occurrence, gasifier and AGR trips combined represent approximately half of all plant upset modes in any given year.</td></tr>
<tr><td>12. Plant upset duration (hours)</td><td>
<table>
<tr><th></th><th>SO_2</th><th>NO_2</th><th>CO</th></tr>
<tr><td>ASU Trip</td><td>2</td><td>4</td><td>70</td></tr>
<tr><td>Gasifier Trip</td><td>2</td><td>4</td><td>0.5</td></tr>
<tr><td>AGR Trip</td><td>2</td><td>4</td><td>0.5</td></tr>
<tr><td>Claus Trip</td><td>2</td><td>0</td><td>0</td></tr>
<tr><td>Power Island Trip</td><td>0</td><td>1.5</td><td>0.5</td></tr>
</table>
</td></tr>
<tr><td>13. Modeled Emissions Rates</td><td>FutureGen Project's estimate of maximum air emissions (FG Alliance, 2007) (Year One operations) was used to develop annual, steady-state, and unplanned restart emissions. The modeling increments 1, 2, and 3 depict emission rates associated with the start of a plant upset mode, restarting the gasifier, and bringing the rest of the components online, respectively. From this analysis, Modeling Increment 2 represents the maximum emission interval.
<table>
<tr><th></th><th>Steady State</th><th>Modeling Increment 1</th><th>Modeling Increment 2</th></tr>
<tr><td>Time Interval</td><td>t_0</td><td>t_1</td><td>t_{1+2hr}</td></tr>
<tr><td>SO_2, g/sec</td><td>2</td><td>2</td><td>2,793</td></tr>
<tr><td>NO_2, g/sec</td><td>25</td><td>34</td><td>51</td></tr>
<tr><td>PM_{10}, g/sec</td><td>4</td><td>1</td><td>4</td></tr>
<tr><td>CO, g/sec</td><td>21</td><td>15</td><td>21</td></tr>
</table>
<table>
<tr><th></th><th>Modeling Increment 3</th><th>Steady State</th></tr>
<tr><td>Time Interval</td><td>$t_{1+2.5hr}$</td><td>t_{1+4hr}</td></tr>
<tr><td>SO_2, g/sec</td><td>2</td><td>2</td></tr>
<tr><td>NO_2, g/sec</td><td>51</td><td>25</td></tr>
<tr><td>PM_{10}, g/sec</td><td>4</td><td>4</td></tr>
<tr><td>CO, g/sec</td><td>21</td><td>21</td></tr>
</table>
Maximum unplanned restart emissions (Table E-4) are based on Modeling Increment 2.</td></tr>
</table>

Table E-5. Air Quality Modeling Basis for the Proposed FutureGen Power Plant Operations Impact Analysis

Parameter	Modeling Basis
14. Steady-state and unplanned restart emissions profile	The steady-state and unplanned restart emissions modeling profile are as follow: t_0 = 0.0 hours (see first steady-state column above) • steady state (main train + smaller, side-steam power train) plant emissions t_1 = approximately 12.0 hours (model run to reach steady state downwind concentrations) (see "Modeling Increment 1" above). • Main train system, gasifier or AGR shutdown = start of plant upset. • Shut down of all main train systems, side-steam power train system continues to operate at steady-state. • Start Natural Gas burners only to keep main train gasifier warm. • For main train system, begin only emissions of CO + NO_2, both at plant upset rates (w/o main train steady-state emissions) • Side-steam power train system continues uninterrupted (full steady-state emissions) t_{1+2hr} = 14.0 hours (see "Modeling Increment 2" above) • Restart main train gasifier + turbine. • Turn off natural gas burners. • Begin steady-state emissions + NO_2 at plant upset rate + SO_2 at plant upset rate. • Side-steam power train system continues uninterrupted (full steady-state emissions). $t_{1+2.5\ hr}$ = 14.5 hours (see "Modeling Increment 3" above) • Restart main train AGR. • Begin steady-state emissions + NO_X at plant upset rates. • Side-steam power train system continues uninterrupted (full steady-state emissions). $t_{1+4.0hr}$ = 16.0 hours (see last "steady state" column above) • Assume the system has no SCR to restart. • Begin steady-state only emissions. • Begin CO_2 capture. • End of emissions associated with plant upset.

E.3 AIR MODELING ANALYSIS

DOE conducted a refined air modeling using detailed meteorological, terrain and other input data to provide accurate estimates of emissions impacts using the EPA's AERMOD dispersion modeling system. EPA recommends the AERMOD as a preferred air dispersion model for use in a wide variety of regulatory applications. The AERMOD modeling system consists of meteorological and terrain preprocessing programs (AERMET and AERMAP, respectively) in addition to the main AERMOD dispersion model. The following are three key surface characteristics required by AERMET:

- Albedo is defined as the fraction of total incident solar radiation reflected by the surface. Typical values range from 0.1 for thick deciduous forests to 0.90 for fresh snow.
- Bowen ratio is the ratio of the sensible heat flux (H) to the latent (evaporative) heat flux (E). It is an indicator of surface moisture and is used for determining planetary boundary layer parameters for convective conditions. According to AERMET user manual, midday values of the Bowen ratio range from 0.1 over water to 10.0 over desert terrain.
- Surface roughness length is related to the height of obstacles to the wind flow (i.e., a measure of the roughness of surface cover) and is, in principle, the height at which the mean horizontal wind speed is zero. Values range from less than 0.001 meter over a calm water surface to 1 meter or more over a forest or urban area.

AERMOD is a comprehensive steady-state plume model system that incorporates air dispersion dynamics based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. As recommended by EPA's Guideline on Air Quality Models (GAQM), which is available as Appendix W of 40 CFR 51, the model was executed using EPA's default regulatory options. The concentration calculation option was selected. Based on predominant land use in the project area, rural dispersion coefficient was specified. Also, the concentration results were obtained for ground level receptors. The modeling was performed using "ISC-AERMOD VIEW" software package, which is an interface for the ISC and AERMOD models developed by Lakes Environmental Software, Inc.

E.3.1 AERMOD MODELING APPROACH

Due to lack of full information on proposed site buildings and structures, building downwash was not included in the modeling. The stack parameters defined in Table E-5 were used for model input assuming all emissions where exhausted from a single HRSG stack. Other modeling variables are described in Table E-5. Modeling for nitrogen oxide (NO_X) was performed conservatively assuming 100 percent conversion to NO_2. The model was separately executed for NO_2, SO_2, and PM_{10} using a nominal 1 g/sec unit emission rate and the unit emission impacts were adjusted to reflect annual emission rates for average annual operating periods of each pollutant. There is no annual averaging period for CO. For short-term averaging period for CO and PM_{10}, the nominal 1 g/s unit emission rate was also used and the higher of the steady-state or unplanned restart emissions rates were adjusted to determine impact. There is no short-term averaging period for NO_2.

Because of the increase in emissions during unplanned restart for a short duration, for SO_2, the short-term averaging periods (3-hrs and 24-hrs) were modeled using a variable emissions modeling tool in AERMOD. Additionally, since worst-case emissions and associated worst-case impacts during worst-case meteorological conditions are highly unlikely, short-term impacts from unplanned restart SO_2 emisisons were modeled to determine if an exceedance of short-term standards would occur. The n^{th} worst-case results were compared to the PSD increments and NAAQS standards.

