MACTEC

engineering and constructing a better tomorrow

November 26, 2007

Mr. Peter Courtney
Georgia Department of Natural Resources
Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, GA 30354

Re: PSD Modeling Protocol
Project Independence
Fitzgerald, GA (Ben Hill County)
Sandersville, GA (Washington County)

Dear Mr. Courtney,

MACTEC Engineering and Consulting, Inc. (MACTEC) is currently working on developing a permit application for construction of two (2) coal-fired power plants, with one located near Fitzgerald, Georgia and the other located near Sandersville, Georgia. Therefore, we are providing this modeling protocol for your review and concurrence, which describes the procedures we intend to use to complete the modeling for this application. We are requesting a quick response to this protocol in order to stay on our client's schedule. We will call you after receipt of this letter to see if you have any questions, comments, or further needs, or would like to discuss this in a meeting. Figures 1 and 2 provide the approximate locations of the planned facilities.

Project Description

Each facility (Fitzgerald, GA and Sandersville, GA) will be a nominal 883 MW net coal-fired generating station. Each facility will consist of one supercritical pulverized coal fired boiler, a steam turbine generator, multiple steam condensers, cooling towers, auxiliary boiler, and various auxiliary equipment and coal handling facilities. The current projected facility design includes burning a mixture of western coal (Powder River Basin) and eastern coal (Illinois #6).

Based on this project scope we prepared preliminary emission calculations to develop a PSD applicability analysis. Table 1 provides a preliminary PSD applicability analysis for the project, with the emissions listed indicative of the emissions at each Project Independence site (Fitzgerald and Sandersville). Per EPA guidance, until significance levels and increment values are established for $PM_{2.5}$, PM_{10} air quality standards will be used as surrogates for $PM_{2.5}$. Preliminary indications from this analysis are that PM_{10}, NOx, CO, SO_2, VOC, and H_2SO_4 emissions will exceed their corresponding PSD trigger levels. Therefore PM_{10}, NOx, CO, and SO_2 will require an air quality modeling analysis. Current guidance indicates that no pre-construction monitoring concentration is prescribed for ozone. Any net emissions increase of 100 tons/yr or more of VOCs or NOx subject to PSD would be required to conduct an ambient impact analysis for ozone, including the gathering of ambient air quality data. VOC emissions are less than 100 tons/yr but NOx emissions exceed this level. A qualitative assessment of the impact of ozone levels will be made using the proposed NOx modeling and information gathered from local monitors.

This modeling protocol outlines how MACTEC plans to complete the modeling analysis. Generally, MACTEC will utilize the "Georgia Air Dispersion Modeling Guidance – December 1, 2006" and the "Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions" for completion of the modeling.