Should the modeled concentrations exceed these standards, the probability of this potential exceedance is then calculated by determining the n^{th} maximum concentration using the following equation:

$$\textbf{\% Compliance} = (7446 * 5 - n) / (7446 * 5)$$

Impacts from unplanned restarts were modeled assuming that unplanned restart emissions occur over a two hour period. The remainder of the time would consist of steady state operations (1 hour for the 3-hour average and 22 hours for the 24-hour average period).

E.3.2 AERMOD INPUT PARAMETERS

Actual meteorology and terrain elevations are incorporated in the model to provide more accurate impacts. Meteorological data was obtained from National Climatic Data Center (NCDC)/National Weather Service (NWS) weather stations. United States Geological Surveys (USGS) 7.5 minute DEM files were used to assign appropriate terrain elevations for both source and receptor locations within the modeling domain. USGS 7.5 Minute Quadrangle maps were used as site base maps. These model input parameters are further described below.

E.3.2.1 Meteorological Input Data

Mattoon and Tuscola, Illinois

For the modeling for the proposed Mattoon Power Plant, a representative and recent 5-year record (2001 to 2005) of hourly surface meteorological data was obtained from the NCDC weather station at Mattoon/Charleston Coles County Airport (WMO No. 725317). The weather station is located in Mattoon and the data is therefore considered to be highly representative of the Mattoon project site. The upper air data was obtained from the upper air soundings taken by the National Weather Service in Lincoln, Illinois.

For the modeling for the proposed Tuscola Power Plant, a representative and recent 5-year record (2001 to 2005) of hourly surface meteorological data was obtained from the NCDC weather station at University of Illinois/Willard Airport at Champaign (WMO No. 725315). The weather station is located approximately 16 miles from Tuscola and the data is therefore considered to be reasonably representative of the Tuscola project site. The upper air data was obtained from the upper air soundings taken by the National Weather Service in Lincoln, Illinois (WMO No. 745600).

The meteorological data was first checked to ensure greater than 90% completeness for all parameters, per EPA requirements. Subsequently, missing data gaps were filled within a tolerable time interval based on EPA guidance procedures. Using AERMET (AERMOD's meteorological preprocessor), both surface and upper air multi-year data files were merged to create a single meteorological data file. In conjunction with site-specific characteristics, the file was then partitioned into a "surface" and "profile" files, which together provide a representative record of prevailing meteorology in the site vicinity. The three AERMET characteristics were determined based on the meteorological data station at which the surface data was collected (e.g., Mattoon/Charleston Coles County Airport for the Mattoon site), per Illinois EPA guidance. Values for seasonal averages of Albedo, Bowen Ratio, and Surface Roughness were computed for each sector, with values weighted by the fraction of land uses within each sector. Table E-6 and E-7 are calculation spreadsheets showing details of the surface characteristics determination. It should be noted that due to the proximity of the data station to the project site, the characteristics can reasonably be assumed to be equally applicable. Using high resolution satellite imagery, circles were constructed around the weather station. Each circle was scaled to a diameter of 6 km, following standard land-use analysis methodology. The circles were then divided into 12 equal sectors (each 30 degrees of arc). Each sector was analyzed for the relative contributions of land use as determined from the map details.

Jewett and Odessa, Texas

The Texas Commission on Environmental Quality's (TCEQ) Emissions Banking Modeling Team (EBMT) has prepared AERMOD meteorological data sets that are required to be used for air dispersion modeling in the state of Texas. The data sets are available by county and comprise a one-year (usually 1988) surface and upper air hourly data record and a similar five-year data set.. These AERMOD data sets have already been pre-processed by AERMET (AERMOD's meteorological processor) to produce "surface" and "profile" files, which together provide a reasonably representative record of prevailing meteorology in the site vicinities. The proposed Jewett Power Plant Site is spread over three counties, namely Leon, Freestone and Limestone counties. However, based on an initial review of the site plan and USGS topographic maps, the majority of the site will be located within Freestone County. Therefore, the meteorological data set for Freestone County was used for AERMOD modeling. The data used for the modeling for the proposed Jewett Power Plant site comprised NCDC surface hourly records from Waco, TX, and upper air data from Longview, TX. The proposed Odessa Power Plant site is located in Ector County. Therefore, the meteorological data set for Ector County was used for AERMOD modeling. The data for the proposed Odessa Power Plant site comprised NCDC surface hourly records from Midland, TX, and upper air data also from Midland.

The data record spanned the five-year period 1987 to 1991, and the processed files corresponding to "medium" surface roughness were selected based on a review of land use types in the vicinity of the project site and are shown in Tables E-8 (Jewett) and E-9 (Odessa). The preprocessed meteorological data sets provided by TCEQ incorporate appropriate values of the above three surface characteristics.

Table E-6. Mattoon Land Use Surface Characterization

KMTO	Urban (Commercial)	Urban (Residential)	Grassland	Cultivated Land	Water	Deciduous Forest	Swamp	Coniferous Forest
Sector 1 (0-30 degrees)		0.02	0.06	0.9		0.02		
Sector 2 (30-60 degrees)		0.05	0.1	0.82		0.03		
Sector 3 (60-90 degrees)		0.05	0.02	0.9		0.03		
Sector 4 (90-120 degrees)		0.05	0.05	0.85		0.05		
Sector 5 (120-150 degrees)		0.01	0.02	0.87		0.1		
Sector 6 (150-180 degrees)		0.05	0.1	0.05		0.8		
Sector 7 (180-210 degrees)		0.15	0.15	0.1		0.6		
Sector 8 (210-240 degrees)		0.05	0.05	0.85		0.05		
Sector 9 (240-270 degrees)		0.03	0.04	0.9		0.03		
Sector 10 (270-300 degrees)		0.02	0.03	0.9		0.05		
Sector 11 (300-330 degrees)		0.05	0.1	0.84		0.01		
Sector 12 (330-360 degrees)		0.01	0.1	0.87		0.02		
Average	**0**	**0.045**	**0.06833333**	**0.7375**	**0**	**0.14916667**	**0**	**0**

Table E-6. Mattoon Land Use Surface Characterization

Seasonal Land Use Parameters by Sector							
Winter	**Albedo**	**Bowen Ratio**	**Surface Roughness**	**Spring**	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.593	1.5	0.029006	Sector 1 (0-30 degrees)	0.142	0.328	0.06
Sector 2 (30-60 degrees)	0.6145	1.575	0.04871	Sector 2 (30-60 degrees)	0.1504	0.372	0.0861
Sector 3 (60-90 degrees)	0.0445	0.15	0.040002	Sector 3 (60-90 degrees)	0.0142	0.079	0.056
Sector 4 (90-120 degrees)	0.0725	0.225	0.050005	Sector 4 (90-120 degrees)	0.022	0.105	0.0775
Sector 5 (120-150 degrees)	0.0655	0.195	0.055002	Sector 5 (120-150 degrees)	0.017	0.088	0.106
Sector 6 (150-180 degrees)	0.4775	1.425	0.42501	Sector 6 (150-180 degrees)	0.121	0.65	0.83
Sector 7 (180-210 degrees)	0.4425	1.35	0.375015	Sector 7 (180-210 degrees)	0.12	0.63	0.6825
Sector 8 (210-240 degrees)	0.0725	0.225	0.050005	Sector 8 (210-240 degrees)	0.022	0.105	0.0775
Sector 9 (240-270 degrees)	0.0495	0.15	0.030004	Sector 9 (240-270 degrees)	0.015	0.067	0.047
Sector 10 (270-300 degrees)	0.05	0.15	0.035003	Sector 10 (270-300 degrees)	0.0142	0.067	0.0615
Sector 11 (300-330 degrees)	0.0825	0.24	0.03001	Sector 11 (300-330 degrees)	0.0262	0.097	0.04
Sector 12 (330-360 degrees)	0.0735	0.195	0.01501	Sector 12 (330-360 degrees)	0.0218	0.064	0.03
Average	**0.2198333**	**0.615**	**0.09856517**	**Average**	**0.05715**	**0.221**	**0.17950833**

Table E-6. Mattoon Land Use Surface Characterization

Seasonal Land Use Parameters by Sector								
Summer	**Albedo**	**Bowen Ratio**	**Surface Roughness**		**Autumn**	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.1964	0.544	0.222		Sector 1 (0-30 degrees)	0.18	0.75	0.0716
Sector 2 (30-60 degrees)	0.2036	0.624	0.248		Sector 2 (30-60 degrees)	0.1892	0.839	0.0935
Sector 3 (60-90 degrees)	0.0152	0.125	0.066		Sector 3 (60-90 degrees)	0.0166	0.15	0.0492
Sector 4 (90-120 degrees)	0.023	0.155	0.095		Sector 4 (90-120 degrees)	0.025	0.2	0.0655
Sector 5 (120-150 degrees)	0.0172	0.066	0.137		Sector 5 (120-150 degrees)	0.0178	0.14	0.0852
Sector 6 (150-180 degrees)	0.122	0.42	1.075		Sector 6 (150-180 degrees)	0.125	1	0.666
Sector 7 (180-210 degrees)	0.123	0.6	0.87		Sector 7 (180-210 degrees)	0.129	1.05	0.5565
Sector 8 (210-240 degrees)	0.023	0.155	0.095		Sector 8 (210-240 degrees)	0.025	0.2	0.0655
Sector 9 (240-270 degrees)	0.0156	0.101	0.058		Sector 9 (240-270 degrees)	0.017	0.13	0.0394
Sector 10 (270-300 degrees)	0.0146	0.079	0.078		Sector 10 (270-300 degrees)	0.0156	0.12	0.0503
Sector 11 (300-330 degrees)	0.0272	0.183	0.048		Sector 11 (300-330 degrees)	0.0302	0.21	0.034
Sector 12 (330-360 degrees)	0.022	0.106	0.041		Sector 12 (330-360 degrees)	0.0242	0.14	0.022
Average	0.0669	0.263166667	0.25275		**Average**	0.066216667	0.41075	0.149891667

Table E-6. Mattoon Land Use Surface Characterization

Seasonal Land Use Parameters by Sector			
Annual	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.27785	0.7805	0.10565
Sector 2 (30-60 degrees)	0.289425	0.8525	0.144075
Sector 3 (60-90 degrees)	0.022625	0.126	0.0778
Sector 4 (90-120 degrees)	0.035625	0.17125	0.097
Sector 5 (120-150 degrees)	0.029375	0.12225	0.1008
Sector 6 (150-180 degrees)	0.211375	0.87375	0.774
Sector 7 (180-210 degrees)	0.203625	0.9075	0.696
Sector 8 (210-240 degrees)	0.035625	0.17125	0.097
Sector 9 (240-270 degrees)	0.024275	0.112	0.0586
Sector 10 (270-300 degrees)	0.0236	0.104	0.0662
Sector 11 (300-330 degrees)	0.041525	0.1825	0.063
Sector 12 (330-360 degrees)	0.035375	0.12625	0.032
Average	**0.102525**	**0.819979**	**0.23545208**

Table E-7. Tuscola Land Use Characterization

Champaign (KCMI) Fractional Land Use								
Sector	**Urban (Commercial)**	**Urban (Residential)**	**Grassland**	**Cultivated Land**	**Water**	**Deciduous Forest**	**Swamp**	**Coniferous Forest**
Sector 1 (0-30 degrees)		0.05	0.1	0.6		0.25		
Sector 2 (30-60 degrees)		0.05	0.1	0.82		0.03		
Sector 3 (60-90 degrees)		0.05	0.05	0.87		0.03		
Sector 4 (90-120 degrees)		0.01	0.09	0.87		0.03		
Sector 5 (120-150 degrees)		0.01	0.09	0.87		0.03		
Sector 6 (150-180 degrees)		0.01	0.09	0.87		0.03		
Sector 7 (180-210 degrees)		0.01	0.09	0.87		0.03		
Sector 8 (210-240 degrees)		0.01	0.09	0.87		0.03		
Sector 9 (240-270 degrees)		0.01	0.09	0.87		0.03		
Sector 10 (270-300 degrees)		0.02	0.05	0.9		0.03		
Sector 11 (300-330 degrees)		0.05	0.1	0.84		0.01		
Average	**0**	**0.03166667**	**0.08666667**	**0.836667**	**0**	**0.045**	**0**	**0**

Table E-7. Tuscola Land Use Characterization

Seasonal Land Use Parameters by Sector							
Winter	**Albedo**	**Bowen Ratio**	**Surface Roughness**	**Spring**	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.5625	1.5	0.15601	Sector 1 (0-30 degrees)	0.139	0.445	0.298
Sector 2 (30-60 degrees)	0.5665	1.455	0.04791	Sector 2 (30-60 degrees)	0.1392	0.348	0.0837
Sector 3 (60-90 degrees)	0.0625	0.195	0.040005	Sector 3 (60-90 degrees)	0.0196	0.091	0.0575
Sector 4 (90-120 degrees)	0.0725	0.195	0.020009	Sector 4 (90-120 degrees)	0.0212	0.067	0.0395
Sector 5 (120-150 degrees)	0.0725	0.195	0.020009	Sector 5 (120-150 degrees)	0.0212	0.067	0.0395
Sector 6 (150-180 degrees)	0.0725	0.195	0.020009	Sector 6 (150-180 degrees)	0.0212	0.067	0.0395
Sector 7 (180-210 degrees)	0.0725	0.195	0.020009	Sector 7 (180-210 degrees)	0.0212	0.067	0.0395
Sector 8 (210-240 degrees)	0.0725	0.195	0.020009	Sector 8 (210-240 degrees)	0.0212	0.067	0.0395
Sector 9 (240-270 degrees)	0.0725	0.195	0.020009	Sector 9 (240-270 degrees)	0.0212	0.067	0.0395
Sector 10 (270-300 degrees)	0.052	0.15	0.025005	Sector 10 (270-300 degrees)	0.0154	0.061	0.0425
Sector 11 (300-330 degrees)	0.0825	0.24	0.03001	Sector 11 (300-330 degrees)	0.0262	0.097	0.04
Sector 12 (330-360 degrees)	0.1	0.315	0.05501	Sector 12 (330-360 degrees)	0.0332	0.147	0.065
Average	**0.15508333**	**0.41875**	**0.03950033**	**Average**	**0.04165**	**0.13258333**	**0.06864167**