Figure 1: Approximate Planned Fitzgerald, GA Site Location

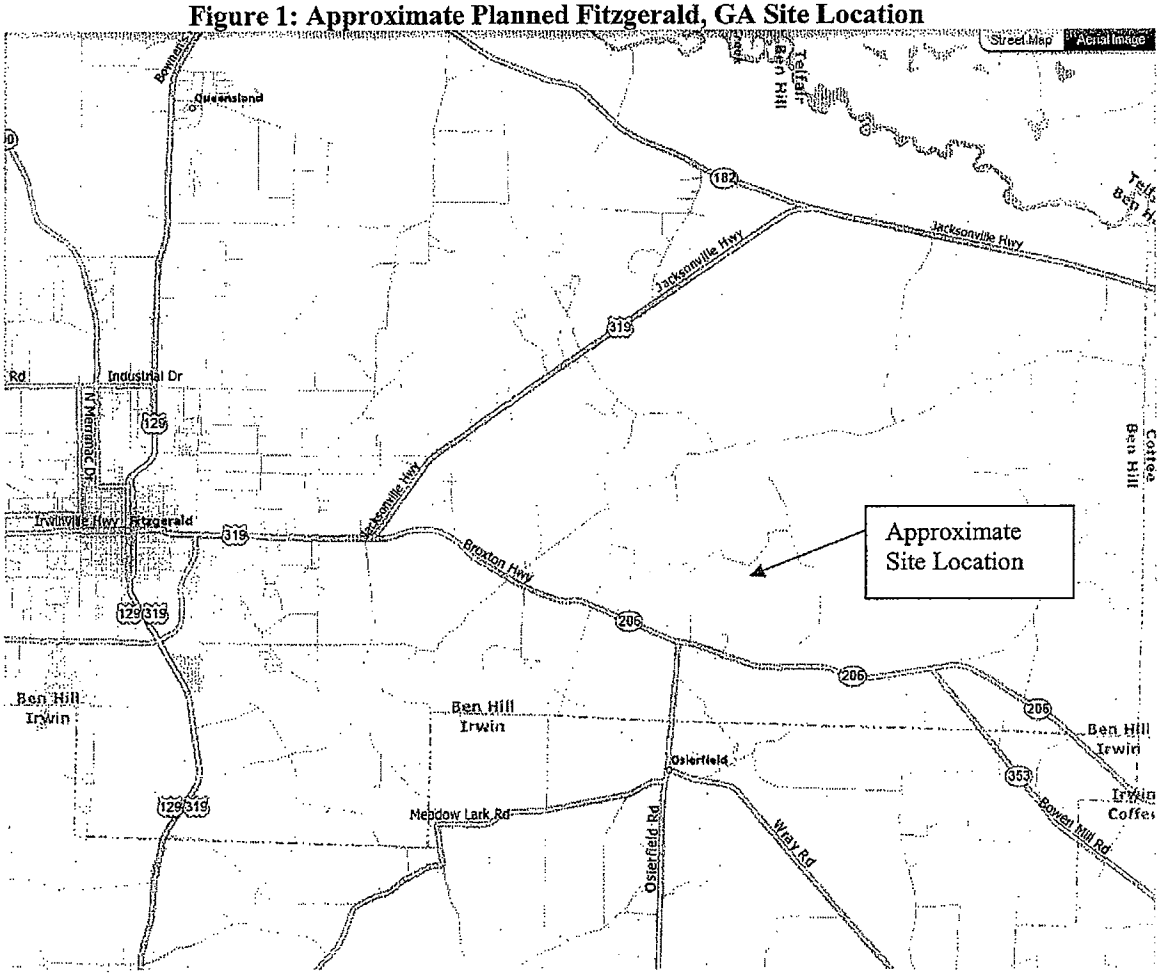

Figure 2: Approximate Planned Sandersville, GA Site Location

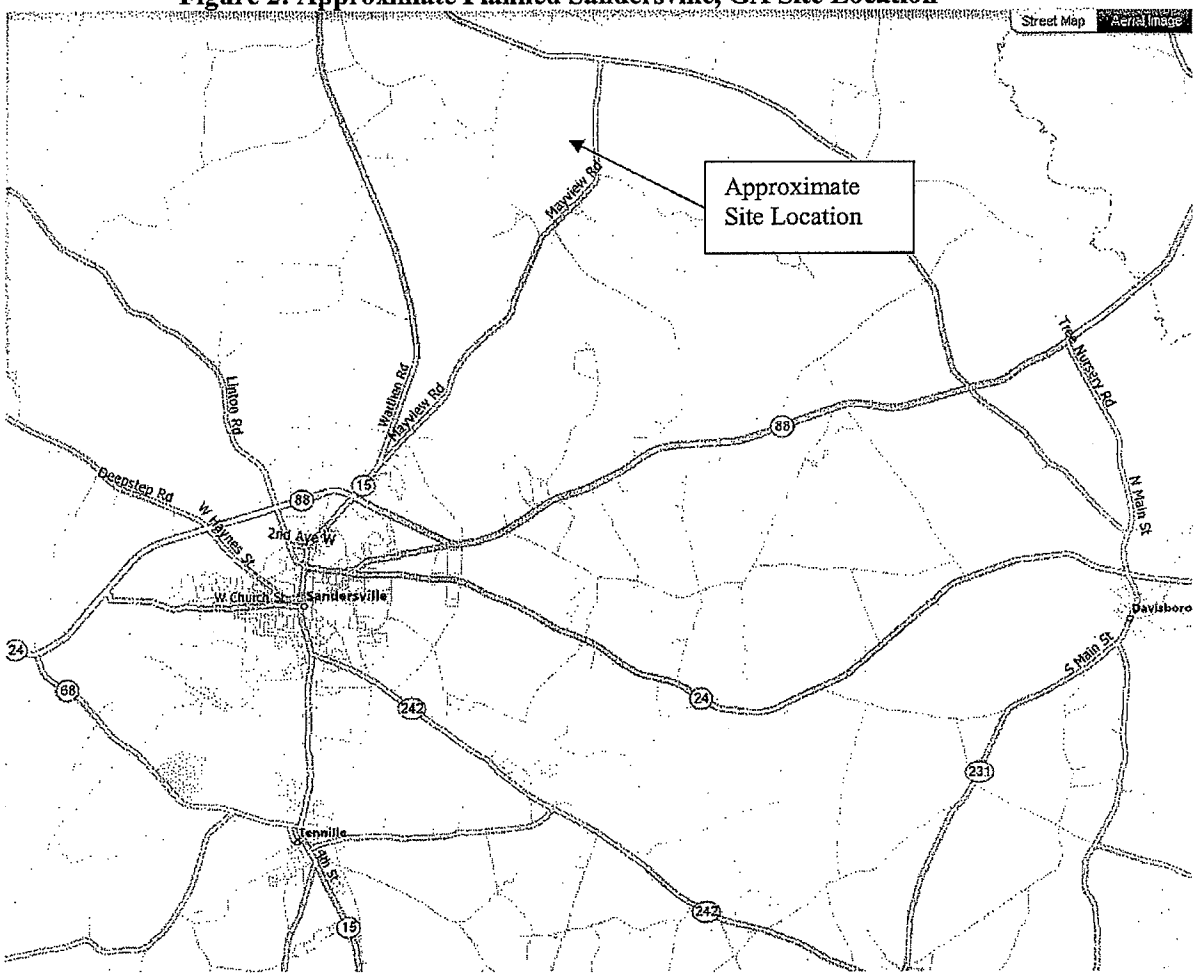

Table 1. Preliminary PSD Applicability Analysis[1]

	PM_{10}	SO_2	NOx	CO	VOC	Pb	Fluorides	H_2SO_4 Mist
	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)
Coal-fired Boiler	571	4565	2663	5706	6.74	0.07	0.59	56
Auxilliary Boiler	1.21	6.28	12.09	4.83	0.36	1.09E-02	1.13E-03	7.25E-03
Diesel-Fired Equipment	0.93	2.63	16.85	6.89	0.94	-	-	-
Cooling Towers	11.71	-	-	-	-	-	-	-
Coal Piles	9.78	-	-	-	-	-	-	-
Coal Handling Fugitives	0.29	-	-	-	-	-	-	-
Ash Management Fugitives	0.011	-	-	-	-	-	-	-
Limestone Management Fugitives	2.08E-04	-	-	-	-	-	-	-
Roadway Emissions	39.14	-	-	-	-	-	-	-
Storage Tanks	-	-	-	-	0.10	-	-	-
Project Totals	634	4,574	2,692	5,718	8.1	0.1	0.6	56.0
PSD Significance Level	15	40	40	100	40	0.6	3	7
PSD (Yes or No)	Yes	Yes	Yes	Yes	No	No	No	Yes

[1] Calculated emission rates given in Table 1 are based on current projected design of the facility. Final design of the plant has not been completed; therefore, the calculated emission rates, while presumably accurate, are subject to change.

Fugitive Emissions

Calculating fugitive emissions of PM_{10} from paved and unpaved roads will be calculated and modeled according to the procedures outlined in the Georgia EPD "Guideline for assuring acceptable ambient concentration of PM_{10} in areas impacted by quarry operation producing crushed stones – October 15, 2004". Fugitive emissions from various coal handling emission sources (i.e. coal piles) and ash and limestone management emission sources will be determined using Chapter 11.9 and Chapter 13.2 of AP-42, Fifth Edition, Volume I. Modeling of these sources of fugitive emissions will follow the guidance provided in the "Guideline for assuring acceptable ambient concentration of PM_{10} in areas impacted by quarry operation producing crushed stones – October 15, 2004" where appropriate.

Screen Modeling

The screen modeling for PM_{10}, NOx, SO_2, and CO will determine whether the emission increases result in ground level concentrations that exceed significant impact levels and significant monitoring concentrations. Sulfuric Acid mist emissions are expected to exceed PSD significance levels but no significant impact level is listed. This pollutant is discussed in the Toxics section of the protocol. These levels are defined for each pollutant as indicated in Table 2 below. If the significance impact level is exceeded, then refined modeling will be completed for that pollutant for that time average period.