Table E-7. Tuscola Land Use Characterization

Seasonal Land Use Parameters by Sector								
Summer	**Albedo**	**Bowen Ratio**	**Surface Roughness**		**Autumn**	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.176	0.555	0.48		Sector 1 (0-30 degrees)	0.167	0.87	0.256
Sector 2 (30-60 degrees)	0.1876	0.584	0.232		Sector 2 (30-60 degrees)	0.1748	0.783	0.0895
Sector 3 (60-90 degrees)	0.0206	0.149	0.069		Sector 3 (60-90 degrees)	0.0226	0.18	0.0495
Sector 4 (90-120 degrees)	0.0214	0.101	0.053		Sector 4 (90-120 degrees)	0.0234	0.14	0.0299
Sector 5 (120-150 degrees)	0.0214	0.101	0.053		Sector 5 (120-150 degrees)	0.0234	0.14	0.0299
Sector 6 (150-180 degrees)	0.0214	0.101	0.053		Sector 6 (150-180 degrees)	0.0234	0.14	0.0299
Sector 7 (180-210 degrees)	0.0214	0.101	0.053		Sector 7 (180-210 degrees)	0.0234	0.14	0.0299
Sector 8 (210-240 degrees)	0.0214	0.101	0.053		Sector 8 (210-240 degrees)	0.0234	0.14	0.0299
Sector 9 (240-270 degrees)	0.0214	0.101	0.053		Sector 9 (240-270 degrees)	0.0234	0.14	0.0299
Sector 10 (270-300 degrees)	0.0158	0.089	0.054		Sector 10 (270-300 degrees)	0.0172	0.12	0.0345
Sector 11 (300-330 degrees)	0.0272	0.183	0.048		Sector 11 (300-330 degrees)	0.0302	0.21	0.034
Sector 12 (330-360 degrees)	0.0352	0.283	0.073		Sector 12 (330-360 degrees)	0.0392	0.31	0.059
Average	**0.04923333**	**0.20408333**	**0.10616667**		**Average**	**0.04928333**	**0.27608333**	**0.05849167**

Table E-7. Tuscola Land Use Surface Characterization

Seasonal Land Use Parameters by Sector			
Annual	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.261125	0.8425	0.3225
Sector 2 (30-60 degrees)	0.267025	0.7925	0.138275
Sector 3 (60-90 degrees)	0.031325	0.15375	0.079
Sector 4 (90-120 degrees)	0.034625	0.12575	0.0406
Sector 5 (120-150 degrees)	0.034625	0.12575	0.0406
Sector 6 (150-180 degrees)	0.034625	0.12575	0.0406
Sector 7 (180-210 degrees)	0.034625	0.12575	0.0406
Sector 8 (210-240 degrees)	0.034625	0.12575	0.0406
Sector 9 (240-270 degrees)	0.034625	0.12575	0.0406
Sector 10 (270-300 degrees)	0.0251	0.105	0.049
Sector 11 (300-330 degrees)	0.041525	0.1825	0.063
Sector 12 (330-360 degrees)	0.0519	0.26375	0.113
Average	**0.0738125**	**0.7985**	**0.13629167**

Table E-8. Jewett Land Use Characterization

Sector	Urban (Commercial)	Urban (Residential)	Grassland	Cultivated Land	Water	Deciduous Forest	Swamp	Coniferous Forest
Sector 1 (0-30 degrees)	0	0.15	0.35	0.2	0	0.3	0	0
Sector 2 (30-60 degrees)	0	0.05	0.95	0	0	0	0	0
Sector 3 (60-90 degrees)	0	0	0.85	0	0.15	0	0	0
Sector 4 (90-120 degrees)	0	0.02	0.98	0	0	0	0	0
Sector 5 (120-150 degrees)	0	0.05	0.79	0	0.01	0.15	0	0
Sector 6 (150-180 degrees)	0	0.05	0.35	0	0	0.6	0	0
Sector 7 (180-210 degrees)	0	0.01	0.8	0	0.1	0.09	0	0
Sector 8 (210-240 degrees)	0	0.1	0.45	0	0.01	0.44	0	0
Sector 9 (240-270 degrees)	0	0.05	0.2	0	0.05	0.7	0	0
Sector 10 (270-300 degrees)	0	0.7	0.1	0	0	0.2	0	0
Sector 11 (300-330 degrees)	0	0.3	0.65	0	0	0.05	0	0
Sector 12 (330-360 degrees)	0	0.5	0.3	0	0	0.2	0	0
Average	**0**	**0.165**	**0.5641667**	**0.016666667**	**0.027**	**0.2275**	**0**	**0**

Table E-8. Jewett Land Use Characterization

Seasonal Land Use Parameters by Sector

Winter	Albedo	Bowen Ratio	Surface Roughness	Spring	Albedo	Bowen Ratio	Surface Roughness
Sector 1 (0-30 degrees)	0.5325	1.5	0.227035	Sector 1 (0-30 degrees)	0.148	0.56	0.3985
Sector 2 (30-60 degrees)	0.5875	1.5	0.025095	Sector 2 (30-60 degrees)	0.178	0.43	0.0725
Sector 3 (60-90 degrees)	***0.54***	***1.5***	***0.0001***	Sector 3 (60-90 degrees)	0.171	0.355	0.042515
Sector 4 (90-120 degrees)	***0.595***	***1.5***	***0.010098***	Sector 4 (90-120 degrees)	0.1792	0.412	0.059
Sector 5 (120-150 degrees)	0.5685	1.5	0.10008	Sector 5 (120-150 degrees)	0.1684	0.472	0.214501
Sector 6 (150-180 degrees)	0.5275	1.5	0.325035	Sector 6 (150-180 degrees)	0.142	0.61	0.6425
Sector 7 (180-210 degrees)	***0.5485***	***1.5***	***0.05009***	Sector 7 (180-210 degrees)	0.1682	0.403	0.13501
Sector 8 (210-240 degrees)	***0.527***	***1.5***	***0.270046***	Sector 8 (210-240 degrees)	0.149	0.589	0.512501
Sector 9 (240-270 degrees)	***0.4975***	***1.5***	***0.375025***	Sector 9 (240-270 degrees)	0.133	0.625	0.735005
Sector 10 (270-300 degrees)	***0.405***	***1.5***	***0.45001***	Sector 10 (270-300 degrees)	0.14	0.88	0.555
Sector 11 (300-330 degrees)	***0.52***	***1.5***	***0.175065***	Sector 11 (300-330 degrees)	0.165	0.595	0.2325
Sector 12 (330-360 degrees)	***0.455***	***1.5***	***0.35003***	Sector 12 (330-360 degrees)	0.148	0.76	0.465
Average	**0.525333333**	**1.5**	**0.1964758**	**Average**	**0.157483333**	**0.557583333**	**0.338711**

Table E-8. Jewett Land Use Characterization

Seasonal Land Use Parameters by Sector							
Summer	**Albedo**	**Bowen Ratio**	**Surface Roughness**	**Autumn**	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.163	0.77	0.54	Sector 1 (0-30 degrees)	0.169	1.09	0.3285
Sector 2 (30-60 degrees)	0.179	0.86	0.12	Sector 2 (30-60 degrees)	0.199	1.05	0.0345
Sector 3 (60-90 degrees)	0.168	0.695	0.085015	Sector 3 (60-90 degrees)	0.191	0.865	0.008515
Sector 4 (90-120 degrees)	0.1796	0.824	0.108	Sector 4 (90-120 degrees)	0.1996	1.02	0.0198
Sector 5 (120-150 degrees)	0.1692	0.778	0.299001	Sector 5 (120-150 degrees)	0.1864	1.041	0.152901
Sector 6 (150-180 degrees)	0.143	0.56	0.84	Sector 6 (150-180 degrees)	0.151	1.05	0.5085
Sector 7 (180-210 degrees)	0.1664	0.697	0.20201	Sector 7 (180-210 degrees)	0.1866	0.92	0.08501
Sector 8 (210-240 degrees)	0.1508	0.693	0.667001	Sector 8 (210-240 degrees)	0.1622	1.091	0.406501
Sector 9 (240-270 degrees)	0.133	0.475	0.955005	Sector 9 (240-270 degrees)	0.14	1.005	0.587005
Sector 10 (270-300 degrees)	0.154	1.54	0.62	Sector 10 (270-300 degrees)	0.17	1.7	0.511
Sector 11 (300-330 degrees)	0.171	1.135	0.28	Sector 11 (300-330 degrees)	0.19	1.3	0.1965
Sector 12 (330-360 degrees)	0.158	1.3	0.54	Sector 12 (330-360 degrees)	0.174	1.5	0.413
Average	**0.16125**	**0.860583333**	**0.4380027**	**Average**	0.176566667	1.136	0.2709777

Table E-8. Jewett Land Use Surface Characterization

Seasonal Land Use Parameters by Sector			
Annual	**Albedo**	**Bowen Ratio**	**Surface Roughness**
Sector 1 (0-30 degrees)	0.253125	0.98	0.4485
Sector 2 (30-60 degrees)	0.285875	0.96	0.088
Sector 3 (60-90 degrees)	0.2675	0.85375	0.034015
Sector 4 (90-120 degrees)	0.28835	0.939	0.0592
Sector 5 (120-150 degrees)	0.273125	0.94775	0.216601
Sector 6 (150-180 degrees)	0.240875	0.93	0.604
Sector 7 (180-210 degrees)	0.267425	0.88	0.12301
Sector 8 (210-240 degrees)	0.24725	0.96825	0.514001
Sector 9 (240-270 degrees)	0.225875	0.90125	0.688005
Sector 10 (270-300 degrees)	0.21725	1.405	0.884
Sector 11 (300-330 degrees)	0.2615	1.1325	0.371
Sector 12 (330-360 degrees)	0.23375	1.265	0.692
Average	0.255158333	1.013541667	0.3935277

Table E-9. Odessa Land Use Characterization

Sector	Urban (Commercial)	Urban (Residential)	Grassland	Cultivated Land	Water	Deciduous Forest	Swamp	Coniferous Forest	Desert Schrubland
Sector 1 (0-30 degrees)	0	0.05		0	0	0	0	0	0.85
Sector 2 (30-60 degrees)		0.05				0			0.95
Sector 3 (60-90 degrees)		0.01				0			0.99
Sector 4 (90-120 degrees)		0.07				0			0.93
Sector 5 (120-150 degrees)		0.15				0			0.85
Sector 6 (150-180 degrees)		0.25				0			0.75
Sector 7 (180-210 degrees)		0.25				0			0.75
Sector 8 (210-240 degrees)		0.2				0			0.8
Sector 9 (240-270 degrees)		0.15							0.85
Sector 10 (270-300 degrees)		0.02							0.98
Sector 11 (300-330 degrees)		0.01				0			0.99
Sector 12 (330-360 degrees)		0.01				0			0.99
Average	**0**	**0.101666667**	**0**	**0**	**0**	**0**	**0**	**0**	**0.89**

Table E-9. Odessa Land Use Characterization

Seasonal Land Use Parameters by Sector			
	Albedo	**Bowen Ratio**	**Surface Roughness**
Winter			
Sector 1 (0-30 degrees)	0.4	5.175	0.1525
Sector 2 (30-60 degrees)	0.445	5.775	0.1675
Sector 3 (60-90 degrees)	0.449	5.955	0.1535
Sector 4 (90-120 degrees)	0.443	5.685	0.1745
Sector 5 (120-150 degrees)	0.435	5.325	0.2025
Sector 6 (150-180 degrees)	0.425	4.875	0.2375
Sector 7 (180-210 degrees)	0.425	4.875	0.2375
Sector 8 (210-240 degrees)	0.43	5.1	0.22
Sector 9 (240-270 degrees)	0.435	5.325	0.2025
Sector 10 (270-300 degrees)	0.448	5.91	0.157
Sector 11 (300-330 degrees)	0.449	5.955	0.1535
Sector 12 (330-360 degrees)	0.449	5.955	0.1535
Average	**0.436083333**	**5.4925**	**0.184333**
Spring			
Sector 1 (0-30 degrees)	0.262	2.6	0.28
Sector 2 (30-60 degrees)	0.292	2.9	0.31
Sector 3 (60-90 degrees)	0.2984	2.98	0.302
Sector 4 (90-120 degrees)	0.2888	2.86	0.314
Sector 5 (120-150 degrees)	0.276	2.7	0.33
Sector 6 (150-180 degrees)	0.26	2.5	0.35
Sector 7 (180-210 degrees)	0.26	2.5	0.35
Sector 8 (210-240 degrees)	0.268	2.6	0.34
Sector 9 (240-270 degrees)	0.276	2.7	0.33

Table E-9. Odessa Land Use Characterization

Seasonal Land Use Parameters by Sector			
	Albedo	**Bowen Ratio**	**Surface Roughness**
Sector 10 (270-300 degrees)	0.2968	2.96	0.304
Sector 11 (300-330 degrees)	0.2984	2.98	0.302
Sector 12 (330-360 degrees)	0.2984	2.98	0.302
Average	**0.281233333**	**2.771666667**	**0.317833**
Summer			
Sector 1 (0-30 degrees)	0.246	3.5	0.28
Sector 2 (30-60 degrees)	0.274	3.9	0.31
Sector 3 (60-90 degrees)	0.2788	3.98	0.302
Sector 4 (90-120 degrees)	0.2716	3.86	0.314
Sector 5 (120-150 degrees)	0.262	3.7	0.33
Sector 6 (150-180 degrees)	0.25	3.5	0.35
Sector 7 (180-210 degrees)	0.25	3.5	0.35
Sector 8 (210-240 degrees)	0.256	3.6	0.34
Sector 9 (240-270 degrees)	0.262	3.7	0.33
Sector 10 (270-300 degrees)	0.2776	3.96	0.304
Sector 11 (300-330 degrees)	0.2788	3.98	0.302
Sector 12 (330-360 degrees)	0.2788	3.98	0.302
Average	**0.265466667**	**3.763333333**	**0.317833**
Autumn			
Sector 1 (0-30 degrees)	0.247	5.2	0.28
Sector 2 (30-60 degrees)	0.275	5.8	0.31
Sector 3 (60-90 degrees)	0.279	5.96	0.302
Sector 4 (90-120 degrees)	0.273	5.72	0.314
Sector 5 (120-150 degrees)	0.265	5.4	0.33