Table 2: Significant Impact Levels and Significant Monitoring Concentrations

Pollutant	Averaging Period	Significant Impact Level ($\mu g/m^3$)	Significant Monitoring Concentration ($\mu g/m^3$)
PM_{10}	Annual	1	--
	24-Hour	5	10
NOx	Annual	1	14
SO_2	Annual	1	--
	24-Hour	5	13
	3-Hour	25	--
CO	8-hour	500	575
	1-hour	2,000	--

The maximum ground level concentration from the screen modeling results will be compared to the pre-construction monitoring level for each pollutant shown in Table 2. If that concentration is exceeded then we will evaluate whether there exists a state or local air monitoring station that collects data on that specific pollutant that can be considered representative for air quality in the vicinity of the Project Independence sites.

Model Selection & Modeling Options

The screen modeling will be performed using the AERMOD model for each of the pollutants for all averaging periods. The latest version of the AERMOD model (version 07026) as downloaded from EPA's SCRAM website will be used for the modeling. Screen modeling using AERMOD will utilize the regulatory default mode in determining concentrations at all receptors. The ambient air concentrations to be output by the model runs are the highest concentration predicted at any receptor for all averaging periods for each of the modeled pollutants for comparison to its

appropriate significance level. In both screening and refined modeling, the maximum concentration predicted by the model will be resolved to 100-meter receptor grid spacing to get a "true" maximum. The greatest distance from the facility to any receptor that has a concentration exceeding the significance level for the corresponding pollutant and averaging period defines the radius of the circular significant impact area (SIA). If none of the concentrations predicted by the model runs exceed the corresponding significance level for the respective averaging period, then no further modeling will be required. Otherwise, MACTEC will proceed with refined modeling according to the procedures outlined under the Refined Modeling discussion.

The latest version of EPA's Building Profile Input Program for PRIME – version 04274 (BPIPPRM) will be used to calculate flow vectors based on 36 possible wind directions in order to allow for building downwash. BPIPRM includes an algorithm for calculating downwash values for input into the PRIME algorithm, which is contained in the AERMOD model. Building coordinates of all buildings and structures which have heights of 40% of the shortest stack or greater will be input to the model along with the stack heights so that the BPIPPRM model can properly compute the proper building dimensions for all stacks in all directions.

Meteorological Data

The Georgia EPD will provide MACTEC with AERMET version 06341 pre-processed meteorological data files for the area within the vicinity of the Project Independence plant sites. The meteorological data set to be used for the Sandersville (Washington County) site will be from Macon/Centreville data. The meteorological data set planned for use for the Fitzgerald (Ben Hill County) site is Georgia Power's Plant Hatch site/Centreville. The following list the approximate coordinates of the two(2) Project Independence sites.

Table 3: Project Independence Site Locations

Site	UTM Easting (m)	UTM Northing (m)	UTM Zone
Fitzgerald (Ben Hill County)	301451	3509004	17
Sandersville (Washington County)	337534	3660219	17

The development of the AERMET data set requires the assessment of surface characteristics of the surface meteorological station. These characteristics include albedo, Bowen ratio, and surface roughness. Albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption, Bowen ratio is an indicator of surface moisture, and surface roughness length is related to the height of obstacles in relation to wind flow. A comparative analysis of surface characteristics surrounding the site and the surface meteorological station will be conducted, according to the interim guidance document "Georgia Air Dispersion Modeling Guidance – December 1, 2006".

Model Receptor locations

A Cartesian receptor grid will be used for the model runs, with receptors spaced at 100 meters along the fence line and out to a distance of 2 kilometers out from the site's main stack. Receptors will be spaced at 500 meters apart from 2 kilometers to 10 kilometers out from the site's main stack. Receptors will be spaced 1000 meters from 10 to 50 kilometers out from the site's main stack. The Spatial Data Transfer Standard 2 Digital Elevation Model (SDTS2DEM), Version 0.018, (a USEPA program) will be used to convert the Data Decryption Field (DDF) files

obtained from the Geocommunity website to Digital Elevation Model (DEM) files. The DEM files and the AERMOD Mapping Program (AERMAP version 06341) will be used to determine the elevation of each modeled receptor and stack. To check the results of the DEM file processing, MACTEC will plot the receptor grid elevations and make spot check comparisons to the resulting plot to a USGS map.