Table E-9. Odessa Land Use Characterization

Seasonal Land Use Parameters by Sector			
	Albedo	**Bowen Ratio**	**Surface Roughness**
Sector 6 (150-180 degrees)	0.255	5	0.35
Sector 7 (180-210 degrees)	0.255	5	0.35
Sector 8 (210-240 degrees)	0.26	5.2	0.34
Sector 9 (240-270 degrees)	0.265	5.4	0.33
Sector 10 (270-300 degrees)	0.278	5.92	0.304
Sector 11 (300-330 degrees)	0.279	5.96	0.302
Sector 12 (330-360 degrees)	0.279	5.96	0.302
Average	**0.2675**	**5.543333333**	**0.317833**
Annual			
Sector 1 (0-30 degrees)	0.28875	4.11875	0.273125
Sector 2 (30-60 degrees)	0.3215	4.59375	0.299375
Sector 3 (60-90 degrees)	0.3263	4.71875	0.269875
Sector 4 (90-120 degrees)	0.3191	4.53125	0.314125
Sector 5 (120-150 degrees)	0.3095	4.28125	0.373125
Sector 6 (150-180 degrees)	0.2975	3.96875	0.446875
Sector 7 (180-210 degrees)	0.2975	3.96875	0.446875
Sector 8 (210-240 degrees)	0.3035	4.125	0.41
Sector 9 (240-270 degrees)	0.3095	4.28125	0.373125
Sector 10 (270-300 degrees)	0.3251	4.6875	0.27725
Sector 11 (300-330 degrees)	0.3263	4.71875	0.269875
Sector 12 (330-360 degrees)	0.3263	4.71875	0.269875
Average	**0.312570833**	***4.392708***	***0.335292***

E.3.2.2 Background Ambient Air Quality

Based on EPA guidance, Guidelines on Data Handling Conventions for the PM NAAQS, to determine representative background data for both PM_{10} and $PM_{2.5}$ 24-hour and annual averaging period, the monitored data are averaged over a period of 3 years (2003 to 2005) (EPA, 1999). For all other pollutants and corresponding averaging periods, the highest of the second-highest values each year for a period of 3 years (2003 to 2005) is used.

Mattoon and Tuscola, Illinois

Mattoon is located in Coles County, Illinois and Tuscola is located in Douglas County. Both counties are part of the East Central Illinois Intrastate Air Quality Control Region (AQCR). The nearest ambient monitors to the sites and the pollutants monitored at these locations are listed below. The stations selected are in proximity to the Mattoon and Tuscola sites.

- Sulfur Dioxide - Decatur
- Nitrogen Dioxide - East St. Louis
- PM_{10} - Peoria
- $PM_{2.5}$ - Champaign
- Carbon Monoxide - Peoria

Table E-10 presents the representative yet conservative background for the criteria pollutants for the proposed Mattoon and Tuscola sites.

Table E-10. Background Concentration for the Proposed Mattoon and Tuscola Power Plant

Pollutant	Averaging Period	Station	Second Highest Concentrations for each Year (1) (µg/m^3)				
			2003	2004	2005	Average 3-yr Value	Highest Value
Sulfur Dioxide	Annual	Decatur	7.85	10.47	10.47	n/a	10.47
	24-hour	Decatur	70.67	60.2	54.99	n/a	70.67
	3-hour	Decatur	123.03	96.85	102.12	n/a	123.03
Nitrogen Dioxide	Annual	East St. Louis	30.09	30.09	28.21	n/a	30.09
	1-hour	East St. Louis	165.41	109.07	99.66	n/a	165.41
PM_{10}	Annual	Peoria	25	22	31	26	n/a
	24-hour	Peoria	55	42	75	57.3	n/a
$PM_{2.5}$	Annual	Champaign	13.1	10.4	14	12.5	n/a
	24-hour	Champaign	32.8	24.3	38.7	31.9	n/a
Carbon Monoxide	8-hour	Peoria	3,321.05	3,435.57	3,457.93	n/a	3,457.93
	1-hour	Peoria	5,611.43	4,466.24	5,264.66	n/a	5,611.43

n/a = not applicable.
Source: Illinois Annual Air Quality Reports, 2003, 2004, 2005.

Jewett, Texas

Jewett is located in northwestern Leon County, Texas and is part of the Austin-Waco Intrastate Air Quality Control Region (AQCR 212). The nearest ambient monitors to the site and the pollutants monitored at these locations are listed below. The stations selected are in proximity to the Jewett site.

- Sulfur Dioxide - Dallas (Hinton St)
- Nitrogen Dioxide - Dallas North (Nuestra Drive)
- PM_{10} - Dallas (South Akard)
- $PM_{2.5}$ - Houston (Aldine)
- Carbon Monoxide - Fort Worth

Table E-11 presents the representative yet conservative background for these criteria pollutants for the proposed Jewett site.

Table E-11. Background Concentration for the Proposed Jewett Power Plant

Pollutant	Averaging Period	Station	Second Highest Concentrations for each Year (µg/m^3)				
			2003	2004	2005	Average 3-yr Value	Highest Value
Sulfur Dioxide	Annual	Dallas Hinton St.	2.62	2.62	2.62	n/a	2.62
	24-hour	Dallas Hinton St.	10.47	13.09	10.47	n/a	13.09
	3-hour	Dallas Hinton St.	23.56	28.79	34.03	n/a	34.03
Nitrogen Dioxide	Annual	Dallas North	26.34	22.58	24.46	n/a	26.34
	1-hour	Dallas North	122.29	101.6	112.88	n/a	122.29
PM10	Annual	Dallas South Akard	28	23	27	26.3	n/a
	24-hour	Dallas South Akard	63	55	47	55.0	n/a
PM2.5	Annual	Houston Aldine	13.8	13.5	13.8	13.7	n/a
	24-hour	Houston Aldine	31	30	27	29.3	n/a
Carbon Monoxide	8-hour	Fort Worth	1,832.30	1,946.82	1,717.79	n/a	1,946.82
	1-hour	Fort Worth	4,008.17	3,321,05	2,977.49	n/a	4,008.17

n/a = not applicable.
Source: TCEQ, 2005 and EPA AirDatabase.

Odessa, Texas

Odessa is located in Ector County, Texas and is part of the Midland-Odessa-San Angelo Intrastate Air Quality Control Region (AQCR 218). The nearest ambient monitors to the site and the pollutants monitored at these locations are listed below.

• Sulfur Dioxide	-	El Paso, TX
• Nitrogen Dioxide	-	Hobbs, NM
• PM_{10}	-	Hobbs, NM
• $PM_{2.5}$	-	Odessa, TX
• Carbon Monoxide	-	El Paso, TX

Table E-12 presents the representative yet conservative background for these criteria pollutants for the proposed Odessa site.

Table E-12. Background Concentration for the Proposed Odessa Power Plant

Pollutant	Averaging Period	Station	Second Highest Concentrations for each Year (1) (µg/m^3)				
			2003	2004	2005	Average 3-yr Value	Highest Value
Sulfur Dioxide	Annual	El Paso, TX.	5.24	2.62	2.62	n/a	5.24
	24-hour	El Paso, TX.	10.47	7.85	13.09	n/a	13.09
	3-hour	El Paso, TX.	52.35	34.03	31.41	n/a	52.35
Nitrogen Dioxide	Annual	Hobbs, NM	ND	15.05	13.17	n/a	15.05
	1-hour	Hobbs, NM	ND	77.14	92.19	n/a	92.19
PM10	Annual	Hobbs, NM	26	15	13	18	n/a
	24-hour	Hobbs, NM	88	48	18	51.3	n/a
PM2.5	Annual	Odessa, TX	7.8	7.6	7.7	7.7	n/a
	24-hour	Odessa, TX	18	22	21	20.3	n/a
Carbon Monoxide	8-hour	El Paso, TX.	3,902.01	3,323.94	3,757.49	n/a	3,902.01
	1-hour	El Paso, TX.	7,225.95	6,792.39	6,069.80	n/a	7,225.95

ND = no data.
n/a = not applicable.
Source: TCEQ, 2005 and EPA AirDatabase.