Refined Modeling

In the screen modeling step the Significant Impact Area (SIA) is determined for each pollutant. The SIA is determined to be the distance from the center of the facility to the furthest point predicted by the SIA Model where the concentration of the pollutant is greater than or equal to the applicable SIL. This distance is determined for each year of meteorological data for each averaging period for each pollutant. The largest radius for each pollutant is defined as the critical distance, and is the radius of the SIA, where refined modeling would be performed should the significance level be exceeded.

The first step in the refined modeling process is to develop an emission inventory of all sources to be included in the model runs. Per EPA guidance 50 km is added to the SIA radius and all appropriate sources within this larger circular area are included in the modeling. In order to develop the list of off-site Georgia sources to be modeled, MACTEC will use the latest available version of the National Emissions Inventory database (2002 V3) to identify all point sources of modeled pollutants within the project's area of impact for a given averaging period. The National Emissions Inventory database information will be supplemented with specific source data obtained from facility permitting information. For PSD increment modeling, MACTEC will utilize the existing list of increment consumers on EPD's website, as well as additional Major and Minor PSD Increment sources provided by EPD. MACTEC would request that the EPD supply MACTEC with the latest Major and Minor PSD Increment source spreadsheets (MAJORPSD.xls and MINORPSD.xls) if they have changed since they were last provided to MACTEC in October 2004. MACTEC will also consider any stack heights in excess of 213 feet above ground to require GA EPD confirmation that they do not exceed Good Engineering Practice (GEP) height. If the SIA (plus 50 km) extends into Florida or South Carolina then MACTEC will request an emission inventory from that state agency as well.

In the event a large inventory list is generated, MACTEC may reduce this list using the "20D" rule which eliminates sources with tons/yr emissions less than twenty times the distance from the source to the area of impact for long term model runs and sources with tons/yr emissions less than twenty times the distance from the source to the site for short term model runs. Emissions from sources within 2 km of each other will be combined prior to eliminating sources based on the 20D technique. This rule will be used only on sources outside the impact area.

If stack parameters are missing, MACTEC will attempt to obtain them from EPD files or from the facility. In addition, off-site source approximate source base elevations will be obtained from a 1:250,000 scale USGS sheet using UTM source coordinates of the GA EPD 'Potential' emission spreadsheet. The NAAQS modeling will include only the future maximum potential emissions of the sources under review for the process changes, as well as both on-site and off-site sources that are within or near the SIA that contribute to the standard. A comparison of the NAAQS emission inventory data base and increment source spreadsheets have found several sources that are included in the Increment data base, but not in the NAAQS data base. For consistency, all increment consuming sources will be included in the NAAQS models as well if it is confirmed that these sources exist.

The intent of the refined modeling is to determine if the proposed project causes or contributes to a violation of either the National Ambient Air Quality Standards (NAAQS) or PSD Increment. Table 3 provides these standards, which will be used to compare the model results. For annual averaging periods, the maximum concentrations predicted by the refined modeling for each year for all receptors will be used for comparison. For short term averaging period, the highest 2nd high concentration predicted by the refined modeling for each year for all receptors will be used for comparison. MACTEC presumes that the EPD has preferred background concentrations of criteria pollutants for inclusion in NAAQS compliance analysis. Therefore, MACTEC requests that acceptable background concentrations for criteria pollutants be provided by the Georgia EPD.

Table 4: Background, NAAQS, and Class I and II Increment Standards

Pollutant	Averaging Period	Background ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)	Class I Increment Standard ($\mu g/m^3$)
PM	24-hour	*	150	30	8
	Annual	*	50	17	4
NO_x	Annual	*	100	25	2.5
SO_2	Annual	*	80	20	2
	24-hour	*	365	91	5
	3-hour	*	1300	512	25

* MACTEC requests that EPD provide background concentrations for PM, NO_x, and SO_2 to be used in the modeling analysis.

The same meteorological data used in the screen modeling will also be used for the refined modeling. Only the receptors inside the SIA will be used in the refined modeling. The building downwash parameters calculated from BPIPPRM in the screen models will also be used in determining concentrations for the NAAQS/Increment modeling.

If the modeling results in exceedance of either the PSD increment or the NAAQS standards, additional modeling will be completed to determine the site's contribution to those individual receptors. If this modeling concludes that the site's contribution is below the significant impact levels, then this will be documented in the permit application. The permit application will identify the exceedance as initially modeled, indicating that Project Independence has an insignificant contribution, then list the maximum receptors for which Project Independence has a significant contribution. The contribution from the Project Independence sources will be determined by modeling just the on-site Project Independence sources. Those receptors for which the modeled concentrations are below the significant impact levels will be considered to have an insignificant impact and will not be included in the determination of the maximum concentration for the project.

Startup Scenario Assessment

The PC boiler will be a baseload unit and will primarily operate at or near its maximum capacity. The emissions profile of the main boiler will be different during startup operations. Therefore, two (2) scenarios will be modeled for the main boiler (baseload operations and startup operations). In starting the coal-fired boiler, an alternate fuel (oil in the case of the proposed plant) is burned in the auxiliary boiler to start warming the boiler and flue gas ducts. Once low level coal firing begins, the use of the auxiliary boiler will be ramped down just to the level needed to stabilize the coal combustion and assure sufficient thermal energy is in the furnace for complete coal combustion.

Pollutant emission factors developed in a BACT analysis for fuel oil firing will be used to calculate emissions from fuel oil firing during startup operations. The calculated startup emissions will be modeled with the off-site source inventory using AERMOD and compared to the NAAQS and Increment Standards.

The same meteorological data used in the screen modeling will also be used for the refined modeling. Only the receptor set inside the SIA will be used in the start-up scenario modeling assessment. The building downwash parameters calculated from BPIPPRM in the screen models will also be used in determining concentrations for the NAAQS/Increment modeling.

Class I Areas

The two (2) Project Independence sites are located within 300 km of several Class I areas. Table 4 below lists each Class I area, the location of the point closest to the Project Independence site at the Class I area, and the corresponding distance to the Project Independence site. MACTEC will contact the Federal Land Manager who will provide guidance on how to assess the emission impact for the Class I areas within 300 km of each project site. We presume that the "Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase I Report (December 2000)" will be acceptable guidance for use in the Class I Area evaluations.

The latest available versions of the CALPUFF and CALPOST models will be used to complete this analysis. Three years (2001 – 2003) of 4-kilometer grid meteorological data will be used in the model. The latest available meteorological data set generated in July 2007 using CALMET version 5.8 by the FLM will be used in the modeling. The receptor sets for Wolf Island, the Okefenokee National Wildlife Refuge, along with the St. Marks Wilderness or Cape Romain will be downloaded from the U.S. National Park Service (USNPS) web site and converted to Lambert Conformal Conic (LCC) coordinate system, which is the coordinate system used by the VISTAS meteorological dataset. In accordance with the VISTAS modeling protocol (page 42), the modeling evaluation will not include building downwash because the Class I areas being evaluated are greater than 50 kilometers from the Project Independence sites.

Table 5: Class I Areas near Project Independence

Class I Area	Fitzgerald (Ben Hill County) Distance to Site (km)	Sandersville (Washington County) Distance to Site (km)
Wolf Island	173	231
Okefenokee National Wildlife Refuge	104	227
Saint Marks	194	347
Cape Romain	350	288

Class II Visibility

An analysis will be done to address the impact on Class II areas. Class II visibility analyses only have to be performed for Regional airports, state or federal parks, or state historical sites located within 50 km of the source. The VISCREEN visibility model will be used to model the facility wide potential to emit emission rates. A Level I Analysis will be performed in order to provide a conservative estimate of plume visual impacts. To conduct a Level I analysis, VISCREEN is run by inputting the observer distance equal to the closest sensitive receptor and on-site source, Level I defaults, and worst-case meteorological condition of F class stability and a wind speed of 1.0 m/s. This worst-case meteorological condition is assumed to persist for 12 hours, with a wind direction that would transport the plume in the direction of the observer. If the Level I Analysis found that the site's potential to emit exceeded the screening threshold for the Class II areas located within 50 km of the source, then a Level II (VISCREEN) Analysis will be completed.