E.3.2.3 Terrain Input Data

USGS 7.5-minute DEM data were used with the AERMOD terrain preprocessing model (AERMAP) to determine appropriate site terrain elevations in accordance with EPA's Guideline on Air Quality Models' (GAQM) recommendations for AERMOD. According to the GAQM, *flat* terrain is terrain equal to the elevation of the stack base, *simple* terrain is terrain lower than the height of the stack top, and *complex* terrain is terrain exceeding the height of the stack being modeled. Terrain input data for the proposed power plant sites are provided in Table E-13.

Table E-13. 7.5 Minute DEM Terrain Input Data for Proposed Power Plant Sites

Mattoon, IL[1]	Tuscola, IL[1]	Jewett, TX[2]	Odessa, TX[3]
Cadwell	Ivesdale	Teague South	Red Lakes
Arthur	Tolono	Dew	Douro
Arcola	Villa Grove NW	Lanely	Odessa SW
Sullivan	Atwood	Farrar	Metz
Cooks Mill	Tuscola	Donie	Penwell
Humboldt	Villa Grove	Buffalo	Clark Brothers Ranch
Windsor	Arthur	Round Prairie	Penwell SW
Mattoon West	Arcola	Jewett	Penwell SE
	Hindsburg	Robbins	Doodle Bug Well

[1] Portions of the modeling terrain for which 7.5 minute DEMs were not found were covered using Decatur 1–degree DEM.
[2] Portions of the modeling terrain for which 7.5 minute DEMs were not found were covered using "Waco" 1–degree DEM.
[3] Portions of the modeling terrain for which 7.5 minute DEMs were not found were covered using "Pecos" 1–degree DEM.

E.3.2.4 Receptor Grid

AERMOD requires receptor data consisting of location coordinates and ground-level elevations (see Table E-14). The discrete Cartesian and discrete sensitive receptors are based on the following tier and spacing distances in accordance with IEPA, TCEQ, and USEPA guidelines:

Table E-14. Receptor Grid Tier and Spacing Distance

Mattoon, IL	Tuscola, IL	Jewett, TX	Odessa, TX
• Refined receptor grid consists of 10,730 discrete points beyond the fence line • Fence line receptors at 50 meter spacing • Near-field Cartesian receptors from source location (center of the site) and extending out to 3,500 meters at 100 meter spacing (can also be described as extending from fence line to approximately 2,800 meters beyond) • Intermediate-field Cartesian receptors between 3,500 meters and extending out to 7,500 meters at 250 meter spacing • Far-field Cartesian receptors from 7,500 meters and extending out to 15,000 meters at 500 meter spacing • 17 sensitive receptors (schools, hospitals, etc.) modeled as discrete Cartesian receptors • Additional discrete Cartesian receptors to ensure full coverage of the sensitive receptor map domain	• Refined receptor grid consists of 11,588 discrete points beyond the fence line • Fence line receptors at 50 meter spacing • Near-field Cartesian receptors from source location (center of the site) and extending out to 3,500 meters at 100 meter spacing (can also be described as extending from fence line to approximately 3,000 meters beyond) • Intermediate-field Cartesian receptors between 4,000 meters and extending out to 7,000 meters at 250 meter spacing • Far-field Cartesian receptors from 7,000 meters and extending out to 15,000 meters at 500 meter spacing • 20 sensitive receptors (schools, hospitals, etc.) modeled as discrete Cartesian receptors • Additional discrete Cartesian receptors to ensure full coverage of the sensitive receptor map domain	• Refined receptor grid consists of 8,147 discrete points beyond the fence line • Fence line receptors at 50 meter spacing • Near-field Cartesian receptors from source location (center of the site) and extending out to 4,000 meters at 100 meter spacing (can also be described as extending from fence line to approximately 3,000 meters beyond) • Intermediate-field Cartesian receptors between 4,000 meters and extending out to 8,000 meters at 500 meter spacing • Far-field Cartesian receptors from 8,000 meters and extending out to 18,000 meters at 1,000 meter spacing • 5 sensitive receptors (schools, hospitals, etc.) modeled as discrete Cartesian receptors • Additional discrete Cartesian receptors to ensure full coverage of the sensitive receptor map domain	• Refined receptor grid consists of 8,147 discrete points beyond the fence line • Fence line receptors at 50 meter spacing • Near-field Cartesian receptors from source location (center of the site) and extending out to 3,500 meters at 100 meter spacing (can also be described as extending from fence line to approximately 3,000 meters beyond) • Intermediate-field Cartesian receptors between 3,500 meters and extending out to 7,500 meters at 500 meter spacing • Far-field Cartesian receptors from 7,500 meters and extending out to 18,000 meters at 1,000 meter spacing • 4 sensitive receptors (schools, hospitals, etc.) modeled as discrete Cartesian receptors • Additional discrete Cartesian receptors to ensure full coverage of the sensitive receptor map domain

E.3.3 AERMOD MODELING RESULTS

The AERMOD results for each site are provided below.

Mattoon, Illinois

The AERMOD results for the proposed Mattoon Power Plant project are provided in Table E-15.

Table E-15. Predicted Maximum Concentration Increases from Proposed Mattoon Power Plant (µg/m³) [1]

Pollutant	Averaging Period	Maximum Annual Concentration Increase	Maximum Short-Term Concentration Increase
SO_2 (Normal Operating Scenario)[2]	3-hour	--	0.7172
	24-hour	--	0.2625
	Annual	0.18	--
SO_2 (Plant Upset Scenario) [3, 4, 5]	3-hour	--	511.82
	24-hour	--	88.00
	Annual	0.18	--
NO_2[6]	Annual	0.26	--
PM_{10}	24-hour	--	0.52
	Annual	0.04	--
$PM_{2.5}$ [7]	24-hour	--	0.52
	Annual	0.04	--
CO	1-hour	--	11.33
	8-hour	--	5.01

[1] Because the FutureGen Project would be a R&D project, DOE assumes that the maximum plant availability would be 85 percent.

[2] The normal operating scenario is based on steady-state emissions and is a period when the plant is operating without flaring, sudden restarts, or other upset conditions.

[3] The plant upset scenario is based on unplanned restart emissions. Most of the unplanned restart emissions would be SO_2. NO_2 and CO emissions would be higher during normal operation. There are no PM_{10}, $PM_{2.5}$ emissions during plant upset scenarios. See Table E-4.

[4] The 3-hr SO2 concentration is based on the 85th maximum concentration reading (out of 14,600 readings) of 5-yr meteorological data. The probability of concentration greater than 511.82 µg/m³ during the 3-hr averaging period is less than 0.23 percent.

[5] The 24-hr SO2 concentration is based on the 1st maximum concentration reading (out of 1,825 readings) of 5-yr meteorological data. The probability of concentrations greater than 88.00 µg/m³ during the 24-hr averaging period is zero.

[6] There are no short-term NAAQS for NO_2.

[7] $PM_{2.5}$ emissions are assumed to be the same as PM_{10}.

µg/m³ = micrograms per cubic meter.