A Level II Analysis determines the worst-day plume dispersion characteristic using the method described in the *Tutorial Package for the VISCREEN Model.* Meteorological data files for surface data for the Macon meteorological station and upper air data from the Centreville meteorological station for 1974-1978 (five year period) will be obtained from the Georgia EPD website. In order to conduct the Level II analysis, it is necessary to determine the dispersion condition (wind speed and stability class of the wind in the direction of the Class II area) that has a 1% cumulative frequency of occurrence. This 1% level is a conservative approach that is expected to represent the worst case dispersion condition. For this project, a 22.5° wind sector directed towards the sensitive area by 6-hour time block of each day is ranked in sequence of increasing value of sigma z times the wind speed of the condition under evaluation. Sigma z is the Pasquill-Gifford vertical diffusion coefficient for a given stability class and downwind distance along the stable plume trajectory. Pasquill-Gifford vertical diffusion coefficient values will be obtained from the Handbook of Air Pollution Control and Engineering and Technology[2].

For the Level II analysis, it is also assumed that steady state plume conditions will not persist for more than 12 hours because plume material would become more dispersed than a standard

[2] Mycock , John C., McKenna, John D., and Theodore, Louis. Handbook of Air Pollution Control Engineering and Technology. New York, NY: CRC Press, Inc., 1995 (Figure 4, pg 328).

Gaussian plume model. Therefore, calms (time periods in the meteorological data where wind speeds are 0 m/s) will not be evaluated.

If the Level II Analysis shows results above the VISCREEN screening criteria, MACTEC will proceed to a Level III analysis and use the Pluvue II model to determine visibility impacts. A separate protocol addendum will be submitted to EPD for review if this occurs.

Toxics Modeling

Toxics modeling will also be addressed for this project by following EPD's Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions dated June 21st, 1998. This modeling will involve initial screening modeling using the EPA SCREEN3 (96043) model. Refined modeling using the ISCT3 (02305) model will be completed for any toxics that exceed their corresponding Acceptable Ambient Concentration (AAC) levels.

The AACs will be developed following the EPD Toxic guidelines. AAC will be based on the toxicity data according to the following order of priority: inhalation reference concentrations (RfC) and then Risk Based Air Concentrations from EPAs Integrated Risk Information System (IRIS) database, followed by OSHA PEL standards, ACGIH TLVs, NIOSH RELs, and LD50 toxicity data. In calculating Acceptable Ambient Concentrations, if a toxic pollutant has an RfC or RBAC value, an annual AAC should be calculated, otherwise a 24-hour average AAC should be calculated. A short-term AAC should be calculated for contaminants with published ceiling concentration limits or short term exposure limits. AACs developed from worker exposure levels will be adjusted to account for the potential exposure of the public as well as those which are determined to be carcinogenic (a safety factor of 300 versus a safety factor of 100 for compounds that are not carcinogenic).

No building downwash will be included in this evaluation and the evaluation will only assess the project's impact on areas off the site's property.

To properly address "non-criteria" regulated PSD pollutants, modeling for emissions of mercury and sulfuric acid mist will also include additional coal fired power electric generating facility emission sources within 50 km of the proposed power plant to address these non-criteria pollutant impacts using the AERMOD model with no downwash. AACs will be developed for mercury and sulfuric acid mist following the EPD Toxic guidelines.

Monitoring

For compounds with modeled concentrations greater than the significance level, PSD regulations require a preconstruction monitoring analysis. MACTEC will review the availability of local monitoring data and after consulting with the GA EPD determine whether the existing monitors adequately address the requirements.

Data Submittal and Conclusion

Upon completion of all modeling, we will submit to EPD in electronic format all model runs, building downwash runs (BPIPPRM files), and weather data used in this modeling. Background information, a map of the area surrounding the facility, a scaled plot plan of the facility, and building heights and dimensions, along with all relevant stack parameters, will be included as well.

Please contact us at the earliest possible date whether you agree with this proposed modeling protocol so that we can proceed without further delay. If you have any questions about any of the above please don't hesitate to call me at (770) 421-3334.

Sincerely,

Justin Fickas
Senior Engineer

Ken Hiltgen
Project Manager/Principal