Source: FG Alliance, 2007 and EPA, 1990.

Tuscola, Illinois

The AERMOD results for the proposed Tuscola Power Plant project are provided in Table E-16.

Table E-16. Predicted Maximum Concentration Increases from Proposed Tuscola Power Plant (µg/m^3) [1]

Pollutant	Averaging Period	Maximum Annual Concentration Increase	Maximum Short-Term Concentration Increase
SO_2 (Normal Operating Scenario)[2]	3-hour	--	0.5355
	24-hour	--	0.1967
	Annual	0.05	--
SO_2 (Plant Upset Scenario) [3, 4, 5]	3-hour	--	511.96
	24-hour	--	67.00
	Annual	0.05	--
NO_2 [6]	Annual	0.07	--
PM_{10}	24-hour	--	0.39
	Annual	0.01	--
$PM_{2.5}$ [7]	24-hour	--	0.39
	Annual	0.01	--
CO	1-hour	--	9.47
	8-hour	--	4.73

[1] Because the FutureGen Project would be a R&D project, DOE assumes that the maximum plant availability would be 85 percent.
[2] The normal operating scenario is based on steady-state emissions and is a period when the plant is operating without flaring, sudden restarts, or other upset conditions.
[3] The plant upset scenario is based on unplanned restart emissions. Most of the unplanned restart emissions would be SO_2. NO_2 and CO emissions would be higher during normal operation. There are no PM_{10}, $PM_{2.5}$ emissions during plant upset scenarios. See Table E-4.
[4] The 3-hr SO_2 concentration is based on the 82nd maximum concentration reading (out of 14,600 readings) of 5-yr meteorological data. The probability of concentrations greater than 511.94 µg/m^3 during the 3-hr averaging period is less than 0.22 percent.
[5] The 24-hr SO_2 concentration is based on the 1st maximum concentration reading (out of 1,825 readings) of 5-yr meteorological data. The probability of concentrations greater than 67.00 µg/m^3 during the 24-hr averaging period is zero.
[6] There are no short-tern NAAQS for NO_2.
[7] $PM_{2.5}$ emissions are assumed to be the same as PM_{10}.
µg/m^3 = micrograms per cubic meter.
Source: FG Alliance, 2007 and EPA, 1990.

Jewett, Texas

The AERMOD results for the proposed Jewett Power Plant project are provided in Table E-17.

Table E-17. Predicted Maximum Concentration Increases from Proposed Jewett Power Plant (µg/m^3) [1]

Pollutant	Averaging Period	Maximum Annual Concentration Increase	Maximum Short-Term Concentration Increase
SO_2 (Normal Operating Scenario)[2]	3-hour	--	0.8195
	24-hour	--	0.4152
	Annual	0.48	--
SO_2 (Plant Upset Scenario) [3, 4, 5]	3-hour	--	511.91
	24-hour	--	89.50
	Annual	0.48	--
NO_2 [6]	Annual	0.67	--
PM_{10}	24-hour	--	0.83
	Annual	0.10	--
$PM_{2.5}$ [7]	24-hour	--	0.83
	Annual	0.10	--
CO	1-hour	--	10.45
	8-hour	--	7.88

[1] Because the FutureGen Project would be a R&D project, DOE assumes that the maximum plant availability would be 85 percent.
[2] The normal operating scenario is based on steady-state emissions and is a period when the plant is operating without flaring, sudden restarts, or other upset conditions.
[3] The plant upset scenario is based on unplanned restart emissions. Most of the unplanned restart emissions would be SO_2. NO_2 and CO emissions would be higher during normal operation. There are no PM_{10}, $PM_{2.5}$ emissions during plant upset scenarios. See Table E-4.
[4] The 3-hr SO_2 concentration is based on the 618th maximum concentration reading (out of 14,600 readings) of 5-yr meteorological data. The probability of concentration greater than 511.91 µg/m^3 during the 3-hr averaging period is less than 1.66 percent.
[5] The 24-hr SO_2 concentration is based on the 88th maximum concentration reading (out of 1,825 readings) of 5-yr modeling data. The probability of concentrations greater than 89.00 µg/m^3 during the 24-hr averaging period is 0.20 percent.
[6] There are no short-term NAAQS for NO_2.
[7] $PM_{2.5}$ emissions are assumed to be the same as PM_{10}.
µg/m^3 = micrograms per cubic meter.
Source: FG Alliance, 2007 and EPA, 1990.

Odessa, Texas

The AERMOD results for the proposed Odessa Power Plant project are provided in Table E-18.

Table E-18. Predicted Maximum Concentration Increases from Proposed Odessa Power Plant ($\mu g/m^3$) [1]

Pollutant	Averaging Period	Maximum Annual Concentration Increase	Maximum Short-Term Concentration Increase
SO_2 (Normal Operating Scenario)[2]	3-hour	--	0.5425
	24-hour	--	0.1884
	Annual	0.25	--
SO_2 (Plant Upset Scenario) [3, 4, 5]	3-hour	--	511.98
	24-hour	--	73.00
	Annual	0.25	--
NO_2 [6]	Annual	0.35	--
PM_{10}	24-hour	--	0.38
	Annual	0.05	--
$PM_{2.5}$ [7]	24-hour	--	0.38
	Annual	0.05	--
CO	1-hour	--	8.42
	8-hour	--	4.85

[1] Because the FutureGen Project would be a R&D project, DOE assumes that the maximum plant availability would be 85 percent.
[2] The normal operating scenario is based on steady-state emissions and is a period when the plant is operating without flaring, sudden restarts, or other upset conditions.
[3] The plant upset scenario is based on unplanned restart emissions. Most of the unplanned restart emissions would be SO_2. NO_2 and CO emissions would be higher during normal operation. There are no PM_{10}, $PM_{2.5}$ emissions during plant upset scenarios. See Table E-4.
[4] The 3-hr SO_2 is based on the 33rd maximum concentration reading (out of 14,600 readings) of 5-yr meteorological data. The probability of concentration greater than 511.98 $\mu g/m^3$ during the 3-hr averaging period is less than 0.09 percent.
[5] The 24-hr SO_2 is based on the 1st maximum concentration reading (out of 1,825 readings) of 5-yr modeling data. The probability of concentrations greater than 73.00 $\mu g/m^3$ during the 24-hr averaging period is zero.
[6] There are no short-term NAAQS for NO_2.
[7] $PM_{2.5}$ emissions are assumed to be the same as PM_{10}.
$\mu g/m^3$ = micrograms per cubic meter.
Source: FG Alliance, 2007 and EPA, 1990.

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List of References:

FutureGen Alliance (FG Alliance). 2006. "Final Request for Proposals for FutureGen Facility Host Site" March 7, 2006

FG Alliance. 2007. "Initial Conceptual Design Report."

Environmental Consulting & Technology, Inc. (ECT). 2006. "Prevention of Significant Deterioration Permit Application. Orlando Utilities Commission Curtis H. Stanton Energy Center Unit B IGCC Project, February 2006. Gainesville, FL.

U.S. Environmental Protection Agency (EPA). 1990. "New Source Review Workshop Manual. Prevention of Significant Deterioration and Nonattainment Area Permitting." Draft, October, 1990. Washington, DC.

EPA. 1999. "Guideline on Data Handling Conventions for the PM NAAQS." EPA-454/R-99-008 April 1999. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

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